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Dalia Bagdziunaite

BRAINS AT BRAND TOUCHPOINTS

A CONSUMER NEUROSCIENCE STUDY OF INFORMATION PROCESSING OF BRAND ADVERTISEMENTS AND THE STORE ENVIRONMENT IN COMPULSIVE BUYING

PhD School in Economics and Management   **PhD Series 24.2018**

CBS COPENHAGEN BUSINESS SCHOOL
HANDELSHØJSKOLEN

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A Consumer Neuroscience Study of Information Processing of
Brand Advertisements and the Store Environment
in Compulsive Buying

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The PhD School of Economics and Management
Copenhagen Business School

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and international research environment at CBS for research degree students
who deal with economics and management at business, industry and country
level in a theoretical and empirical manner.

Abstract

Background. Compulsive buying—defined as excessive, uncontrolled, and repetitive buying—is a serious problem in today's society, driven by consumeristic values and reinforced by marketing efforts. However, the research on the external influences (e.g., brand information) and underlying processes that explain consumer behavior in brand-manifesting situations in compulsive buying is relatively scarce. This thesis provides an integrative literature review and two experimental studies that yield cross-disciplinary insights into the compulsive buying phenomenon. The thesis aims to study the cognitive, emotional, and behavioral responses that characterize consumer-brand interactions at relevant brand touchpoints in compulsive buying.

Research methodology. Two experimental studies investigate similarities and differences between two groups of consumers with high and low compulsive buying tendencies (CBTs) at two brand touchpoints that represent a pre-purchase and purchase phase of the consumer journey. Multimodal consumer neuroscience tools (i.e., eye-tracker, EEG, and EDA) are employed to collect neurophysiological and physiological responses during exposure to marketing information. The first study examines consumer information processing of advertisements during a simulated TV commercial-viewing experiment. The second study investigates consumer information processing of store environments during a field experiment conducted in two single-brand fashion-apparel stores (i.e., low-end vs. high-end).

Findings. The findings from the first study indicate that, regardless of their CBT level, consumers tend to allocate a relatively equal amount of cognitive resources to attend to, process, and remember exposed advertising information during the entire duration of commercial viewing. The two groups differed in their visual processing of brand elements only when viewing advertisements related to social cause. In the consumer group with a high CBT, a higher cognitive workload was linked to a lower probability of subsequent brand recognition. The findings from the second study revealed that, regardless of the fashion-store type, consumers with a high CBT chose items that were more expensive than consumers with a low CBT. The changes in physiological arousal during the first minute of shopping showed that, although both consumer groups were more emotionally responsive to the high-end than the low-end fashion

store, the emotional receptivity in both groups was expressed in different physiological responses. Specifically, consumers with a high CBT demonstrated a higher frequency and a shorter duration of emotional responses, whereas consumers with a low CBT showed a higher amplitude of emotional responses in the high-end fashion store than in the low-end fashion store. The results indicate that there are two potentially different mechanisms that occur in the two consumer groups during encounters with store information.

Conclusions. This thesis provides theoretical, methodological, managerial, and societal contributions. This research highlights the fact that compulsive buying is a complex phenomenon and that researchers should address both internal and external influences, examine the unconscious processes and mechanisms, and study consumer responses to marketing information in more naturalistic settings. The thesis also promotes the integration of consumer neuroscience tools with the compulsive buying research practice, aims to increase the awareness of the problem of compulsive buying, and encourages the development of novel, technology-based and scientifically driven consumer-behavior-monitoring policies.

Dansk Résumé

Baggrund. Kompulsiv køb - der er defineret ved omfattende, ukontrolleret og gentagen købsadfærd – er et stigende problem i samfundet, og denne tendens er drevet af forbrugernes stærke købsmentalitet og forstærket af virksomhedernes markedsføringsindsats. Dog er forskningen indenfor kompulsiv køb meget begrænset når det kommer til forståelsen for hvordan eksterne påvirkninger (f.eks. brand information) og (neuro)fysiologiske processer forklarer forbrugeradfærd i brandrelaterede kontekster. Denne afhandling præsenterer en integrativ litteraturgennemgang samt to eksperimentelle studier, der afføder tværdisciplinære indsigter i kompulsiv køb. Afhandlingen sigter mod at undersøge kognitive, emotionelle såvel som adfærdsmæssige responser, der er centrale for forbrugerens interaktion med et brand i relevante kontekster.

Metodologi. De to eksperimentelle studier udforsker ligheder og forskelle mellem to forbrugergrupper med henholdsvis høj og lav kompulsiv købstendens (KKT) i to brandkontekster der repræsenterer en prækøbs- og købsfase i deres forbrugerrejse. Multimodale neurovidenskabelige værktøjer (Eye-tracker, EEG og EDA) bliver anvendt for at indsamle neurofysiologiske og fysiologiske responser under forsøgspersonernes eksponering til marketing information. Det første studie undersøger forsøgspersonernes informationsprocessering af reklamer i et eksperiment med simulerede Tv-reklamer. Det andet studie undersøger forbrugeres omgivelsesmæssige informationsprocessering i et felteksperiment udført i to enkelt-brand modetøjsbutikker (eksklusiv vs. billig).

Resultater. Resultaterne fra det første studie indikerer, at forbrugerne allokerede en relativt ens mængde kognitive ressourcer til at være opmærksom på, processere og huske den eksponerede marketing information, gennem hele reklameeksperimentet. De to grupper (høj-KKT vs. lav-KKT) udviste en forskel relateret til visuel processering af brandelementer. Denne forskel forekom dog kun når deltagerne blev eksponeret for reklamer omhandlende sociale problemstillinger. I gruppen med høj KKT var en højere kognitiv arbejdsbelastning forbundet med en lavere probabilitet for efterfølgende brandgenkendelse. Resultaterne fra det andet studie viser, at høj-KKT forbrugere valgte produkter, der var dyrere end lav-KKT forbrugere, også på tværs af butikstyper (eksklusiv vs. billig). Deltagernes fysiologiske arousal i løbet af det første

minut af indkøbsturen viste, at begge eksperimentgrupper (høj-KKT / lav-KKT) var mere følelsesmæssigt engageret i forhold til eksklusive modetøjsbutikker. Dog udviste eksperimentgrupperne forskellige fysiologiske former for følelsesmæssig respons. I den eksklusive modetøjsbutik, sammenlignet med den billige, var den emotionelle fysiologiske respons hos forbrugere med høj-KKT højfrekvent og kortvarig. Tilsvarende var responsen hos forbrugerne med lav-KKT kendetegnet ved at være stærkere i styrke. Disse resultater indikerer at der potentielt er to distinkte mekanismer, der udspiller sig hos de to forskellige forbrugergrupper i mødet med butiksinformation.

Konklusion. Denne afhandling bidrager med ny viden på et teoretisk og metodisk såvel som ledelses- og samfundsmæssigt plan. Afhandlingen lægger vægt på at kompulsiv køb er et komplekst fænomen. Derfor argumenteres der for, at forskere bør anerkende både interne og eksterne påvirkninger, undersøge ubevidste processer og mekanismer, såvel som studere forbrugerresponser på marketinginformation i mere naturalistiske omgivelser. Denne afhandling fordrer en mere udbredt anvendelse af neurovidenskabelige værktøjer i forskningen af kompulsiv køb. Endeligt, sigter denne afhandlingen mod at øge bevidstheden om problemet med kompulsiv køb og at opfordre til udviklingen af nye, teknologibaserede og vidensdrevet politikker angående forbrugermonitorering.

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List of Abbreviations

Ad: advertisement

AOI: area of interest defined for visual attention measures

Axis I and II disorders: mood disorders

CBT: compulsive buying tendency

DFA: discriminant function analysis

DSM- II-R, DSM – IV, and DSM-V: diagnostic and statistical manual of mental disorders

EEG: electroencephalography

ELM: Elaboration Likelihood Model

FF and HF: high –end fashion and low-end fast-fashion stores

fMRI: functional magnetic resonance imaging

GLMM: generalized linear mixed model

GSR: galvanic skin response, **EDA:** electrodermal activity, **EDR:** electrodermal reactivity; **SC**: skin conductance, **SCR:** skin conductance response, **SCL:** skin conductance level

ICD – 10 and ICD-11: international statistical classification of diseases and related health problems

ICD: impulse control disorders

LC4PM: Limited Capacity Mediated Model of Motivated Mediated Message Processing

LMM: linear mixed model

Low-CBT and High-CBT: low and high compulsive buying tendency groups

MRM: Mehrabian-Russell Model

OCD: obsessive compulsive disorders

RAS: Reticular Activating System

TS: time spent fixating on area of interest

TTFF: time to first fixation on area of interest

Main Concepts

Compulsive buying. There are two streams of literature that view compulsive buying from different perspectives. The clinical field conceptualizes compulsive buying as a distinct set of symptoms and behaviors that can be identified as a mental disorder that is treated as an individual's problem. Consumer researchers identify compulsive buying among consumers that exhibit the *"extreme generalized urges to buy"* within the normal consumer population (without limitation to a special subgroup) (d'Astous, 1990, p.17). Compulsive buying represents consumer behavior that is characterized by a tendency for excessive shopping and buying behavior driven by experienced preoccupations and irresistible buying urges that lead to negative consequences (Ridgway, Kukar-Kinney, & Monroe, 2008). Consumer researchers also expand the understanding to include socio-cultural influences and the social context in which consumers function. The latter approach is used as a point of departure for an understanding of compulsive buying in this thesis. Thus, this thesis views compulsive buying as behavior that is expressed in wide-ranging tendencies among the general consumer population (e.g., d'Astous, 1990; Ridgway et al., 2008) where only the extreme merits the label of *"abnormal"*.

Brand. The consumer-based brand approach is chosen to be pursued in this doctoral thesis (for review, see Keller, 1993; 2003; 2009).

Brand touchpoint. The term "customer touchpoint" refers to any occurrence in which a consumer encounters a product or brand, regardless of whether the encounter occurs via mass communications or contact in the real world (Aufreiter, Elzinga, & Gordon, 2003). As defined by Neslin et al., (2006, p.96), a brand touchpoint is *"a customer contact point or a medium through which the firm and the customer interact."*

Consumer neuroscience. Consumer neuroscience is an academic discipline that is a hybrid of consumer psychology and neuroscience. The field is aimed at the *"integration and adaptation of the methods and theories from neuroscience combined with behavioral theories, models, and tested experimental designs from consumer psychology and related disciplines, such as behavioral decisions sciences to develop the neuropsychologically sound theory to understand consumer behavior"* (Plassmann, Ramsøy, & Milosavljevic, 2012, p.12).

Attention. The term "attention" refers to both higher cognitive processes - such as engagement and cognitive workload—and visual attention, which is related to visual perception (Anderson, 2005; Duchowski, 2002; Gottlieb, Hayhoe, Hikosaka, & Rangel, 2014; Kahneman, 1973).

Memory. In this thesis, memory is viewed as an associative neural network in the brains of the consumers (Collins & Loftus, 1975; Keller, 1987). This includes both the explicit (declarative) memory and implicit (non-declarative) memory (Schacter & Tulving, 1994; Tulving & Schacter, 1990; Tulving, Schacter, & Stark, 1982).

Emotions. The term "emotions" is used to describe *"a collection of changes in body and brain states triggered by a dedicated brain system that responds to specific contents of one´s perceptions, actual or recalled, about particular object or event"* (Bechara & Damasio, 2005, p.339). Emotional changes primarily occur in interoceptive states of the body and result in different physiological modifications, such as changes in the arousal system that are translated into behavioral responses as well as a cognitive interpretation of the experienced states (Bechara & Damasio, 2005).

Information processing. "Information processing" refers to the complex dynamic interplay between the different processes that occur in different levels of awareness and are captured via cognitive, emotional, and behavioral responses (Foxall, 2008; Plassmann et al., 2012; Shaw & Bagozzi, 2018).

Store environment. The terms "store environment" and "store atmospherics" are used interchangeably in this thesis. Per the definition introduced by Kumar and Kim (2014), the store environment consists of both the store atmospherics cues (including the social, design, and ambient cues) as well as merchandise cues. The effects of the store environment are viewed from the holistic rather than the individual perspective, and this holistic perspective is expressed in the store experience (Ballantine, Parsons, & Comeskey, 2015).

Hedonic and utilitarian motives. The term "utilitarian motives" refers to the desire to fulfill a task (e.g., to purchase a product to satisfy a specific functional need) (Hirschman & Holbrook, 1982; Van Rompay, Tanja-Dijkstra, Verhoeven, & van Es, 2012). In contrast, "hedonic motives" are related to a positive feeling (e.g., excitement or pleasure) experienced while interacting with the shopping environment or products.

Natural environment. "Natural environment" refers to both the simulated and real-world situations that are studied in this thesis (Gravetter & Forzano, 2012).

This Ph.D. thesis is a 'monograph-based' Ph.D. thesis from the Copenhagen Business School that consists of six chapters revolving around Brand Advertising and Store Environment Processing in Compulsive Buying. The thesis begins with an Introduction chapter (Chapter 1), which presents the foundation for the conducted research. The section on the Problem Orientation introduces the topic and outlines the research strategy. The section on the Research Goal and Research Approach provides the research focus, the deducted research questions, the methodological approach, and the thesis contributions. Chapter 1 ends with a Reader's Guide that provides a detailed description of the thesis structure.

1. Introduction

"You look... amazing!" And I have to say, I agree.

I'm wearing all black - but **expensive black**. The kind of deep, soft black that you fall into. A simple sleeveless dress from **Whistles, the highest of Jimmy Choos**, a pair of stunning uncut amethyst earrings.

> **And please don't ask how much it all cost, because that's irrelevant.**

This is investment shopping. The **biggest investment of my life. I haven't eaten anything all day,** so I'm nice and thin and for once my hair has fallen perfectly into shape. I look... well, I've never looked better in my life. However, of course, looks are only part of the package, aren't they?"

— **Sophie Kinsella, Confessions of a Shopaholic**

1.1. Problem Orientation

Although buying is an important pillar of economic activity (Woodruffe-Burton, Eccles, & Elliott, 2002), the dark side of consumption—namely, compulsive buying—is often ignored or even forgotten (Dittmar, 2005; Kukar-Kinney, Ridgway, & Monroe, 2012). Compulsive buying is defined as a consumer's tendency for a constant preoccupation with buying that manifests in repetitive buying and an inability to control impulses when faced with buying temptations (Black, 2007; Ridgway, Kukar-Kinney, & Monroe, 2008). It has been identified as an *"excessive, expensive, and time-consuming retail activity"* (Kellett & Bolton, 2009, p.83) that often leads to harmful financial, emotional, and social consequences (Claes et al., 2010; Dittmar, 2005; Faber 1992; Faber & O'Guinn, 1988). In light of these observations, we can conclude that compulsive buying is an excellent representation of a complex behavior that challenges the predominant assumption in conventional economic models that consumers are rational (Black, 2001, 2007; Lejoyeux & Weinstein, 2010; Ridgway et al., 2008).

Recent studies demonstrate that there has been a shift in the economic and cultural landscapes over the past few decades that has resulted in a measurable increase in compulsive buying rates in the general population (Neuner, Raab, & Reisch, 2005; Unger & Raab, 2015). Additionally, epidemiological studies have reported that the estimation of prevalence rates for compulsive buying may range from 1 to as much as 30% depending on the studied sample (e.g., adult sample, college students, web visitors, shopping-specific samples, etc.) (Basu, Basu, & Basu, 2011). A hundred years ago, compulsive buying was labeled as an *"impulse insanity"* and was considered prominent only in a small subgroup of the population (Bleuler, 1924; Kraepelin, 1915). Over the past few decades, the phenomenon has become a *"global problem"* in the consumption-driven society that is observed in various cultural settings (Unger & Raab, 2015, p. 16).

For over twenty years, compulsive buying has been an ongoing area of interest for two major scientific research streams: 1) clinical psychology and psychiatry research (e.g., Black, 2001, 2007; Claes et al., 2010; Trotzke, Starcke, Pedersen, Müller, & Brand, 2015) and 2) consumer research (e.g., d'Astous, 1990; Dittmar & Drury, 2000; Faber & O'Guinn, 1989, 1992; Kukar-Kinney, Scheinbaum, & Schaefers, 2016; Ridgway et al., 2008).

Clinical researchers commonly refer to compulsive buying as a distinct disorder (Müller, Mitchell, & De Zwaan, 2015, p. 135) and view it from a medical standpoint that highlights the individual. In the clinical field, compulsive buying is often perceived as a manifestation of comorbid psychiatric conditions, although there is no agreement on the classification of the specific types of disorders (Dittmar, 2005). Thus, clinical measures are used to diagnose the so-called *"suffering"* buyers (Müller et al., 2015). According to Lee and Mysyk (2004, p.1709), *"what could be considered a social problem is treated as a widespread medical problem"*. This medicalization process has consequences on the control of the consumers prone to compulsive buying in the general population who deviate from the norm (Lee & Mysyk, 2004). Instead of conceptualizing compulsive buying as a pathological condition driven by intrinsic factors, the context that facilitates and reinforces a buyer's desire to buy should be also acknowledged (Spinella, Lester & Yang, 2015; Lee & Mysyk, 2004).

On the other hand, consumer researchers instead frame compulsive buying as a problematic behavior (e.g., Faber & O'Guinn, 1992) in the general population that is facilitated by socio-cultural influences. From this standpoint, compulsive buying is understood to be a compensatory strategy implemented by consumers who believe that it will help them fulfill unmet emotional and social needs, which could include gaining social confirmation (d'Astous, 1990), regulating their mood (Elliott, 1994; McElroy et al., 1994), or transforming their self-identity with branded possessions (Dittmar, Long, & Meek, 2007). Most consumer researchers agree that there is a significant number of consumers that fall somewhere between the two extremes of clinically diagnosed compulsive buyers and highly frugal consumers (Benson, 2000; d'Astous, 1990; Dittmar et al., 2007; Chaker, 2003; Desarbo & Edwards, 1996). This difference between two extremes is discerned via an increasing degree of excessive and uncontrolled buying that has a set of sub-clinical symptoms and characteristics linked to compulsive buying. According to Hassay and Smith (1996), *"consumer behavior falls on a normal-abnormal continuum with an ill-defined middle that is culture and context specific"*. Consumer researchers predominantly assess the strength of compulsive buying behavior in the general population with shopping attitudes and behavior measuring questionnaire-based compulsive buying scales (Dittmar, 2005).

According to Benson (2008, p.2), policies facilitating economic growth have resulted in the production of substantially more non-necessary goods that *"are sold to the populations whose basic needs are me*t." Sociocultural progress has also reinforced the development of consumption-driven society values highlighting hedonic motivation, symbolic consumption, and materialistic ideals (Benson, 2000; Dittmar, 2005; Elliott, 1994). In short, we live in a disposable society that triggers anxiety and offers instant-gratification solutions to numb the invoked negative emotional states. Due to the increased competition between brands, marketing professionals continuously invest large sums of money to deliberately attract consumers' attention, create stronger brand memories, stimulate positive emotions, and ultimately motivate consumers' purchase decisions. As a result, each day consumers are exposed to more than 2000 brands (Solomon, 2015) at different brand touchpoints (e.g., brand advertising or retail touchpoints) over the course of their purchasing journey (i.e., through the pre-purchase, purchase, and post-purchase stages) (for review, see Court David, Dave Elzinga, Susan Mulder, 2009).

Despite the vast amount of research that has been conducted on compulsive buying, the underlying responses that characterize consumer interaction with marketing information in brand-manifesting situations have not yet been fully established. In particular, the following gaps remain:

First, despite the fact that brands have an inevitable impact on consumer decisions during multiple stages of the consumption journey (e.g., pre-purchase, purchase, etc.), research on the consumer behavior during brand encounters in compulsive buying literature is still quite limited (e.g., Lo & Harvey, 2012; Mikołajczak-Degrauwe & Brengman, 2014; Kukar-Kinney et al., 2016). Only a few studies, which questioned the role of brands in the buying experience, have been conducted in compulsive buying domain (e.g., Horváth & Birgelen, 2015; Kukar-Kinney, Ridgway, & Monroe, 2009; Lejoyeux et al., 2007; Lo & Harvey, 2011, 2012). In addition, only a handful of studies have investigated consumer responses during interaction with brands through different types of brand communication (e.g., Kwak, Zinkhan & DeLorme, 2002; Lee, Lennon, & Rudd, 2000; Mikołajczak-Degrauwe & Brengman, 2014); similarly, the compulsive buying behavior in an actual shopping context is also under-investigated (e.g., Kellett & Totterdell, 2008; Lo & Harvey, 2012). Thus, more research is needed to provide a better understanding of a consumer's interaction with brands via different brand touchpoints in compulsive buying.

Secondly, compulsive buying is predominantly studied from a general point of view instead of being investigated in the settings in which consumer behavior occurs (Johnson & Attmann, 2009; Dittmar, 2004). Previous studies have demonstrated that compulsive buyers are more vulnerable to shopping triggers and have a higher dependence on buying activities due to their enhanced sensitivity to emotionally charged reward-related cues (Kukar-Kinney et al., 2009). Thus, they are more easily affected by environmental-situational factors such as encountered brand information or media effects (Desarbo & Edwards, 1996; Kellett & Bolton, 2009; Valence et al., 1988). For instance, twice as many compulsive than non-compulsive buyers admit to often being influenced by advertising efforts (Mikołajczak-Degrauwe & Brengman, 2014). In addition, approximately 45% of a compulsive buyer's buying decisions are affected by brands, and compulsive buyers are twice as likely to make their purchasing decisions during store visits as non-compulsive buyers (Lejoyeux et al., 2007; Lo & Harvey, 2011). According to Kellett and

Totterdell (2008), there is a need for more research in compulsive buying domain to study consumer behavior in the context(s) of its manifestation.

Thirdly, the dynamic cognitive, emotional, and behavioral responses underlying consumer-brand interaction in compulsive buying have not been fully established. According to Kukar-Kinney et al., (2016, p. 697), *"to assess and prevent negative consequences of marketplace offers for at-risk consumers it is necessary to understand characteristics of these individuals."* It has long been demonstrated that the *"homoeconomicus"* assumptions about consumer rationality, which drive conventional theories in economics, are no longer valid (for review see, Bechara & Damasio, 2005). Brands affect consumers from the first milliseconds of branded product exposure by activating consumers' memory, reward valuation, and emotional brain systems important for purchase decisions (Kirk, Skov, Hulme, Christensen, & Zeki, 2009; McClure et al., 2004). Despite this fact, the traditions of knowledge acquisition and interpretation in compulsive buying literature have been driven by conventional research approaches. For example, the evidence in the field has been predominantly collected via self-report methods (e.g., Dittmar, 2004; Horváth & Birgelen, 2015; Kellett & Totterdell, 2008). There have been only a few experiments that studied the underlying mechanisms of compulsive buying behavior with neural, physiological, and behavioral data collection techniques (e.g., Lawrence, Ciorciari, & Kyrios, 2014a; Raab, Elger, Neuner, & Weber, 2011; Trotzke, Starcke, et al., 2015). According to Horváth, Büttner, Belei, and Adıgüzel (2015), more direct methods should be used in field in order to gain better insight into compulsive buying phenomenon. According to Dittmar (2000), since compulsive buying is a complex behavior, to adequately understanding it we must go beyond surveys.

In the early 1980s, Nobel laureate Daniel Kahneman and his colleague Amos Tversky (1981) introduced a new wave of experiments studying the cognitive plausibility of decisions. Their findings led to the recent scientific advances offering new interdisciplinary consumer neuroscience and behavioral economics approaches and methods to be integrated into the traditional disciplines regarding consumer behavior and marketing strategies. Traditional consumer behavior and marketing theories highlight the conscious aspects of the decision-making. Consumer neuroscience approaches, on the other hand, offer an excellent opportunity to provide more profound insights on cognitive, emotional, and behavioral processes underlying the information processing in aberrant behavior patterns (Padoa-Schioppa, 2011). Furthermore,

the introduction of less-intrusive mobile solutions, advanced statistical multivariate modeling, and noise-reduction algorithms offered a possibility to study consumer behavior in more realistic situations (Duchowski, 2002; Gidlöf, Wallin, Dewhurst, & Holmqvist, 2013; Groeppel-Klein, 2005; Holmqvist et al., 2011; Stopczynski et al., 2014; Zink, Hunyadi, Huffel, & Vos, 2016).

1.2. Research Goal and Research Approach

1.2.1. Research Goal

This doctoral thesis is a result of a series of literature reviews and two experimental studies. This research yields cross-disciplinary insights into compulsive buying via an examination into the processing of marketing information. Cognitive, emotional, and behavioral responses that underlie the consumer-brand interaction are investigated at two brand touchpoints. Different multimodal consumer neuroscience tools are employed, and the information processing is studied in more natural environment representing experimental settings. The central research goal of this thesis is therefore summarized as follows:

> *RG: To investigate the cognitive, emotional, and behavioral responses that characterize consumer-brand interaction at relevant brand touchpoints in compulsive buying.*

Court et al. (2009) argued that consumer decision-making is an interactive process in which a consumer's decisions can be affected by any contact with a brand over the course of the consumer-decision journey (i.e., during the pre-purchase, purchase, and post-purchase stages). In this thesis, two study settings (namely, interaction with brand advertising and interaction with the in-store environment) representing two phases of the consumer-decision journey (i.e., pre-purchase and purchase) are chosen for empirical investigation (Baxendale et al., 2015; Davis & Dunn, 2002; Lemon & Verhoef, 2016). Selected brand touchpoints have been proven to be amongst the most influential touchpoints for brand consideration (Baxendale et al., 2015) and are reported to have a tremendous, yet understudied, impact on compulsive buying behavior

(e.g., Mikołajczak-Degrauwe & Brengman, 2014; Prete, Guido, & Pichierri, 2013; Sohn & Choi, 2012; Lejoyex et al. 2007). To address both the specifics of each situation and the different parts of the consumer journey, this thesis approaches brand touchpoints separately (Baxendale et al., 2015). Thus, the central research goal is divided into two research questions that each resulted in an experimental study:

> ***RQ1 (Study I): What are the cognitive responses that characterize consumer information processing of advertisements in compulsive buying?***
>
> ***RQ2 (Study II): What are the emotional and behavioral responses that characterize consumer information processing of the store environment during a shopping experience in compulsive buying?***

Understanding the underlying responses that characterize consumer-brand interaction in compulsive buying is of theoretical, managerial, and social relevance. First, examining the negative aspects of consumption is essential in further development of the consumer research field (Faber 1992; O'Guinn & Faber, 1989). By studying compulsive buying in the general population, this research may provide better insight into consumers' shopping and spending habits, reflecting excessive patterns rather than representing the pathological form of buying (Desarbo & Edwards, 1996). By revealing the cognitive, emotional, and behavioral differences during interaction with brand advertising and the store environment, this research can help improve the compulsive buying theories built on the descriptive and self-reports-based evidence. In addition, this thesis also provides useful insight for the marketing and retail design literature on information processing and brand touchpoints. Finally, increased awareness about compulsive buying may encourage public institutions to support research efforts in the academic domain and to foster more research investigations in the field (Raab et al., 2011).

Secondly, considering the effects of and responses to marketing stimulation may increase the general understanding of the factors that negatively contribute to compulsive buying behavior (Gupta, 2013; Workman & Paper, 2010). Today, social responsibility has become one of the main tactics that companies use in their brand's communication strategies (Kerin, Hartley, & Rudelius, 2011). Thus, the knowledge gained in this thesis may help educate marketing professionals about their impact on this vulnerable consumer group and thereby encourage more

socially responsible marketing practices (Gupta, 2013; Workman & Paper, 2010). Finally, there is a high volume of returns (Hassay & Smith, 1996) and/or frequent brand switching (Horváth & Birgelen, 2015) that can result from compulsive buying. Instead of benefiting retailers, the uncontrolled buying may lead the loss in their profits. Thus, an increased understanding of different consumer segments can help marketing professionals to reduce the stimulation in their communication and instead design more optimized marketing strategies.

Thirdly, the problems faced on a personal level by compulsive buyers— such as an inability to pay off debts, emotional despair, and/or impairment in market functioning—often ultimately lead to more substantial problems that affect the collective well-being of the population (Manolis & Roberts, 2008). A better understanding of compulsive buying can provide valuable input for the development of public policies (Ridgway et al., 2008), and help detect, define, and predict the manifestation of aberrant behavior. Applied in a socially responsible way, the interdisciplinary consumer neuroscience approaches can provide significant input for consumer protection (Kenning & Linzmajer, 2011; Raab et al., 2011; Scherhor, Reisch, & Raab, 1990). By challenging the conventional view of consumer behavior, consumer advocates can design more efficient consumption-monitoring strategies. As an example, assumptions from consumer neuroscience and behavioral economics are widely acknowledged and practiced in the health and public-policy domain. This knowledge is used to design programs that more precisely match human behaviors with an intended goal of effecting behavioral change (Datta & Mullainathan, 2014).

Finally, the knowledge presented in this thesis may also serve an educative purpose, enlightening consumers about their own behaviors and choices as well as informing them of the consequences of overconsumption (Edwards, 1993; Faber & O'Guinn, 1992; Lejoyeux & Weinstein, 2010). By being more aware of their own reactions, a consumer may gain more control over the factors that reinforce their behavior during interaction with brands, products, and the context surrounding their decision-making.

1.2.2. Research Approach

To accomplish the central goal of this thesis and answer the related research questions, interdisciplinary theoretical and methodological insights are employed. The predominant approach takes a deductive point of view with positivistic epistemologies. Quantitative research is chosen to identify and explore the relationships between the variables of interest. Selecting quantitative methods for these purposes gives the possibility to draw the scientific conclusions while minimizing the subjective judgment (Bryman, 2015). To better explain the phenomenon investigated in Study II, quantitative data is supplemented with qualitative information on the underlying motives of shopping behavior. In each experiment consumers are recruited from the general population and grouped into high and low compulsive buying tendency groups. The two groups are compared with each other in regard to their responses to brand advertisements, and their responses to the store environment.

Sample. Both studies are limited to female participants. This limitation was chosen for several reasons. First, numerous studies on the prevalence rates of compulsive buying have shown that both men and women tend to buy compulsively. Even though some studies show equal gender distributions for compulsive buying (e.g., Koran, Faber, Aboujaoude, Large, & Serpe, 2006; Mueller, Mitchell, et al., 2010), most researchers agree that more women than men buy compulsively in general (e.g., Black, 2007; d'Astous, 1990; Faber & O'Guinn, 1992; Harvanko et al., 2013). Additionally, studies that evaluate compulsive buying tendencies in the consumer population indicate that women tend to score higher on compulsive buying assessing scales than men (e.g., Scherhor et al., 1990). From a clinical perspective, researchers indicate that women report being more vulnerable to so-called "mall disorders," such as binge eating and excessive shopping (McElroy et al., 1994), while men tend to compensate their emotional needs via gambling, excessive drugs, or sex (Holden, 2001). Second, there are significant differences in the preferred product categories for compulsively buying men and women (e.g., Black, 2001; Scherhorn, 1990). These could have impacted how a participant responded to a stimulus in the contexts tested in this thesis. Third, a large number of studies that previously explored the neurophysiological and physiological responses in compulsive buying (e.g., Lawrence et al., 2014a; Raab et al., 2011) and the consumer interaction with marketing stimuli (e.g., Kukar-Kinney et al., 2009, 2012, 2016) or a specific marketing context (e.g., fashion) (e.g., Lejoyeux et al., 2007; Park & Burns, 2005) primarily examined female consumers. Thus, keeping this

research sample consistent with the delimitation used in previous studies facilitates a more precise interpretation of the results. The choice for gender-specific delimitation is discussed in further depth in the *Limitations section* in *Chapter 5.6.* and also addressed in the *Future Research section 5.7.*

Compulsive Buying Assessment. Based on the psychometric properties of the scales, *Compulsive Buying Scale* from Valence et al. (1988) is chosen as the primary method for assessing the consumer's compulsive buying tendency. The *Compulsive Buying Index* (Ridgway et al., 2008) is additionally employed to validate the chosen instrument's convergent validity. Based on indicated scores, the consumers are divided into two groups: those with a high compulsive buying tendency and those with a low compulsive buying tendency, which are hereafter respectively also referred to as "compulsive buyers" and "non-compulsive buyers"/ "prudent buyers". The specific methodological choices employed in each study are further presented in *Chapter 3 (Study I)* and *Chapter 4 (Study II).* The limitations of these choices are outlined in *Chapter 5.6.*

To test the deducted hypotheses, neurophysiological and physiological data in combination with verbal data are collected. Stationary and mobile eye-tracking devices are used to measure physiological responses, namely, visual attention, to the stimuli that are tracked through the visual system. An electroencephalograph (EEG) is employed to study electromagnetic brain activity, thereby enabling the investigation of cognitive responses such as engagement and cognitive workload. A biosensor measuring electrodermal activity (EDA) is employed to track the changes in physiological arousal. Self-reports with both open and closed questions are used to better understand the consumer's opinions of the constructs under investigation.

Eye-tracking. Eye-tracking is a valuable technique to identify and measure the immediate physiological responses induced by the presented visual information. Eye movement helps us determine the sequence of data selection and acquisition, and it also provides information on the temporal aspects of the studied cognitive processes (Duchowski, 2002, 2007; Gidlöf et al., 2013; Holmqvist et al., 2011). We can track the location of a subject's gaze using eye-tracking devices, which use corneal reflections induced by infrared light to locate the positions of the pupil and cornea, from which we can estimate the point of a gaze in a presented image (for technical details, see: Duchowski, 2007; Holmqvist et al., 2011). Although eye-tracking can

give important temporal and spatial indication of the cognitive processes, it does not provide any information about which cognitive processes are involved (Holmqvist et al., 2011).

Electroencephalography (EEG). An EEG is a neurophysiological measurement that can capture complex patterns in brain activity in milliseconds after being exposed to a stimulus (Teplan, 2002; Zurawicki, 2010). Rather than measuring the deep brain structures, EEGs record brain activity in frequencies by capturing the electric field in the scalp. The amplitudes of the electric currents are related to frequency bands of mental states. Although an EEG can provide a precise understanding of the slightest neurophysiological changes induced by stimuli and feature a high temporal resolution, it has a low spatial resolution (Venkatraman et al., 2015; Zurawicki, 2010). Hence, it is often coupled with other physiological measurement tools.

Galvanic skin response (GSR). This technique is also known as skin conductance (SC) or electrodermal activity (EDA). GSR captures changes in sweat secretion by non-invasively recording the skin's electrical characteristics and providing the measures in micro-Siemens (μS) per unit time (Boucsein et al., 2012; Boucsein, 2012; Fowles et al., 1981). The latency of the response is slow since reactions are recorded 1-2 seconds after the onset of the stimulus. GSR responses are important to consider because sudomotor activity plays a dominant role in thermoregulation and sensory discrimination (Boucsein, 2012). Specifically, the secretion of sweat in hands and feet is a robust indication of emotional stimulation representing activation of the autonomic nervous system, which could indicate an orienting response or a more general emotional arousal (Boucsein, 2012; Ravaja, 2004). EDA responses are hard to be consciously controlled since they are modulated autonomously by sympathetic activity which motivates human behavior through cognitive and emotional states under conscious awareness (Boucsein, 2012). Measuring of tonic and phasic EDA responses enable us to assess the changes of emotional and motivational components of arousal that reflect the relevance of a stimulus or an event in the surrounding environment (Boucsein, 2012). However, although the EDA parameters can indicate slightest variations in arousal, they cannot provide information about the valence or subjective interpretation of the experienced emotional state. To measure the simultaneous perception of the stimuli in the natural environment (e.g., store), by capturing the variations of physiological changes in emotional responses, a mobile EDA device is often employed (Bagozzi, Gopinath, & Nyer, 1999; Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). This data-collection method has been validated and successfully applied in other affect

investigating studies in the consumer research domain (Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001; Ohme, Reykowska, Wiener, & Choromanska, 2009).

By coupling the eye-tracker with other tools to collect neurophysiological and physiological data, such as EEG or EDA measurement devices, the researcher can track the changes in the measurements during the time frame of interest and at the specific position. A more detailed description of the specific methods employed for each study is provided in *Chapter 3* and *Chapter 4.*

The integration of state-of-the-art measurement techniques (i.e., EEG, eye-tracking, and EDA) in this study enables the recording of pertinent behavioral signals in the investigated scenarios. It also complements and advances traditional approaches because consumer neuroscience tools that measure biofeedback can help overcome the limitations of data-collection techniques based on self-reporting (Kenning, Plassmann, & Ahlert, 2007; Knutson, Rick, Wimmer, Prelec, & Loewenstein, 2007; Plassmann et al., 2012). Compulsive buying is a sensitive topic. Self-report measures can often be influenced by various biases as consumers may often provide strategically-shaped responses affected by filters of sense and/or social desirability, they may be reluctant, or unable to verbalize their behavior or experienced states (Dimofte, 2010; Nevid, 2010). By integrating the consumer neuroscience methods to collect data, this study offers a potential to explain the variance in the studied phenomenon at a more in-depth level, which is necessary for the development of more neuropsychologically sound theoretical models (Kenning et al., 2007; Knutson et al., 2007; Plassmann et al., 2012; Solnais, Andreu-Perez, Sánchez-Fernández, & Andréu-Abela, 2013; Yoon et al., 2012)

In addition, by conducting a field experiment (*Study II*), this thesis responds to the emerging call for studies that use mobile data-collection methods to investigate consumer behavior and choices in more natural environments (e.g., Gidlöf et al., 2013). This offers pioneering theoretical and methodological insights that could be valuable for further research attempts, both in academic and commercial fields.

In Study I, the cognitive responses to brand advertisements in two groups of consumers with a high and low compulsive buying tendency are examined during a task that simulates the viewing of a TV-advertisement. The advertising variables underlying information processing (namely, engagement and cognitive workload during ad-exposure, visual attention to visual brand elements, and self-reported memory performance) are estimated and compared between two groups. Additionally, the impact of the presented advertising category and the relationship between the attention measures and the memory measures for the two groups are also explored.

In Study II, emotional and behavioral responses in two groups of consumers — again grouped into a high or low compulsive buying tendency groups— are tested during a shopping excursion through two single-brand fashion-apparel stores, one representing a low-end fashion store and one a high-end fashion store. The variables that indicate the effects of the store during interaction with the in-store environment (namely, arousal and behavioral shopping-experience outcomes) are measured during a shopping experience in each fashion store and compared between the two groups. The relationship between the emotional and behavioral measures and their differences depending on the groups are also explored.

An overview of the research studies included in the thesis is presented in Table 1-1 below.

	Setting	Constructs	Consumer segments	Research methods	Research design	Analyses
Study I	<u>Pre-purchase:</u> Interaction with brand advertising	Attention and memory	Consumers with a high and low compulsive buying tendency	EEG synchronized with stationary eye-tracker and self-report-based questionnaire	Simulated laboratory experiment	Linear Mixed Models Generalized Linear Mixed Models Parametric and nonparametric tests Spotlight analyses
Study II	<u>Purchase:</u> Interaction with the store environment	Arousal and in-store behavior	Consumers with a high and low compulsive buying tendency	Mobile EDA tracking device, eye-tracking glasses and self-report-based questionnaire	Field experiment	Linear Mixed Models Parametric and nonparametric tests Spotlight analyses

Table 1-1. Overview of studies included in this Ph.D. thesis

1.3. Readers Guide

This thesis begins with an overview of the compulsive buying literature to set the stage for the conceptual and empirical inquiry. *Chapter 2* commences with a *Preface* subsection that introduces the reader to the theoretical and methodological research traditions within clinical and consumer research streams. This preface is followed by an integrative review of findings from the compulsive buying research. The literature review is organized into four areas of interest:

- conceptualization and taxonomy of compulsive buying definitions *(Section 2.2),*
- compulsive buying measurement *(Section 2.3),*
- consumer characteristics linked to compulsive buying (*Section 2.4*), and
- compulsive buying and brand touchpoints (*Section 2.5*).

Chapter 2 provides a retrospective view of compulsive buying by clarifying the taxonomy of definitions and different conceptual approaches to compulsive buying and by overviewing different compulsive buying assessment tools. The chapter also addresses the importance of acknowledging the contextual influences in the compulsive buying domain. Therefore, literature findings on consumer characteristics linked to compulsive buying including personal variables and product, brand, and buying context variables are identified. Then, findings on compulsive buying and brand touchpoints are presented. *Chapter 2* ends with a summary of the compulsive buying literature *(Section 2.6)*. The chapter serves as theoretical background for the experimental studies presented in *Chapter 3* and *Chapter 4*.

Chapter 3 (*Study I: Interaction with Brand Advertising: Attention and Memory in Compulsive Buying)* and *Chapter 4 (Study II: Interaction with Store Environment: Arousal and In-store Behavior in Compulsive Buying*) present the empirical findings of this doctoral thesis. Each chapter begins with a short recap of the corresponding study *(Sections 3.1. and 4.1)* and is followed by sections containing the research rationale and theoretical framework *(Sections 3.2, 3.3 and 4.2, 4.3)*. The studied variables are subsequently defined, the developed hypotheses are presented, methods and the results for the tested hypotheses are also outlined *(Sections 3.4, 3.5, 3.6., 3.7 and 4.4, 4.5, 4.6., 4.7)*. Each chapter ends with a discussion of the theoretical

contributions, managerial and social implications, study limitations, and future research directions *(Sections 3.8 and 4.8).*

Chapter 5 presents the theoretical, managerial, and social contributions and the implications of the scientific findings as viewed from the meta-perspective. The chapter ends with a discussion on the limitations of the presented research along with suggestions for future studies. General conclusions from this doctoral thesis are outlined in *Chapter 6.*

The structure of the thesis is presented schematically in Figure 1-1.

Chapter 1. Introduction

1.1. Problem Orientation
1.2. Research Goal and Research Approach
1.3. Reader's Guide

Chapter 2. Compulsive Buying Literature Review

2.1. Preface
2.2. Conceptual Approaches
2.3. Compulsive Buying Measurement
2.4. Consumer Characteristics linked to Compulsive Buying
2.5. Compulsive Buying and Brand Touchpoints
2.6. Summary of Literature Review

Chapter 3 and Chapter 4. Studies I and II

Brand Touchpoints: Study Settings

3. Study I. Interaction with Brand Advertising: Attention and Memory in Compulsive Buying

3.1. Study Summary
3.2. Research Rationale
3.3. Theoretical Background
3.4. Development of Hypotheses
3.5. Method
3.6. Results
3.7. Summary of Results
3.8. Discussion

4. Study II. Interaction with Store Environment: Arousal and In-store Behavior in Compulsive Buying

4.1. Study Summary
4.2. Research Rationale
4.3. Theoretical Background
4.4. Development of Hypotheses
4.5. Method
4.6. Results
4.7. Summary of Results
4.8. Discussion

Chapter 5. General Discussion

5.1. Summary of Results
5.2. Theoretical Contributions
5.3. Methodological Implications
5.4. Managerial Implications
5.5. Social Implications
5.6. Limitations
5.7. Future Research

Chapter 6. General Conclusions

Figure 1-1. Ph.D. thesis structure

2. Compulsive Buying Literature Review

2.1. Preface

There are two main research fields that study compulsive buying: 1) clinical research and 2) consumer research. The synthesis between two fields is still complicated because clinical and consumer researchers approach compulsive buying from different theoretical and methodological perspectives (Horváth et al., 2015; Müller et al., 2015). An in-depth summary of the main compulsive buying studies from the clinical research field is given in Table 8-1 in Appendix 1; a similar table with the studies from consumer research is given in Table 8-2. In each table, the reviewed literature is organized into the four areas of interest, and the table includes following study characteristics:

- description of the studied sample,
- introduction to the employed compulsive buying evaluation method,
- identification of the studied constructs and variables, and
- description of the employed research procedures including research approaches and data-collection methods.

A short introduction summarizing the traditions from each of the two research streams is presented in the following section.

Over the years, compulsive buying has been predominantly studied in psychology and psychiatry to explore more effective treatment possibilities (e.g., Black, Shaw, & Blum, 2010; Davenport, Houston, & Griffiths, 2012; Williams & Grisham, 2012). Researchers in the clinical domain have mainly focused on aetiological factors and general characteristics to provide more insight into the identification and adequate classification of compulsive buying within standard psychiatric nomenclature. Hence, variables such as personality traits (e.g., Black, 2007; Black, Shaw, McCormick, Bayless, & Alle, 2012; Davenport et al., 2012) or clinical symptoms and comorbid conditions (e.g., Faber, Christenson, Zwan, & Mitchel, 1995; Grant, Levine, Kim, & Potenza, 2005; Lawrence et al. 2014 a, 2014 b) have been examined.

The pioneering knowledge of compulsive buying behavior is primarily descriptive in nature (e.g., McElroy, Keck, Pope, Smith, & Strakowski, 1994; Schlosser, Black, Repertinger, & Freet, 1994). There is some experimental evidence of the physiological, behavioral, and neural correlates underlying the mechanisms of compulsive buying in the clinical domain that have been recently introduced (e.g., Kyrios, Frost, & Steketee, 2004; Trotzke, Starcke, et al., 2015). For example, Kellett and Bolton (2009) offered the first systematic cognitive-behavioral model that establishes causal relationships between compulsive buying antecedents, internal and external triggers, compulsive buying behavior, and consequences. Trotzke et al. (Trotzke, Starcke, et al., 2015; Trotzke, Starcke, Pedersen, & Brand, 2014) provided the first psychophysiological evidence of the underlying mechanisms for craving reactions that potentially drive pathological buying. Kellett and Totterdell (2008) introduced the first experimental evidence on emotional variability in compulsive buying, as studied during actual shopping episodes. Furthermore, a few experiments with simulated shopping tasks during interaction with products, prices, and brands have been conducted to define the so-called "*compulsive buying style*" (e.g., Lejoyeux, Embouazza, Huet, & Lequen, 2007; Lo & Harvey, 2011, 2012).

Consumer researchers, on the other hand, have been primarily interested in the cultural, sociological, psychological, and economic variables that impact both the onset and the course of compulsive buying. These researchers have studied the antecedents and potential drivers of compulsive buying—such as self-esteem, materialistic values, cultural differences, personal goals (e.g., Dittmar, 2005; Kwak, Zinkhan, DeLorme, & Larsen, 2006; Neuner et al., 2005)—the consequences of compulsive buying—such as financial debts or feelings related to shopping (e.g., Achtziger, Hubert, Kenning, Raab, & Reisch, 2015; Manolis & Roberts, 2011)—and the prevalence of compulsive buying in general consumer populations (e.g., Hubert, Hubert, Gwozdz, Raab, & Reisch, 2014; Neuner et al., 2005).

Consumer-related characteristics and contextual influences linked to marketing and branding efforts have also been examined. Researchers have studied compulsive buying motivations, attempts at self-control, the role of price in compulsive buying, advertising attitudes, persuasion knowledge, the role of brands in compulsive buying, the consumption of fashion products, and product involvement (e.g., Dittmar, Beattie, & Friese, 1996; Johnson & Attmann, 2009; Kukar-Kinney et al., 2009, 2012; Kwak et al., 2002). For instance, Dittmar et al. (Dittmar & Drury,

2000; Dittmar et al., 2007) offered the first model to explain compulsive buying behavior based on motivation theories from social psychology. In addition, Horváth et al. (2015) provided the first empirical evidence that, similar to non-compulsive buyers, compulsive consumers use self-regulatory abilities during shopping activities; however, they employ different self-control strategies than non-compulsive buyers that results in excessive buying. Only a few attempts in consumer research have been made to better understand the underlying mechanisms of compulsive buying behavior in decision-making situations and buying contexts that reflect realistic behavior (e.g., Kukar-Kinney et al., 2016; Raab et al., 2011). For example, a few studies have been conducted to characterize consumer interaction with different cues during shopping tasks (e.g., Kukar-Kinney et al., 2012; 2016). Furthermore, one neurological study employing functional magnetic resonance imaging (fMRI) has been recently conducted, and it offers insights into the neural correlates of a compulsive buyer's decision-making (Raab et al., 2011).

To conclude, because both fields provide significant theoretical contributions to the compulsive buying literature, the following section presents an integrative overview of the findings relevant for this thesis. The literature review begins with an introduction to the conceptualization and taxonomy of compulsive buying definitions.

2.2. Conceptual Approaches

In the clinical field, researchers often define compulsive buying as a *"compulsive buying disorder"* (e.g., Aboujaoude, 2014; Black, 2007), *"pathological buying,"* (e.g., Trotzke et al., 2014), or *"addictive buying"* (e.g., Rose, 2007). Consumer researchers, on the other hand, label it as *"compulsive buying"* (e.g., Faber & O'Guinn, 1992)*, "excessive buying"* (e.g., Dittmar, 2005), or a *"compulsive buying tendency"* (e.g., Ridgway et al., 2008). Some terms in the literature are used interchangeably, while others are designed to indicate certain distinctive characteristics related to the compulsive buying phenomenon. Over the years, many meaningful discussions about the labeling, classification, and conceptualization of compulsive buying have been introduced in the literature. These discussions are further outlined in the following sections to shed more light on the nature of the compulsive buying construct.

2.2.1. Compulsive Buying within the Clinical Domain

Compulsive buying as a "mental disorder." In the field of psychiatry, compulsive buying has for a long time been defined as a *"mental disorder,"* without any agreement on its classification. In 1915, German psychiatrist Emil Kraepelin—a founder of modern scientific psychiatry—introduced compulsive buying in the scientific literature by including it into the psychiatric nomenclature. Kraepelin proposed to define compulsive buying as *"oniomania"*, derived from the Greek roots for *"selling"* and *"insanity"*(Kraepelin, 1915). In 1924, Swiss psychiatrist Paul Eugen Bleuber, famous for his contributions to the understanding of mental illnesses, offered to include *"oniomania"* in psychiatric texts as *"the reactive impulses"* (also known as *"Kraepelin's impulse insanity")* (Bleuler, 1924). During the 20th century, due to an increased interest in the commercial field, compulsive buying was forgotten in the scientific domain. The interest in the topic arose once again in 1990 when new peer-reviewed scientific evidence on clinical cases of compulsive buying was published in clinical research (Black, 2007).

McElroy and colleagues (1994) were among the first researchers in the field of psychiatry to offer the most important scientific operationalization for compulsive buying (disorder). The provided conceptualization was based on definitions from obsessive control disorders (OCD), impulsive control disorders (ICD), and substance-use disorders introduced in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM – III-R) (Aboujaoude, 2014). The proposed clinical features included in the offered definition were validated by longitudinal studies with twenty clinical cases (McElroy et al., 1994). Per the established diagnostic criteria (McElroy et al., 1994, p.247), compulsive buying disorder can be described by several behavioral characteristics:

> A. *Maladaptive preoccupation with buying or shopping, or maladaptive buying or shopping impulses or behavior, as indicated by at least one of the following:*
>> 1. *Frequent preoccupation with buying or impulses to buy that is/are experienced as irresistible, intrusive, and senseless.*
>> 2. *Frequent buying of more than can be afforded, frequently buying items that are not needed or shopping for longer periods of time than intended.*
> B. *The buying preoccupations, impulses, or behaviors cause marked distress, are time-consuming, significantly interfere with social or occupational functioning, or result in financial problems (e.g., indebtedness or bankruptcy).*

C. *The excessive buying or shopping behavior does not occur exclusively during periods of hypomania or mania.*

A variety of clinical symptoms and processes associated with other mental conditions—such as ICD, OCD, and substance-use disorders—were explored to determine an adequate classification for compulsive buying within the standard nomenclature of psychiatric conditions (e.g., Grant et al., 2005; Mueller, Mitchell, et al., 2010; Mueller et al., 2009). Due to the shared biological, psychological, and physiological characteristics, compulsive buying was for a long time linked to ICD conditions such as pyromania, and kleptomania (e.g., Black et al., 2010; Claes et al., 2010; Di Nicola et al., 2010; Lejoyeux & Weinstein, 2010). For instance, in the third edition of Diagnostic Statistical Manual for Mental Disorders (DSM-III-R), published in 1980, compulsive buying was classified as an ICD under the section of *"impulse control disorders not otherwise specified."* In the International Statistical Classification of Diseases and Related Health Problems (ICD-10), compulsive buying was included in the group of *"other impulse disorders"* (McElroy et al. 1994; Mueller et al. 2009; Black, 2007; https://www.psychiatry.org/psychiatrists/practice/dsm/history-of-the-dsm). In 1994, due to systematic inconsistencies in the definitions of criteria used in DSM-III-R, a revised edition of DSM (DMS-IV) was introduced. Instead of being grouped as ICD, in DSM-IV compulsive buying was classified as a behavioral addiction along with the subcategories of *"sex addiction"* and *"exercise addiction"* (American Psychiatric Association, 2013).

In the early 2000s, a group of scientists from clinical psychology and psychiatry domains were invited to overview the state of the literature on psychiatric diagnosis so that a new and improved DSM protocol could be designed for the classification of disorders (https://www.psychiatry.org/psychiatrists/practice/dsm/history-of-the-dsm). Researchers raised few critical debates concerning the conceptualization and classification of compulsive buying. Previous research demonstrated that 67% of clinical compulsive buying cases also show OCD symptoms, and 96% of cases are diagnosed with ICD (Christenson et al., 1994). In addition, a vast number of buyers diagnosed with compulsive buying disorder per the established diagnostic criteria (McElroy et al., 1994,), meet the diagnostic criteria for Axis I disorders (mood, anxiety, and substance use) or Axis II disorders (depression or anxiety). Additionally, clinical compulsive buyers also show high rates of comorbidity with behavioral addictions (Mueller et al., 2009). Hence, given substantial evidence of comorbidity with different disorders, it was fair

to raise doubts about whether compulsive buying is a distinct condition or an epiphenomenon of comorbid conditions (Mueller, Mitchell, et al., 2010). Another question was related to the identification of the most suitable group of disorders for the classification of compulsive buying (Racine, Kahn, & Hollander, 2014). Previous research showed that compulsive buying shares different underlying psychological and physiological characteristics with a few groups of different disorders. For example, ICD is characterized by an inability to resist impulses to perform a harmful behavior. OCD, on the other hand, is characterized by obsessive thoughts and preoccupations and by compulsive behavior, including a ritualized and uncontrolled or automatic performance of an act to reduce anxiety that does not necessarily leads to a reward (Hollander & Allen, 2006; Ridgway et al., 2008). Both traits of impulsivity and compulsivity can also be linked to compulsive buying (Black et al., 2010). Despite common characteristics with ICD and OCD disorders, the "*behavioral addiction*" group was suggested to be the most optimal classification group for compulsive buying disorder in the new revision of DSM-V.

According to the leading researcher in the psychiatry field, Donald Black (2007, p.15), similar to substance addiction, compulsive buying can be characterized by an "*increasing level of urge or anxiety that can only lead to the sense of completion when a purchase is made*". Based on the cue-reactivity paradigm studies, compulsive buyers demonstrate induced craving reactions that are operationalized by a stronger urge to buy and elevated skin conductance levels in response to reward-related cues (specifically shopping bags, products, or other consumption-related items) but not to neutral cues (Lawrence et al., 2014a; Trotzke et al., 2014). According to Trotzke et al. (2014), the craving responses and reward sensitivity may explain the development and motivation of a pathological engagement with buying activities that characterize the addictive behaviors.

In summary, even though compulsive buying does share some common characteristics with other groups of disorders, based on the meta-analysis of the established literature, there is a lack of substantial evidence to adequately qualify compulsive buying to the traditional grouping system of psychiatric disorders (Piquet-Pessôa, Ferreira, Melca, & Fontenelle, 2014). To date, compulsive buying is no longer included in any of the diagnostic manuals (Aboujaoude, 2014; Grant & Chamberlain, 2016). Thus, there is no classification for compulsive buying proposed in the most recent edition of the DSM-V (American Psychiatric Association, 2013), or in the World Health Organization's International Statistical Classification of Diseases and Related

Health Problems (ICD-11) (World Health Organization, 2017).

Compulsive buying as a context-dependent excessive behavior. Even though the predominant stream of researchers argues for a clinical definition of compulsive buying, a new stream of researchers (e.g., Lee & Mysyk, 2004; Spinella et al., 2015) raise concerns for the potential pathologization of all excessive buying cases in the general population. During the past years, the increased number of new *"absurd"* addictions in the literature such as *"tango addiction"*, *"studying addiction"*, or *"fortune telling addiction"* raised an interesting and controversial debate of what actually constitutes addiction (e.g., Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015; Blaszczynski, 2015; Brevers & Noel, 2015; Kardefelt-Winther, 2015; Maraz, Király, & Demetrovics, 2015). A new trend to medicalize different incentive-driven activities, such as excessive mobile phone or Internet use, gaming, or studying, by labeling it as a *"behavioral addiction"* raised significant concerns about potential over-pathologization of deviations in daily life habits (e.g., Blaszczynski, 2015; Brevers & Noel, 2015). According to Billieux and colleagues (2015, p.8), this misconception can be caused by the fact that the a-theoretical and confirmatory quantitative approaches drive research traditions in the field: *"the field is invaded by an increasing number of studies that creates new psychiatric disorders by endorsing concepts and models that were based on decades of research and were validated for other disorders"*.

To label a behavior that is conducted in excess as pathological, the behavior should significantly impair person's daily life or have a negative impact on those around that person (Konkolÿ Thege, Woodin, Hodgins, & Williams, 2015; Spinella et al., 2015). Based on the findings from a 5-year longitudinal study, excessively repeated behaviors such as gaming, sexual activities, problem eating, or buying can, in fact, be characterized by excessive involvement; however, it is often context-dependent and there frequently is a spontaneous recovery from the compulsive habits (Konkolÿ Thege et al., 2015). Addiction, on the other hand, is more resistant to contextual changes and less impacted by situational and environmental factors (Blaszczynski, 2015). Thus, similar to the other deviations in daily habits (e.g., excessive gaming or sexual behavior), since to date there is no clear empirical evidence of biomarkers to prove otherwise, compulsive buying can be viewed as reinforcement-driven behavior performed to excess instead of being labeled as an addiction (Lee & Mysyk, 2004).

2.2.2. Compulsive Buying in Consumer Research

At the same time the first clinical cases of compulsive buying were being published in the clinical field, consumer researchers also became more interested in the compulsive buying phenomenon. The first conceptual definition of compulsive buying in consumer research was proposed by the pioneering group of American researchers Ronald J. Faber, Thomas C. O'Guinn and Raymond Krych (e.g., Faber, 1992; Faber & O'Guinn, 1988, 1989; Faber, O'Guinn, & Krych, 1987; O'Guinn & Faber, 1989). Scientists wanted to understand how *"good"* buying habits, as opposed to bad *"aberrant"* buying habits, could be formed (Faber, 2000, p. 27). Thus, compulsive buying emerged as opposition to something what was considered *"normal consumption."* German scientist Gerhard Scherhorn further developed this dichotomous view (e.g., Scherhorn, 1990; Scherhorn et al., 1990). Another stream of researchers, on the other hand, has challenged the predominant views that were rooted in psychological theories. Instead of distinguishing the *"normal"* and *"aberrant"* consumption cases, this alternative stream of thought proposed to address the continuum of compulsive buying behavior expressed in the general population (e.g., d'Astous, 1990; Edwards, 1993; Ridgway et al., 2008). These two streams of research are further introduced and discussed in the following section.

Compulsive buying and "normal buying." As mentioned above, compulsive buying can be viewed from a dichotomous perspective, where it is the opposite of what is called *"normal consumption."* O'Guinn and Faber (1989, p. 155) define compulsive buying as *"a chronic, repetitive purchasing behavior that becomes a primary response to negative events or feelings"* and note that *"such chronical behavior typically becomes very difficult to stop, and ultimately results in harmful consequences."* Researchers claim that buying serves as a form of short-term gratification with a temporary improvement in mood preceding compulsive buying episodes (Faber & O'Guinn, 1989).

In 1990, another conceptualization of compulsive buying was proposed by a German scientist, Gerhard Scherhorn (e.g., Scherhorn, 1990; Scherhorn et al., 1990). In his theoretical paper, Scherhorn (1990) argued that compulsive buying should be conceptualized as an *"addictive consumption."* In psychological terms, a *"compulsion"* refers to an action prompted and

performed against one's will whereas *"addiction"* refers to an action driven by urges that are experienced as one's wants or needs, and this latter term more closely reflects excessive buying behaviors (Scherhorn, 1990). Researcher claims that addictive consumption is an extension of a habit or behavioral trait that can be substituted with another kind of addictive behavior. According to the author, the addictive buying pattern in consumption is often driven by distorted autonomy, such as beliefs linked to negative self-perceptions developed during childhood. Children are often taught to rely on external sources of support because their parents provide them with monetary rewards to fulfill their emotional needs. Hence, as adults, those individuals rely on activities that yield excitement (e.g., gambling or buying) to compensate a negative state. Since buying provides a feeling of *"grandiosity"*, which increases an individual's self-esteem, they are reminded of the excitement they felt in their childhood (ibid).

Internally and externally driven compulsive buying. Another group of researchers, Wayne Desarbo and Elisabeth A. Edwards (1996) argued that heterogeneity in compulsive buying should be acknowledged. According to Edwards (1993, p.67), compulsive buying can be defined as an *"abnormal form of shopping and spending in which afflicted consumer has an overpowering, uncontrollable, chronic, repetitive urge to shop and spend as a means of alleviating the negative feeling of stress and anxiety."* Researchers claim that there are multiple routes to compulsive buying. Some types of compulsive buyers may be driven by deep psychological issues, such as underlying psychological problems, while situational and external factors may motivate another type of compulsive buyers. The first group of compulsive buyers is referred to as the *"internal compulsive buying group,"* while the second group is referred to as the *"external compulsive buying group."* According to the researchers, the behavior linked to external influences may be more temporary and not pathological, but in the long term, it may develop into pathological buying.

Compulsive buying on the continuum of general buying behavior. A team of Canadian researchers—Gilles Valence, Alain d'Astous and Louis Fortier (1988)—were the first to propose a broader perspective on compulsive buying. For instance, d'Astous (1990) considered the previous position to be extreme and argued that the nature of compulsive buying is not qualitatively different from *"normal"* consumption. The only difference between these behaviors is the intensity of the behavior, the frequency, and the degree of negative consequences caused by the excessive consumption. He defined compulsive buying as *"an*

extreme case of a generalized urge to buy" (d'Astous, 1990, p. 17). Valence et al. (1988, p.419) argued that compulsive buying behavior can be characterized by three driving forces: 1) strong emotional activation (increase in psychological tension), 2) high cognitive control (understanding that buying will reduce the tension), and 3) high emotional reactivity (action taken to reduce the tension not to gain an ownership of acquired possessions). These responses can be triggered by internal variables (e.g., psychological factors or traits learned in the family environment) and/or external circumstances (e.g., socio-cultural factors or the commercial environment) that affect the probability of an action and the level of engagement in compulsive buying activities. For example, the decision to visit a shop may be driven by a pre-disposed emotional state, such as general anxiety or anxiety modulated by media efforts, such as the promotion of a "*materialistic ideal."*

Helga Dittmar (2004; 2005) also agreed that the difference between buying behaviors identified as *"ordinary"* or *"excessive" ("abnormal")* are on a continuum rather than a dichotomous distinction. The researcher proposed to label compulsive buying as *"excessive buying"* (2000, p.106), since this term does not assume any formal behavioral classification to any of the mental conditions. According to Dittmar (2004), compulsive buying is described by three characteristics: the experience of irresistible urges, loss of control over buying behavior, and continued buying despite negative consequences. Dittmar (2000, p.128) claims that *"a substantial proportion of excessive buyers are without psychiatric comorbidity and may well lead fairly "normal" and reasonably successful lives apart from their buying behavior."* Compulsive buying is therefore viewed as *"an extreme manifestation of individual's seeking mood repair and an improved sense of self-identity through material goods"* (Dittmar, 2005, p.470). The behavioral tendency, according to the author, depends on the size of the gap in self-discrepancy and the degree of materialistic orientation (Dittmar, 2004; 2005). A larger gap between the actual and imagined self-esteem and stronger materialistic values leads to higher compulsive buying tendencies.

An expanded conceptualization of compulsive buying has been recently proposed by Nancy Ridgway, Monika Kukar-Kinney and Kent B. Monroe (2008) to address the fact that previous conceptual definitions highlighted impulsivity instead of compulsivity in compulsive buying. According to the authors, compulsive buyers manifest both, a lack of impulse inhibition linked to the need for immediate gratification, which is acquired by taking action on buying urges (ICD

characteristic), and preoccupations and compulsions linked to buying that consequently interfere with the individual's everyday life (OCD characteristic) (Ridgway et al., 2008). The authors further define compulsive buying as a *"consumers' tendency to be preoccupied with buying that is revealed through repetitive buying and lack of impulse control over buying"* (Ridgway et al., 2008, p.622).

A summary of import conceptual propositions in compulsive buying is presented in Table 2-1 below.

Authors	Conceptualisation	View
O'Guinn & Faber, 1989 (p. 155)	Compulsive buying is "a chronic, repetitive purchasing behavior that becomes a primary response to negative events or feelings is difficult to stop and results in harmful consequences."	Dichotomous: compulsive buying is viewed as opposition of so-called *"normal consumption."*
Scherhorn, 1990 (p.33)	Compulsive buying is conceptualized as *"addictive consumption"* since *addiction"* is an urge experienced as one's want or need whereas a *"compulsion"* in psychological terms refers to a behavior that is prompted to be acted upon against one's will.	Dichotomous: addictive consumption can be viewed as an extension of habit or a behavioral trait that can be substituted with another kind of addictive behavior.
Edwards, 1993 (p.67)	Compulsive buying is "an abnormal form of shopping and spending in which afflicted consumer has an overpowering, uncontrollable, chronic, repetitive urge to shop and spend as a means of alleviating the negative feeling of stress and anxiety."	Dichotomous/ continuous: there are multiples types of compulsive buying, including *internally motivated compulsive buyers* and *externally motivated compulsive buyers.* Behavior can vary along the continuum.
d'Astous, 1990 (p. 17)	Compulsive buying is *"an extreme case of a generalized urge to buy."* Compulsive buying can be described by strong emotional activation, cognitive control, and high emotional reactivity.	Continuous: compulsive buying by its nature is not qualitatively different from *"normal"* consumption. Thus, compulsive buying behavior entails behavior intensity and frequency as well as the degree of negative consequences caused by the excessive consumption.
Dittmar, 2005 (p.470)	Compulsive buying is "an extreme manifestation of individual's seeking mood repair and an improved sense of self-identity through material goods."	Continuous: the compulsive buying tendency depends on the size of the gap in the self-discrepancy and the degree of materialistic orientation.
Ridgway et al., 2008 (p. 622)	Compulsive buying is "consumers' tendency to be preoccupied with buying that is revealed through repetitive buying and lack of impulse control over buying."	Continuous: on one hand, compulsive buyers manifest a lack of impulse inhibition linked to a need for immediate gratification. On the other hand, compulsive buyers demonstrate preoccupations and compulsions linked to buying that ultimately interfere with the individual's everyday life.

Table 2-1. Summary of the main compulsive buying definitions used in consumer research

Impulsive and compulsive buying. The delineation between compulsive buying and impulsive buying as studied in the marketing literature is also important, because the two type of behaviors are conceptually different (Flight, Rountree, & Beatty, 2012). Impulsive buying tendency is defined as a *"degree to which an individual is likely to make unintended, immediate, and unreflective purchases"* (Jones, Reynolds, Weun, & Beatty, 2003, p.506). To some extent, compulsive buying and impulsive buying behaviors overlap due to the related characteristics such as the increased emotional and psychological engagement during buying episodes and a lack of consideration of the adverse financial consequences (Verplanken & Herabadi, 2001). Impulsive buying is primarily externally driven (e.g., by advertising or a desire for specific items), whereas compulsive buying is motivated by ones' internal needs, preoccupations, and the buying process, which are all reinforced by external factors (Desarbo & Edwards, 1996). In addition, impulsive buying tendency often emerges from positive emotions, whereas compulsive buying is often more strongly reinforced by adverse emotions such as psychological tension and destructive preoccupations about buying (Flight et al., 2012). Because impulsive buying is defined as an occasional buying spurt, it leads to only mild or moderate negative financial consequences. Compulsive buying, on the other hand, is characterized by a repetitive chronic buying pattern that often cause more severe financial and also emotional, and social consequences (d'Astous, 1990; Xiao & Nicholson, 2013).

2.3. Compulsive Buying Measurement

The compulsive buying literature not only provides a broad range of definitions of compulsive buying but also a variety of methods to evaluate the compulsive buying tendency or identify the extreme and/or clinical compulsive buying cases. An overview of methods to measure compulsive buying and their implications in both clinical and consumer research is presented in the following section. The specific methodological choices employed in the literature are introduced in depth in Table 8-1 and Table 8-2 provided in Appendix 1.

According to Lee and Workman (2015), there is a significant difference between classifying consumers as compulsive buyers and evaluating their compulsive buying tendencies. Different measures and approaches have been employed to identify compulsive buyers in clinical

research. Compulsive buyers are often diagnosed using one or more of the following clinical instruments:

- Structured Clinical Interview for DSM-IV (e.g., Mueller, Mitchell, et al., 2010; Trotzke, Starcke, Pedersen, Müller, & Brand, 2015; Vogt, Hunger, Pietrowsky, & Gerlach, 2015),

- Minnesota Impulse Disorders Interview (e.g., Christenson et al., 1994; Grant et al., 2005), and

- established diagnostic criteria for compulsive buying disorder introduced by McElroy et al., 1994 (e.g., Black et al., 2012; Ureta, 2007; Kellett & Bolton, 2009; McElroy et al., 1994; Mueller, Mitchell, et al., 2011).

Compulsive buyers have also been recruited from psychiatric, clinical treatment, or self-help organizations. Additionally, self-identified samples have been used in clinical research. Different compulsive buying evaluation scales derived from consumer research have been also employed to evaluate compulsive buying tendencies in the tested samples (e.g., Mikołajczak-Degrauwe & Brengman, 2013; Schlosser et al., 1994). In some cases, compulsive buying scales [1] have been used with other compulsive buying assessment methods (e.g., diagnostic questions) (e.g., Kyrios, McQueen, & Moulding, 2013; McQueen, Moulding, & Kyrios, 2014). According to Maraz, Király, and Demetrovics, (2015, p.151), using the compulsive buying scales for diagnostics have significant pitfalls. Researchers claim that they do not have enough diagnostic power, and they can therefore only serve as an *"early detection 'gate'"* for problematic compulsive buying cases (ibid).

Consumer behavior researchers primarily focus on studying undergraduates or consumers within the general population (e.g., Dittmar & Drury, 2000; Harnish & Bridges, 2014; Khare, 2014; Pham, Yap, & Dowling, 2012; Roberts & Pirog, 2004). The majority of consumer researchers assess compulsive buying by employing scales that evaluate the propensity for compulsive buying. These scales were designed for grouping purposes and they provide scientifically validated norms to indicate which consumers are affected by compulsive buying. However, the scales have also been applied to indicate the propensities on the whole range in tested samples rather than to assign consumers to a specified group. Only a few studies in this field have investigated the self-identified compulsive buying cases (e.g., Scherhorn et al. 1990; O'Guinn &

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[1] Primarily Clinical Screener for Compulsive Buying introduced by Faber & O'Guinn (1992).

Faber, 1989) or consumers who underwent psychiatric treatment for compulsive buying (e.g., Raab et al. 2011; Faber & Christenson, 1996).

Compulsive buying scales are designed to measure self-reported reflections on shopping behavior and existing attitudes towards shopping (Black, 2007; Müller et al., 2015). Five scales are often used to measure compulsive buying propensity in the general population in consumer research:

- Clinical screener for Compulsive Buying (Faber & O'Guinn, 1992),
- Compulsive Buying Scale (Valence et al., 1988),
- German Addictive Buying Scale (Raab, Neuner, Reisch, & Scherhorn, 2005),
- Compulsive Buying Index (Ridgway et al., 2008), and,
- Edwards Compulsive Buying Scale (Edwards, 1992).

Clinical Screener for Compulsive Buying (Faber & O'Guinn, 1992). This is a unidimensional scale consisting of seven items designed to evaluate buying consequences and the financial implications of buying behavior. The scale was initially designed to be applied in the clinical and consumer research fields as a screening tool for compulsive buyers (Ridgway et al., 2008). Consumers, who score above the cut-off point of 1.34, a score two standard deviations above the mean of the general population, can be identified as compulsive buyers (Aboujaoude, 2014). According to Cole and Sherrell (1995), instead of measuring motivations or behavior, the clinical screener measures the consequences. Thus, due to its reliance only on income-related questions and the high weight assigned to those items, the screener may misclassify consumers as compulsive buyers (Ridgway et al., 2008). Moreover, in contrast to other assessment methods, this instrument captures the extreme range of compulsivity in buying (Manolis & Roberts, 2008). In addition to the standardized application of this scale as a clinical screener, it is also employed to assess consumers' tendency for compulsive buying. Here, a higher score indicates a higher propensity for compulsive buying. Examples of studies that employ this scale include the following:

- an empirical investigation of the compulsive buying tendency in college students (e.g., Mowen & Spears, 1999; Yurchisin & Johnson, 2004; Yurchisin et al., 2014),
- studies aimed at understanding compulsive buying behavior within a general adult population (e.g., Spinella et al., 2015; Horváth et al., 2015).

Compulsive Buying Scale (Valence et al., 1988). This is a multidimensional scale that measures three main facets of compulsive buying: the tendency to spend, a reactive aspect during shopping, and post-purchase guilt. The scale consists of thirteen questions with a five-point Likert scale ranging from *"strongly disagree"* (1) to *"strongly agree"* (5). The scale addresses not only the financial but also the psychological consequences of compulsive buying behavior (e.g., guilt and emotional despair). This scale is designed to examine the motivational aspect of compulsive buying and captures the compulsive buying tendency rather than is designed to screen for extreme compulsive buying cases (Cole & Sherrell, 1995). Hence, higher scores on this scale indicate stronger compulsive buying tendencies (Valence et al., 1988). While the Clinical Screener for Compulsive Buying is primarily used in USA, the Compulsive Buying Scale is more widely adopted in Canada, England, and Europe. Various researchers have successfully tested the psychometric properties of the instrument and its modifications (e.g., d'Astous, Maltais, & Roberge, 1990; Dittmar et al. 1996; Hanley & Wilhelm, 1992; Neuner et al. 2005). Different applications of the scale have been reported. For example, it has been used to classify consumers as compulsive buyers per the established norms (i.e., scoring 42.2 and more on Compulsive Buying Scale) (Dittmar, 2004; Valence et al., 1988). Alternatively, Cole and Sherrell (1995), who question the reliability of the established cut-off point, instead suggest a clustering approach. Following this notion, the entire range of consumers evaluated on their compulsive buying tendencies is grouped into two groups of consumers (i.e., stronger and weaker compulsive buying tendencies) based on a reference point provided by the sample statistics. Furthermore, the Compulsive Buying Scale is also often applied to evaluate the range of compulsive buying tendencies in studied samples without any inference on sample classification (Dittmar, 2004).

German Addictive Buying Scale (Raab et al., 2005). This is an adapted and modified version of the Canadian Compulsive Buying Scale (d'Astous, 1990; Valence et al., 1988) that is aimed at identifying compulsive buyers in German-speaking countries, including Switzerland (Achtziger et al., 2015). The scale consists of sixteen items that assess the constructs linked to compulsive buying on a five-point Likert scale that ranges from *"Strongly disagree"* (1) to *"Strongly agree"* (5). An arbitrary cut-off point built on the algorithm proposed by Faber and O'Guinn (1992) is used to classify consumers as compulsive buyers. This cutoff point is a 45-point score on the German Addictive Buying Scale (Raab et al., 2005; Scherhorn et al., 1990).

Compulsive Buying Index (Ridgway et al., 2008). This is the most recently established compulsive buying assessment scale, which is applied to study compulsive buying propensity. Compulsive Buying Index consists of six items that measure obsessive-compulsive and impulsive behavior on a seven-point Likert scale from 1 to 7 (*1= "Strongly disagree"* or *"Never"* and *7 = "Strongly agree*," or *"Very often"*). Due to the fact that financial consequences are only one aspect of the negative impact of excessive buying (Chaker, 2003), Compulsive Buying Index excludes questions regarding the buying consequences related to income. By doing so, according to Ridgway et al. (2008), the scale enables the consideration of a larger consumer segment that may be affected by compulsive buying and therefore tests for compulsive buying in a wider variety of contexts. There have been two reported approaches for using the Compulsive Buying Index. On one hand, the scale can be used to identify consumers with a high propensity for compulsive buying by using the established, but arbitrary, norms (i.e., 25 points scored on the Compulsive Buying Index). On the other hand, the Compulsive Buying Index can also be used to measure the whole range of compulsive buying tendencies in the consumer population (e.g., Kukar-Kinney et al., 2009, 2012).

Edwards Compulsive Buying Scale (Edwards, 1993). This scale assumes that compulsive buying is not a dichotomous behavior because it lies along a continuum of a different buying behavior that is identified as a non-compulsive, recreational, borderline compulsive, addicted buying. Thus, only a small part of the population may be assigned to the addicted buying group. The Edwards Compulsive Buying Scale uses thirteen items that measure five factors: the tendency to spend, the compulsion to spend, feelings about shopping and spending, dysfunctional spending, and post-purchase guilt. Only a few studies have employed the Edwards Compulsive Buying Scale in the compulsive buying literature (e.g., Edwards, 1993). Hence, the validity and reliability of the scale are not fully established.

A summary of scales used in consumer research stream is presented in Table 2-2 below.

Developers	Scale	Measurement focus	Characteristics	Application
Faber & O'Guinn, 1992	Clinical Screener for Compulsive Buying	Financial consequences of the buying behavior.	7-items, 1- item measured on the 5-point Likert scale: "Strongly disagree" (1), "Strongly agree" (5), and 6-items measured on the 5-point Likert scale: "Often" (5); "Never" (1).	Mostly used in the USA
Valence et al., 1988	Compulsive Buying Scale	The tendency to spend, a reactive aspect present during shopping, and post-purchase guilt.	13-items, 5-point Likert scale: "Strongly disagree" (1); "Strongly agree" (5).	More widely adopted in Canada, England, and Europe
Raab et al., 2005	German Addictive Buying Scale (adapted version of Compulsive Buying Scale)	The tendency to spend, a reactive aspect present during shopping, and post-purchase guilt.	16-items, 5-point Likert scale: "Strongly disagree" (1); "Strongly agree" (5).	Designed for German-speaking countries, including Switzerland
Ridgway et al., 2008	Compulsive Buying Index	Obsessive-compulsive and impulsive behavior.	6-items, 4 - items measured on the 7-point Likert scale: "Strongly disagree" (1); "Strongly agree" (7); 2-items measured on the 7-point Likert scale: "Never" (1), "Very often" (7).	Designed to capture compulsive buying phenomenon in a wide variety of contexts
Edwards, 1993	Edwards Compulsive Buying Scale	The tendency and compulsion to spend, feelings about shopping and spending, dysfunctional spending, and post-purchase guilt.	13-items, 5-point Likert scale: "Strongly agree" (5); "Strongly disagree" (1);	Application is not explicitly indicated in the literature

Table 2-2. Summary of the main compulsive buying assessment scales used in consumer research.

2.4. Consumer Characteristics Linked to Compulsive Buying

A review of the available literature on compulsive buying reveals that personal characteristics—such as personality traits—neurobiological factors, and external environmental factors—such as brands, products, and information related to the buying context—all play a significant role in compulsive buying. Although internal characteristics are primary factors that drive compulsive buying behavior, external-situational cues are also important because they act as catalysts that stimulate and reinforce the influence of psychological factors (Black, 2007; Desarbo & Edwards, 1996; Kellett & Bolton, 2009). The following section summarizes extant findings on consumer characteristics that are linked to compulsive buying.

Personality traits. Personality research has shown that various facets of impulsivity (e.g., Billieux et al., 2008; Black et al., 2012; Vogt et al., 2015), reactive temperament (e.g., Claes et al., 2010; Voth et al., 2014), lower attentional mindfulness, and poor emotional regulation (e.g., Williams & Grisham, 2012) are linked to compulsive buying. For example, Billieux et al. (2008) demonstrate that, when controlled for depression, compulsive buying was positively correlated with negative urgency scores, indicating more impulsive reactions in contexts that engender negative emotions. Additionally, Claes et al. (2010) and Voth et al. (2014) indicate that compulsive buying tendency is positively linked with stronger emotional reactivity to options that result in immediate rewards. Williams and Grisham (2012) show that compulsive buyers have lower attentional mindfulness and less emotional clarity in decision situations when compared with non-compulsive buyers. This leads to stronger emotional responses to cues in the shopping context, an impaired ability to reflect on any emotions experienced at the present moment, and poor decision-making abilities while making a choice.

Previous research has also established a positive link between compulsive buying and higher levels of negative mental states, such as anxiety, depression, or boredom (e.g., Black, 2007; Black, 2001; Christenson et al., 1994; Miltenberger et al., 2003; O'Guinn & Faber, 1989; Scherhorn, 1990); higher excitement-, novelty-, and arousal-seeking tendencies (e.g., Christenson et al., 1994; Edwards, 1993; McElroy et al., 1994; O'Guinn & Faber, 1989); higher tendency to fantasize (e.g., Faber & O'Guinn, 1992; Shoham, Gavish, & Segev, 2015); perfectionism (e.g., Kyrios et al., 2004); compulsive personality traits (e.g. Ridgway et al., 2008); introversion (e.g., d'Astous, Maltais, & Roberge, 1990); and passion (e.g. Wang & Yang,

2008).

Neurobiological factors. From the neurobiological point of view, the etiology of compulsive buying is still unknown. A biological dysfunction that may be caused by the absence of a chemical substance in the brain has been reported by Faber et al. (1987). Research with gamblers has shown that compulsive buyers and gamblers share similar behavioral characteristics (i.e., impulsive reactivity to temptation and compromised decision-making) that can be linked to disturbed neurotransmission in the brain (e.g., Holden, 2001). Both Faber (1992) and Ridgway et al. (2008) agreed that repeated buying may cause habituation and disturbed homeostasis in the compulsive buyer's brain, leading to a stronger motivation to increase the neurotransmission via chronic buying activities.

Self-evaluation, cognitions, and values. Characteristics that are related to self-identity concerns have been also linked to compulsive buying; these included lower self-esteem and higher self-discrepancies (e.g., d'Astous, 1990; Dittmar, 2005; Harnish & Bridges, 2014; O'Guinn & Faber, 1989; Roberts, Manolis, & Pullig, 2014); a stronger need for social desirability and social approval (e.g., Davenport et al., 2012; Desarbo & Edwards, 1996; Otero-López & Villardefrancos, 2015; Roberts & Pirog, 2004; Yurchisin & Johnson, 2004); and a sensitivity to social comparison information (e.g., Attiq, 2015).

Research on cognitions in compulsive buying has demonstrated that compulsive buyers tend to report a higher tendency for maladaptive beliefs about the nature of objects, potential purchases, and possessions, including irrational cognitions associated with the buying experience (Kyrios et al., 2004; Lejoyeux et al., 2007). For instance, by using metric to measure cognitions, namely, Buying Cognitions Inventory, Kyrios et al. (2004) demonstrated that, compared to non-compulsive buyers, compulsive buyers were more concerned about a potential loss of buying opportunities and had stronger beliefs that the purchases of chosen items were unique. These patterns have been previously identified in compulsive hoarders, who are characterized by an excessive acquisition of items that are rarely used and an inability to discard large quantities of items to such an extent that their daily life is affected (Frost et al., 1998). In addition, due to the erroneous belief that the acquisition of objects can help them counteract or neutralize unwanted negative emotional states, they have stronger emotional attachments to objects of consumption (Kyrios et al., 2004). Furthermore, materialistic values (e.g., Claes et al., 2010; Dittmar, 2005;

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Faber & O'Guinn, 1988; Ureta, 2007; Johnson & Attmann, 2009; Manolis & Roberts, 2011; Spinella et al., 2015), irrational cognitions towards money, poorer financial-management skills (e.g., Lejoyeux., Richoux-Benhaim, Löhnardt, & Lequen, 2011; Pham et al., 2012; Spinella et al., 2015), and an increased focus on extrinsic life aspirations, such as image and popularity (Otero-López & Villardefrancos, 2015; Roberts & Pirog, 2004; Yurchisin & Johnson, 2004), have been also reported. Compulsive buyers tend to assume that the acquisition and possession of material goods leads to happiness (Richins & Dawson, 1992) because the items may help in the pursuit of status, success, emotional security, and/or safety in life (Kyrios et al., 2004; McQueen et al., 2014).

Motivation. Motivation research has shown that compulsive buyers are driven by the process of buying itself (d'Astous, 1990; Faber et al., 1987; Lejoyeux & Weinstein, 2010; O'Guinn & Faber, 1989). According to Müller et al. (2015), compulsive buyers indicate that they are more interested in browsing for, choosing, and ordering the items rather than using them. A higher compulsive buying tendency have been linked to increased hedonic and social motivations (Kukar-Kinney et al., 2009; Lejoyeux et al., 2007). Compulsive buying tendencies have also been shown to be unrelated to consumers' utilitarian motives (Kukar-Kinney et al., 2009). Based on anecdotal evidence, compulsive buyers report that only shopping activities can provide them with a "*remedy*" for their low emotional states (Elliott, 1994; Faber & Christenson, 1996). Due to a higher awareness of their negative states, compulsive buyers often attempt to escape their reality by engaging in a fantasy world (Faber & Christenson, 1996; Faber, 2004; Kukar-Kinney et al., 2009; Scherhorn, 1990). Hedonic pleasure can be obtained by various means, including engagement in a multisensory and/or pleasurable shopping experience (Ballantine, Jack, & Parsons, 2010) or a consumption of goods that display hedonic attributes such as designed goods, fashion clothing, or luxury items (Dhar & Wertenbroch, 2000; Hirschman & Holbrook, 1982). Thus, the buying activities provide them with emotional value but also with social rewards (Pooler, 2003). For instance, compulsively buying consumers often imagine that by acquiring goods and brands matching a socially desirable image (e.g., being fashionable or funky), they can gain social confirmation and more effectively compete with "*upper-rank*" peers (Bearden & Etzel, 1982; d'Astous, 1990; Elliott, 1994). In addition, buying branded possessions is often linked with perceived self-identity gains (Dittmar et al., 2004). Finally, interaction with the sales personnel satisfy their need for interpersonal contact (Krueger, 1988).

Product categories. Several product categories have been linked to compulsive buying, such as clothes, shoes, cosmetics, and jewelry (McElroy et al., 1994; Christenson et al., 1994; Faber et al., 1987). Previous literature shows that consumers prone to compulsive buying often choose goods related to attractiveness, self-image, and appearance (d'Astous, 1990; Dittmar, 2005; Harnish & Bridges, 2014; Roberts et al., 2014; Scherhorn, 1990). According to Belk (1991), they focus on the items that can temporarily change their appearance and boost their self-esteem. However, researchers also highlight that heterogeneity within the compulsively buying consumer group should be acknowledged. For example, in one study Ureta (2007) describes that one of the compulsive buyers was very interested in purchasing books. Johnson and Attmann (2009) argue that compulsive buying evaluation scales should be adjusted depending on the product category of interest. For instance, for products related to appearance management, compulsive buyers may be involved only in a subcategory of products, such as apparel, shoes, or accessories, and a buyer's characteristics within each compulsive buying segment may vary. Although most of the research in compulsive buying focuses on women, Black (2007) highlights that while compulsively buying women are the most involved in CDs/DVDs, clothes, shoes, jewelry, housewares, and cosmetics, males are often most engaged in CDs/DVDs, clothes, computers, consumer electronics, and sports equipment products.

Fashion consumption. Studies exploring fashion variables indicate that a higher compulsive buying tendency is positively correlated with an interest in or orientation towards fashion (Johnson & Attmann, 2009; Park & Burns, 2005). For example, wearing fashionable clothing may help women feel better about themselves (Dittmar & Drury, 2000; O'Guinn & Faber, 1989). According to Park and Burns (2005), compulsive consumers tend to be very susceptible to fashion vagaries and *"flux-fashion"*, which is defined as a trendy fast-fashion market in which products are often designed for a season and are oriented towards fast purchase and replacement. Another stream of research has shown that compulsive buyers are interested in buying items that indicate social status (d'Astous, 1990; Roberts & Jones, 2001). According to Roberts and Jones (2001), *"status consumption"* leads to an increase in the consumption of the items that signify wealth. Previous research has shown that, in the fashion domain, compulsive buyers are more positively oriented towards luxury products such as designer brands (Lejoyeux et al., 2007). For instance, compulsive buyers demonstrate a higher sensitivity to prestige and choose more expensive, well-known fashion brands than non-compulsive buyers (Kukar-Kinney et al., 2012; Lo & Harvey, 2011; Lejoyeux et al., 2007). In addition, instead of being driven by

sales, compulsively buying women indicate that they are more motivated by brands with which they have an emotional or narcissistic relationship (Lejoyeux et al., 2007). For instance, one woman remarked that *"to meet my social demands; I should purchase luxury items even if I do not need them or if I do not use them as much as expected"* (Lejoyeux et al., 2007, p. 46).

Brand consciousness. Previous research on branding and compulsive buying has indicated that compulsive buyers are more vulnerable than non-compulsive consumers to branding efforts (e.g., Horváth & Birgelen, 2015; Lee & Workman, 2015; Lejoyeux et al., 2007; Lo & Harvey, 2011). While being asked about their decisions, compulsive buyers report being strongly affected by products and brands (Lejoyeux et al., 2007; Lo & Harvey, 2011). For example, a study with internet shoppers for upper-class shopping items demonstrates that consumers scoring higher on compulsive buying tendency to be more brand-conscious and show a better knowledge of store prices. In addition, consumers with a higher compulsive buying tendency are more prone to sales promotions yet they tend to seek higher-value transactions (Kukar-Kinney et al., 2012). Another study exploring fashion brand variables in compulsive buying shows that compulsive buying tendencies are positively correlated with a stronger brand attachment and higher brand loyalty but negatively correlated with brand awareness, which is indicated by a weaker ability to recognize brands and recall brand symbols (Lee & Workman, 2015). It is therefore possible that, instead of being interested in new brands, compulsively buying consumers tend to prefer their favorite brands. Horváth and Birgelen (2015), on the other hand, have come to a different conclusion. By studying the relationship between compulsively buying consumers and brands in a broad range of product categories, researchers demonstrate that compulsive buyers are more prone to brand switching than non-compulsive consumers. Although non-compulsive buyers indicate an increased interest in the practical benefits of brands, compulsive buyers report being more swayed by a brand's emotional or social benefits, such as whether the brand logo communicates a unique image or status. However, by compromising quality to satisfy their need for seeking variety, they often end up buying lower-priced, unbranded possessions (Horváth & Birgelen, 2015). In another study, Horváth et al. (2015) shows that compulsive buyers use different self-control strategies than non-compulsive buyers during their shopping trips, and this impacts their choices. To avoid financial problems, they tend to *"balance their balance"* by choosing a higher quantity of cheaper goods instead of buying expensive items (ibid).

Emotional sensitivity to rewards and decision-making. Cue-reactivity experiments have shown that, in response to reward-related cues such as products or shopping-related items, compulsive buyers demonstrate stronger emotional reactivity, enhanced executive processing, better memory, more intensified cravings, and stronger urges to buy compared to non-compulsive buyers (Lawrence et al., 2014a; Raab et al., 2011; Trotzke et al., 2014). For instance, an EEG study conducted by Lawrence et al., (2014a) shows that an increased severity of compulsive buying is linked with a stronger activation of visual and attentional neurophysiological brain pathways and better episodic memory in response to the presented consumption items (Lawrence et al., 2014a). An fMRI experiment by Raab et al. (2011) demonstrates that, regardless of their final buying decisions, compulsive buyers show a higher activation in the ventral striatum—which is the area of the brain responsible for reward-processing, valuation, and *"unconscious wanting"*—in response to presented products (Knutson et al., 2007). Additionally, when being shown price information, compulsive buyers demonstrate a lower general activity in the insula region, which is responsible for a pain response related to loss. Finally, during the decision-making stage, compulsive buyers also show higher activation in the anterior cingulate cortex, which is the area of the brain in charge of conflict resolution when evaluating wins/losses. Surprisingly, compulsive buyers and non-compulsive consumers show no differences in the activation of the prefrontal cortex, the brain area with the executive control mechanisms for judgments and decision-making. Thus, instead of demonstrating decreased general executive function responsible for impulse control, compulsive buyers simply show a lower negative emotional response for the anticipated loss and a more positive emotional response towards the anticipated gains related to the items of interest, and these result in compromised decisions.

A simulated shopping study findings introduced by Lo and Harvey (2012) demonstrate that emotional responses experienced in the shopping situation have a measurable impact on the shopping behavior and shopping outcomes. Researchers propose that the following several consumer characteristics can be used to define a compulsive *"buying style"*:

- reduced need for product information search,
- lack of concern for a physical description of products (e.g., function or material),
- increased interest in the symbolic meaning of product information (e.g., economy, success, or social class),

- reduced need for comparison of product with other products,
- decreased levels of budget awareness, and
- lack of concern with budgetary constraints.

Study also shows that compulsive buyers make more materialistic choices, spend more money than they initially planned, and choose a higher number of items than non-compulsive buyers. In light of this, researchers have concluded that choices in compulsive buying can be driven by the *"hot"* emotional system (for a review on the dual-processing system, see Kahneman, 2003, 2011), which overestimates the actual need for a desired product and leads to sub-optimal purchasing decisions (Lo & Harvey, 2011).

Experienced "euphoria" during buying episodes. Studies investigating emotional states and emotional variability during buying episodes in compulsive buying indicate stronger changes in the buyer's emotional state and more intense emotional stimulation during shopping trips (e.g., Faber & Christenson, 1996; Kellett & Totterdell, 2008; McElroy et al., 1994). These mood changes are often positive because they are linked with an increase in arousal levels (McElroy et al., 1994), relief from their negative emotional states, and/or an achieved hedonic or social gratification (Christenson et al., 1994). Compulsive buyers describe buying as highly exciting and an emotionally stimulating activity. Anecdotally, they report that, during shopping and buying episodes, they experience positive feelings that they identify as states of *"high", "intoxication", "emotional lift"* and *"loss of control"* (Faber & Christenson, 1996; Faber & O'Quinn, 1992; McElroy et al., 1994; Ridgway et al., 2008). The time span of reported euphoria is nevertheless short-lived and is often followed by feelings of remorse, guilt, and depression (d'Astous, 1990; McElroy et al., 1994).

A few experimental studies have been conducted to provide empirical evidence on emotional variability during shopping episodes in compulsive buying (e.g., Faber & Christenson, 1996; Kellett & Totterdell, 2008). Faber and Christenson (1996) studied consumer moods before and during exposure to shopping scenarios in a simulated shopping experiment. The study results demonstrated that one in four tested participants reported mood changes during the shopping trip; however, compulsive buyers experienced more intense mood changes than non-compulsive buyers, and they were changing more frequently from a negative emotional state to a positive one. Miltenberger et al. (2003) were the first researchers to provide self-reported evidence on

the *"euphoric"* experience felt during a shopping experience's point of purchase. Another group of researchers, Kellett and Totterdell (2008) aimed to capture this state by conducting a field experiment. They tested the difference between the moods of compulsive buyers and of the control group over the three phases of the shopping experience (pre-shopping, shopping, and post-shopping). Reflections based on self-reporting have shown that, even though compulsive buyers indicate stronger feelings of guilt and self-dislike during shopping activities than non-compulsive buyers, both groups tend to show more similarities than differences in their responses. When comparing the consumer responses for the compulsive buying group during the three shopping phases, a stronger excitement was reported at the beginning of the shopping experience (ibid). These profound changes in the emotional states of compulsive buyers immerse them in the buying activities and are therefore known as mental absorption. This absorption can block a consumer's who buy compulsively consciousness and reduce their reflexive information processing, which is necessary for optimal decision-making at the point-of-purchase (Faber, 2004; Ureta, 2007). Because the chosen products do not deliver the expected psychological adjustment after a buying episode, compulsive buyers often end up dissatisfied with purchases they have made (ibid).

2.5. Compulsive Buying and Brand Touchpoints

Brands communicate with consumers via different touchpoints at three main stages during the consumer's journey: pre-purchase, purchase, and post-purchase. Each stage can impact a consumer's decisions. In the following section, studies within compulsive buying and the relevant brand touchpoints are reviewed and summarized. The literature review is organized according to the touchpoint classification proposed by Baxendale et al. (2015), which emphasizes breadth in the stakeholder with whom the customer interacts. Based on this classification, researchers respectively classify brand advertising touchpoints and in-store communications to the groups of brand-owner touchpoints and retail touchpoints.

Brand owner touchpoints: brand advertising. A consumer's interaction with advertising information and their attitudes towards advertising and its influence have been explored in several studies. For instance, it has been shown that an increase in compulsive buying is linked with excessive advertising efforts (Faber, O'Guinn, 1987; Valence et al., 1988) such as the

cultivation of TV commercials and the introduction of TV shopping channels (Kwak et al., 2002; Lee et al., 2000). Several studies have also demonstrated that compulsively buying consumers report that they are more attracted to and influenced by advertising information (e.g., Mikołajczak-Degrauwe & Brengman, 2014; Lee et al., 2000). For instance, Mikołajczak-Degrauwe & Brengman (2014) show a positive correlation between attitudes towards advertising and compulsive buying. Compared with non-compulsive buyers, compulsive buyers reported that they were more influenced by advertising efforts in magazines, the Internet, or billboards but not on TV media. In another study, Kwak et al. (2002) indicate the opposite phenomenon. Specifically, the authors show that a higher compulsive buying tendency is linked with negative attitudes towards TV commercials, but this relationship is moderated by the frequency of exposure to TV ads and TV shows. In the Korean sample, but not the U.S. sample, an increased exposure to TV commercials positively impacted attitudes towards advertising that were caused by higher compulsive buying tendencies. Lee et al. (2000) explore compulsive buying amongst television shoppers in the U.S. and demonstrate that compulsive buying is positively linked with exposure to television shopping channels and that 10% of television shoppers tend to buy compulsively.

d'Astous and Bellemare (1989) show that a particular type of ads can impact compulsive buying behavior. Compulsive buyers report a preference for ads that promote self-image rather than product benefits. Reeves, Baker and Truluck (2012) claim that compulsive buying can also be linked with a higher susceptibility to celebrity endorsements. According to Racine et al. (2014), because compulsive buyers believe that materialistic possessions provide happiness, they tend to be more persuaded by advertising messages that portray aspirations promoting happiness. According to Faber and O'Guinn (1988, p.474), "*advertising and media presentations may not directly cause or trigger this problem; they may encourage people with low self-esteem to manifest their problem through buying. They may contribute to the belief that happiness can be found through consumption*".

A study investigating consumer interactions with advertising information on the Internet has shown that, specifically within daily-deal websites, compulsive buyers tend to be more responsive to contextual clues indicating high pressure (e.g., Kukar-Kinney et al., 2016). For instance, compulsive buyers indicate a higher vulnerability than heavy deal users to cues indicating time pressure and social desirability, such as information about the deals sold,

remaining transaction time, and the number of other consumers who have already bought the offered products. The authors conclude that distinctiveness defined as a subjective evaluation, and whether or not the choices are interesting, unique, and/or novel, is a crucial context-specific factor that affects compulsive buyers behavior. Additionally, social information motivates compulsive buyers to pursue the same offer (Kukar-Kinney et al., 2016).

Retail touchpoints. Several aspects of the role of the retail environment have been previously investigated in the compulsive buying literature. These include store environment and effects of store atmosphere (e.g., Prete et al., 2013; Sohn & Choi, 2012; Schlosser et al., 1994), the role of hedonic stimulation during the shopping experience (e.g., O'Guinn & Faber, 1989; Arnold & Reynolds, 2003), behavior within the store context (e.g., Lejoyeux et al. 2007; 2011; Kellett & Totterdell, 2008), and interaction with sales personnel (d'Astous, 1990; O'Guinn & Faber, 1989).

From a field study, Kellett and Totterdell (2008) present experimental evidence of the emotional variability underlying the shopping experience within the store environment. In another study, Dittmar and Drury (2000) offer qualitative insights for a better understanding of compulsive buying behavior during the decision journey in the store environment. Researchers highlight the role of situational factors and show that the shopping environment provides compulsive buyers with an opportunity to victimize themselves because they generally believe to be incapable to resist temptations and the power of shops (Ditmmar & Drury, 2000, p.130). According to Prete et al. (2013), compulsive buyers experience a state of consciousness defined as "*consumer hypnotic-like suggestibility*" and therefore tend to be more responsive to commercial messages in the shopping environment such as purchase promotions. Lejoyeux et al. (2007; 2011) indicate that compulsive buyers have a higher tendency than prudent consumers to make their buying decisions during store visits.

In addition, a positive link between the stimulation in the store induced by store atmospherics and compulsive purchasing has also been established (Sohn & Choi, 2012). In particular, a study introduced by Schlosser et al. (1994) demonstrates that compulsive buyers tend to be more vulnerable than non-compulsive consumers to a range of retail stimuli such as colors, textures, sound, and smells. O'Guinn and Faber (1989) show that compulsive buyers respond more to the arousing in-store stimuli at the point-of-purchase. d'Astous (1990) indicates that compulsive

buyers tend to be more influenced by sales personnel than non-compulsive buyers. Moreover, research in a Parisian shopping mall introduced by Lejoyeux et al. (2007) shows that compulsively buying women tend to prefer shopping in small boutiques rather than in larger stores because this provides them with an opportunity to closely interact with the sales personnel and enjoy the store environment. Mueller, Mitchell, et al. (2011), on the other hand, report that when asked about their preferences for buying environments (i.e., online, TV, stores, and garage sales), compulsive buyers and non-compulsive buyers showed no significant differences in their responses. However, the two groups differed in their preferences for product-browsing environments. Specifically, compulsive buyers prefer to browse using TV media more often than non-compulsive buyers.

2.6. Summary of Literature Review

In summary, a review of the existing literature on compulsive buying shows the complex and contradictory nature of the current findings. To date, the labeling, classification, and conceptualization of compulsive buying are still debated. The term "*compulsive buying*" is the most-encountered label in compulsive buying literature, especially within the field of consumer research. The literature review demonstrates that, even though compulsive buying behavior shares several characteristics with different types of psychiatric conditions (i.e., ICD, OCD, Axis I, II disorders, and behavioral addictions), it is no longer included in the standard nomenclature for psychiatric disorders. Medicalizing compulsive buying by labeling it as a *"mental disorder"* and viewing it strictly as a member of that group of conditions has negative consequences for the control of deviant buying cases in the general population (Lee & Mysyk, 2004). Medicalizing compulsive buying deflects the attention from the social context of consumerism where the consumer is encouraged by media and other socio-cultural influences to buy continuously. Moreover, it focuses attention on individual characteristics as a source of the problem that can be addressed by treatment (Lee & Mysyk, 2004). Viewing compulsive buying solely as a psychiatric problem also frames the research interests and chosen methodological perspectives in the compulsive buying field and provides empirical evidence based only on clinical samples. The literature review highlights the similarity of compulsive buying to other types of incentive-driven behaviors in terms of their context-dependence (Konkolÿ et al., 2015; Lee & Mysyk, 2004), existence without any psychiatric comorbidity (Dittmar, 2005), and ability

to be viewed from a broader perspective as an important problem in the general consumer population reinforced by the socio-cultural and environmental factors.

The literature review also demonstrates that the conceptualization of compulsive buying construct impacts its operationalization. A variety of research methods to screen and evaluate compulsive buying tendency are proposed in the clinical and consumer research streams. Contrary to the clinical researchers, who primarily, but not without exceptions, study clinical cases or self-identified compulsive buyers, consumer behavior researchers investigate compulsive buying by studying undergraduates or consumers within the general population (e.g., Dittmar & Drury, 2000; Dittmar, 2005; Roberts et al., 2014). Instead of using clinical instruments, consumer researchers employ compulsive buying scales (e.g., Compulsive Buying Scale [Valence et al., 1988] or Compulsive Buying Index [Ridgway et al., 2008]) to evaluate the compulsive buying propensity or identify the problematic compulsive buying cases in the general population. The application of each scale has its benefits and drawbacks, as different scales address different aspects of compulsive buying (i.e., motivation, behavior, consequences, etc.) and are designed, tested, and adopted in specific contexts.

A review of the literature also indicates that empirical studies investigating consumer characteristics linked to compulsive buying predominantly focus on psychological variables: personality traits (e.g., negative mood states, compulsiveness, impulsivity, excitement, attentional mindfulness, etc.), cognitions and values (e.g., irrational beliefs about the nature of objects, materialistic values, etc.), self-evaluation (e.g., lower self-esteem, susceptibility to social influence, etc.). Some research attempts have also been made to explore the consumer's relationship with brands and products. Higher brand consciousness, susceptibility to peer opinions, vulnerability to advertising promoting the *"materialistic ideal,"* preference for purchases that provide symbolic value (such as fashion items and designer's brands) have all been documented (d'Astous, 1990; Dittmar, et al., 1996; Kukar-Kinney et al., 2012; Lejoyeux et al., 2007; Valence et al., 1988). However, less attention in the compulsive buying literature is paid to the dynamic processes expressed through the emotional, cognitive, and behavioral responses that can characterize a consumer's behavior and experiences in consumption-related contexts during encounters with products and brands (e.g., Faber & Christenson, 1996; Kellett & Totterdell, 2008; Lawrence et al., 2014a; Raab et al., 2011).

The literature review also indicates that several groups of brand touchpoints have been studied in the compulsive buying domain. Most of the research has been provided in the context of brand advertising and retail, and, to the best of the author's knowledge, no research has been done to explore third-party brand touchpoints (i.e., word-of-mouth, other consumer observations, or traditional earned media [Baxendale et al., 2015]). The literature review demonstrates that both brand advertising and in-store context have a substantial impact on compulsive buying behavior (e.g., d'Astous, 1990; Kukar-Kinney et al., 2016; Lee & Workman, 2015; Mikołajczak-Degrauwe & Brengman, 2014). Based on the existing evidence, compulsive buyers tend to be more influenced by advertising efforts and have more positive attitudes towards advertising information (Mikołajczak-Degrauwe & Brengman, 2014). Within the fashion domain, consumers with a propensity for compulsive buying tend to have superior market knowledge and are more preoccupied with brand information (Kukar-Kinney et al., 2012; Lo & Harvey, 2011; Lejoyeux et al., 2011). Certain aspects of store atmospherics have also been reported to stimulate compulsive purchasing (Prete et al. 2013; Sohn & Choi, 2012). Most of these findings are primarily driven by self-reports and descriptive data-collection techniques that provide insight into the opinions, attitudes, or self-reflections of consumers. Thus, the amount of research on the underlying responses characterizing the processes of brand advertising cognition and the influence of store environment on compulsive buying behavior is still relatively small.

In summary, there is a need in the compulsive buying literature for a more comprehensive understanding of the underlying dynamic responses that can characterize consumer information processing. These responses should be investigated at the most influential brand touchpoints and tested in settings that better represent actual situations compulsive buyers often encounter. To address this gap in the state of the art, the following section introduces two studies exploring the cognitive, emotional, and behavioral characteristics underlying the consumer-brand interaction at two relevant brand touchpoints: brand advertising (*see Study I*) and store environment (*see Study II*). The theoretical framework is built on the compulsive buying literature review presented in *Chapter 2* and the conceptual propositions developed in *Chapter 3* and *Chapter 4*.

Chapter 3 presents an experimental study on the consumer information processing of brand advertisements that particularly focuses on attention and memory constructs. The study examines the similarities and differences between two groups of consumers with high and low compulsive buying tendencies during exposure to TV-commercials. The chapter begins with a summary of conducted research before proceeding into a Research Rationale section that defines the study field and sets the research direction.

3. Study I. Interaction with Brand Advertising: Attention and Memory in Compulsive Buying

"In **every second** of every minute of every day, **brands attempt to engage customers** and influence purchasing decisions in infinite ways" (Martin & Todorov, 2010, p.61).

"How do you take a **medium** seriously when it is so **laced with high decibel reminders to run** right out to your supermarket, your drug store, your friendly car dealer, your favorite department store **and buy....**

That's the twentieth century marching song — buy!
> **~Rod Serling,** speech at second district AAF meeting, quoted in Media Decisions, vol. 9, part 1, "1974

3.1. Study Summary

Aim – to investigate the cognitive responses that characterize consumer information processing of advertisements in compulsive buying.

Design/methodology/approach – an experiment that simulated TV commercial viewing was conducted with fifty-two women assessed on their compulsive buying tendencies and grouped into two groups representing a high and low compulsive buying tendency segments. Participants were randomly exposed to sixteen advertisements from four different product categories (social cause, fashion, fast-moving consumer goods, and food) in between two short documentaries. Neurophysiological and physiological attention measures (engagement and cognitive workload during an ad-viewing; time to first fixation and time spent fixating on visual brand elements) were recorded with a high-resolution eye-tracker (Tobii T60 XL) synchronized with an EEG headset (ABM B-Alert X10). The memory performance of the participants (i.e., the density of retrieved associations and brand recognition) was assessed using cued-recall and recognition tests performed after the ad-viewing task.

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Findings – the experimental results demonstrated that consumers tend to allocate a relatively equal amount of cognitive resources to attend to, process, and remember the presented advertising information regardless of the level of their compulsive buying tendency (i.e., high or low). However, consumer groups significantly differed in the way they processed the visual brand information. In particular, consumers with a high compulsive buying tendency noticed brand-elements information presented during the social cause advertisement more slowly but examined it for longer than consumers with a low compulsive buying tendency. In addition, the consumer segment with a high compulsive buying tendency demonstrated an increased cognitive workload during ad exposure that was negatively correlated with the likelihood that the advertised brand was subsequently recognized.

Research limitations – while this research provides a more thorough understanding of the consumer interaction with brand advertisements in compulsive buying, it is limited to a specific sample, the chosen ad-exposure context, and the investigated advertising categories.

Originality/value – this is the first study to shed light on the peculiarities of information processing of advertisements and the underlying dynamic responses of a vulnerable group of consumers. The study promotes socially responsible marketing practices and mindfulness of compulsive buying behavior.

Keywords - Compulsive buying, Information processing, Advertising, Cognitive workload, Engagement, Visual Attention, Memory, Eye-tracking, Electroencephalography

3.2. Research Rationale

Brand advertising, as introduced in *Chapter 1.2.1.,* is the first brand touchpoint that was chosen for the investigation into the responses underlying information processing in compulsive buying. Countless models and theories have been proposed in the marketing literature to explain the influence of advertisements. Researchers have approached consumer interaction with brand advertising from a managerial perspective by studying the strategic decisions regarding advertising design, execution, placement, and distribution (e.g., Hartmann, Apaolaza, & Eisend, 2016; Yoo, Kim, & Stout, 2004). Scientists have also explored consumer interaction with brand advertising from the consumer perspective. Different information processing models of advertising effects (e.g., AIDA, Food-Cone-Belding, Rossiter-Percy-Grid, Elaboration Likelihood Model, Limited Capacity Model of Motivated Message Processing) have been suggested to explain how marketing information is communicated to the receiver. Even though the hierarchy-of-effects models (i.e., AIDA, Food-Cone-Belding, and Rossiter-Percy-Grid) are the oldest models in the literature that explain and measure the effects of advertising, they have been recently criticized within the scientific community (e.g., Scholten, 1996; Vakratsas & Ambler, 1999). To overcome the limitations imposed by the linear hierarchical models and to integrate relevant variables associated with the target audience and media contexts, researchers have recently shifted their approach to studying higher-level constructs such as attention and memory. These constructs have been shown both individually and in combination to predict the success of advertising communication because they provide a more realistic picture of the influence of advertising on consumer behavior (Venkatraman et al., 2015).

Based on the compulsive buying literature review presented in *Chapter 2*, it can be assumed that advertising plays an important facilitating role in compulsive buying. Previous studies have proved that compulsive buying is positively correlated with excessive advertising exposure (Faber, O'Guinn, 1987; Valence et al., 1988). Specifically, compulsive buying is strongly linked with the introduction of the TV shopping channels and the cultivation of TV shows (Kwak et al., 2002; Lee et al., 2000). For example, Mueller, Mitchell, et al., (2011) indicate that, when asked about their product-browsing preferences, compulsive buyers prefer TV media more than non-compulsive buyers. Scientific studies have also demonstrated that compulsive buyers are reportedly less skeptical about advertising information and more influenced by advertising efforts (e.g., Lee et al., 2000; Mikołajczak-Degrauwe & Brengman, 2014).

According to Chinomona (2013, p.6), compulsive buying is a *"a socially and externally induced" "emotional addiction"*. By definition, it is characterized by a persistent preoccupation with buying activities leading to repetitive browsing or buying (Black, 2007; Lejoyeux & Weinstein, 2010; Rodgway et al., 2008). For instance, studies investigating the influence of brands have shown that compulsive buyers are relatively more preoccupied with branding information than non-compulsive consumers (e.g., Lejoyeux et al., 2007; Lo & Harvey, 2012). A study exploring the perception and consumption of fashion brands has indicated that compulsive buyers are more brand-conscious than non-compulsive buyers (e.g., Kukar-Kinney et al., 2012). Another study investigating the responses of compulsive buyers and brand variables in a broader range of product categories has shown that compulsive buyers have a lower brand awareness but better brand loyalty and brand attachment than non-compulsive consumers (e.g., Lee & Workman, 2015). Thus, brand advertising often serves as a powerful tool that facilitates compulsive buying urges (Workman & Paper, 2010), increases brand awareness, and persuades consumers to approach the advertised brands, thereby increasing the number of store visits. This ultimately reinforces continual consumer indulgence in a vicious cycle of buying.

Previous studies in the literature provided interesting insights on the role of advertising in compulsive buying. However, the consumer information processing during actual exposure to brand advertisements in compulsive buying remains unexplored. The study of information processing through cognitive responses such as attention and memory in the context of TV advertising in compulsive buying is vital due to several reasons discussed below.

First, very little research has been conducted on advertising and compulsive buying. Previous studies have examined the consumer's attitudes towards advertising (e.g., Kwak et al., 2002; Mikołajczak-Degrauwe & Brengman, 2014), their preferences for specific types of ads (e.g., d'Astous & Bellemare, 1989), and the relationship between the ad-exposure frequency and compulsive buying tendency (e.g., Faber & O'Guinn, 1987; Lee et al., 2000). However, although these studies offer some interesting findings, they are not conclusive. For example, Mikołajczak-Degrauwe and Brengman (2014) indicated that, when asked about their susceptibility to advertisements, compulsive buyers reported being more vulnerable than prudent consumers to ads found in magazines, on the Internet, and on billboards, but not on TV. Kwak et al. (2002), on the other hand, found that compulsive buying tendency and negative attitudes towards advertisements

were positively correlated. However, exposure to TV commercials and TV shows decreased negative attitudes towards advertising in compulsive buying. Although these studies focus on understanding consumer self-reflections about the influence of advertising, due to cognitive biases that often emerge in self-report data, the measures for their attitude and actual behavior may not always correlate (Vakratsas & Ambler, 1999; Venkatraman et al., 2015). Thus, it is not yet clear what actually characterizes compulsive buyer behavior in relevant advertising contexts such as during exposure to TV-commercials.

Second, studies examining the role of brands in compulsive buying have explored brand variables (e.g., Horváth & Birgelen, 2015; Workman & Paper, 2010) and consumer attitudes towards brand influence on their decisions (e.g., Lejoyeux et al., 2007). However, choosing a product entails interacting with and learning about brand information. An advertising message, both its content and structure, serves as a mediator of the communication exchange between the brand and the consumers. A certain amount of a consumer's attention is needed to ensure the success of this exchange (Smith & Gevins, 2004). According to Keller (1987), different types of verbal and visual information encoded in advertising message may be retained in a consumer's memory. In an ad context that is highly cluttered, brands compete for consumer attention with advertising content from other brands. The kind of information that a consumer is likely to notice will ultimately impact their brand choices, because attention and representation is a crucial step in the formation of value-based brand memories and in the retrieval of memories during brand choice (for review see Plassmann et al., 2012). In addition, cues embedded in the brand advertisements that are encountered later at the point-of-purchase may reactivate the latent memories and consciously or unconsciously impact purchase behavior (Dijksterhuis & Aarts, 2010; Dijksterhuis, Smith, van Baaren, & Wigboldus, 2005; Huang & Bargh, 2014). Thus, attention and memory are crucial processes that must be further addressed while studying the interaction of compulsively buying consumers with brands.

Finally, as previously mentioned, research in compulsive buying on the influence of advertising or the interaction with brand information is primarily driven by self-reports and descriptive evidence. The efficacy of traditional measures, however, is limited because traditional measures cannot fully uncover internal reactions (Ohme et al., 2009; Ohme, Reykowska, Wiener, & Choromanska, 2010), which have a higher predictive power for realized behaviors and choices (Kenning, Plassmann, & Ahlert, 2007). Based on the published neuroscientific evidence, any

encountered marketing information (e.g., brand or price) first affects neural signals in the brain that are expressed as physiological and behavioral changes. It is these physiological/behavioral changes that are translated into self-reported preferences (Kirk et al., 2009; McClure et al., 2004). Traditional measures capture delayed responses rather than real-time responses. Therefore, retrospective accounts of advertising effects do not provide a full understanding of its cognition (Nomura & Mitsukura, 2015; Rothschild & Hyun, 1990; Vecchiato et al., 2010). The use of physiological measures has the advantage of tracking changes in real time during ad exposure (Bolls, Muehling, & Yoon, 2003; Smith & Gevins, 2004). Previous studies have shown that the quantification of arousal and attention (i.e., a viewer's engagement and information processing in their working memory) via neurophysiological EEG measures in the context of commercial viewing provides valuable insights (Ohme et al., 2009; 2010; Smith & Gevins, 2004; Vecchiato et al., 2011). According to Rothschild and Hyun (1990), working with richer data can yield a deeper insight into the cognition and learning processes of TV commercials. Thus, including physiological and neurophysiological measures in the experimental techniques increases the ability of the findings to predict the influence of real-life advertisements (Venkatraman et al., 2015).

Hence, the study aims to investigate the cognitive responses that characterize consumer information processing of advertisements in compulsive buying. The study also considers the context of TV-ads exposure.

The following section describes the role of advertising in brand communication, introduces to the TV-advertising context, and reviews two relevant information processing models (namely, ELM and LC4PM). The theoretical background section ends with an in-depth revision of the literature of cognitive neuroscience related to attention and memory. After the review of the existing theory, the hypotheses are derived and tested during the simulated ad-viewing experiment. Finally, the theoretical, managerial, and social implications obtained from the study along with the limitations and future research directions are discussed.

3.3. Theoretical Background

3.3.1. Advertising as a Brand Touchpoint

As introduced in *Chapter 1.2*, brand advertising is one of the most influential brand touchpoints for brand consideration (Baxendale et al., 2015). Employing brand advertising as a brand communication tool is one of the leading approaches in the strategic brand management literature rooted in the scientific understanding of learning and memory (e.g., Aaker, 1991; Keller, 1993; Percy & Elliott, 2012). Thus, advertising is a powerful tool of brand communications that uses the advertising message to strategically portray brand information to target consumers in order to achieve specific marketing goals (Court et al., 2009; Hogan, Almquist, & Glynn, 2005). In particular, advertising can increase brand awareness, build brand knowledge and ultimately contribute to the strong brand equity thereby increasing the probability of advertised brand choice (Keller, 1993, 2003, 2009; Percy & Elliott, 2012; Smith & Aaker, 1992; Aaker, 1991).

3.3.2. TV Advertising Context

There are different forms of advertising (e.g., online advertising, broadcast advertising, print advertising, outdoor advertising, public-service advertising) that are delivered by different media (e.g., TV, radio, cinema, billboards, business-to-business magazines, direct mail, etc.) (De Pelsmacker, Geuens, & Van Den Bergh, 2010). Depending on the advertising format and media context, ads may consist of multiple information streams (e.g., auditory, visual, etc.) transmitted via different forms of communication (e.g., words, texts, moving pictures, etc.) (Lang, 2000). Different media-exposure contexts result in different engagement experiences (Kim, Ahn, Kwon, & Reid, 2017). For instance, print ads consist only of visual inputs, so the processing of print ad information uses primarily visual senses. TV ads, on the other hand, consist of both visual and auditory inputs that engage more senses. If an ad uses more information streams, then more types of brand information provided in verbal and visual cues can be retained as brand associations in the consumer's memory (Keller, 1987). For example, the viewing of TV ads is a more dynamic and complex process than the viewing of ads from other media channels (Lang,

2000). The viewers are exposed to large amounts of information that must be continuously processed in a short span of time to be fully understood (Rothschild & Hyun, 1990). Researchers claim that TV advertising is still one of the most effective media for reaching out to large audiences (Kim et al., 2017). A study on the distribution of advertisement spending from 2010 to 2015 in the USA market has shown that, of the different multisensory media, TV tends to receive the largest share of advertising expenditures, followed by digital media (Statistica, 2015). Additionally, research in Europe has demonstrated that the expenditures for TV ads are the second largest, beaten only by those allocated for digital media (Statista, 2015).

3.3.3. Models for the Information Processing of Advertisements

Two models, one from the marketing literature (i.e., Elaboration Likelihood Model, abbreviated to ELM) and one from media communications (i.e., Limited Capacity Model of Motivated Mediated Message Processing, abbreviated to LC4MP), are reviewed in this section to provide a framework for the information processing of advertisements.

ELM. Even considering its published criticisms, ELM (Cacioppo & Petty, 1984; Petty & Cacioppo, 1986; Petty et al., 1983) remains one of the most dominant models of advertising persuasion in the marketing communication literature (e.g., Agostinelli & Grube, 2002; Chebat, Charlebois, & Gélinas-Chebat, 2001; Te'eni-Harari, Lampert, & Lehman-Wilzig, 2007; Whittler & Spira, 2002). ELM is designed to model the process of brand attitudes formation and change. The model is grounded on the dual-process theory of *"two routes of persuasion"* (Petty & Cacioppo, 1990; Petty et al., 1983). In this thesis, ELM is used to highlight two types of information processing (i.e., active and passive) that occur during encounters with ads. The model theorizes that advertising may influence the consumer via a central route (elaborative) or peripheral (non-elaborative) route[2] of persuasion that uses two distinct mental processing mechanisms (Petty & Cacioppo, 1990; Petty et al., 1983). Specifically, when a viewer's motivation to elaborate on and their cognitive capacity to interpret the information are high, there is a higher likelihood that the advertisement will be processed via the central route of

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[2] Heath and colleagues (Heath, 2001; Heath & Nairn, 2005) proposed to change the terms *"central route"* and *"peripheral route"* to *"high-attention processing"* ad *"low-attention processing"* to change the focus from persuasion strategies to ad-viewer processing levels.

processing. Because this involves higher-level processes such as the elaboration, comprehension, and analysis of presented advertising arguments, this type of processing results in better memory retention and recall (Craik & Tulving, 1975). However, when a viewer's motivation and/or cognitive capacity are low, there is a higher possibility that the advertisement will be processed via the peripheral route of processing. This type of processing requires less mental control and may occur without any voluntary focus or elaborative efforts (Heath, 2001; Heath & Nairn, 2005). Thus, instead of actively elaborating on information about the brand or advertising arguments, the viewer is passively impacted by contextual cues embedded in the ad content, such as music, scenery, celebrity endorsements, or other factors (Petty & Cacioppo, 1986; Petty et al., 1983). These cues activate specific associations in the viewer's memory network that helps the viewer heuristically infer the quality of the advertised brand. In addition, with repeated exposure, previously shown information activates automatic processes that facilitate the brain's access to stored information. This ultimately strengthens the already established links in the consumer's memory network (Harris, 1983). Importantly, if the advertising experts aim for an immediate and direct effects during the early stages of information learning, then consumer engagement via central-route of processing (i.e., high-attention processing) is crucial for advertising success (Heath, 2001; Heath & Nairn, 2005).

In summary, ELM provides a framework for two types of information processing: active and passive. The model also highlights the role of an individual's motivation and cognitive capacity for the allocation of cognitive resources for comprehension of advertising information. However, because ELM primarily focuses on the conscious aspects of information processing, it is somewhat limited. To explain the underlying processes of memory formation and the role of attention in learning brand information from mediated communications, LC4MP (Lang, 2000, Lang, 2006; Lang, Bolls, Potter, & Kawahara, 1999) is further discussed in the following section.

The LC4MP is based on assumptions from two scientific disciplines, cognitive sciences (e.g., Lachman, Lachman, & Butterfield, 1979) and social sciences, and uses models from mass communications (e.g., Berger & Chaffee, 1989). The model was initially designed to explain the processing of different messages in mediated communications, including the context of TV advertising (Lang, 2000). The model highlights the dynamic interaction between the message (communicated via the ad's content and structure) and the cognitive and motivational responses

of the viewer when exposed to the message. The central concept of LC4MP is a memory system that is defined as an outcome of three co-occurring independent yet interactive processes: memory encoding, memory storage, and memory retrieval. LC4MP theorizes that all of the memory-formation stages are necessary to convert the message information into a mental representation in the viewers brain that can be reproduced later during memory recollection (Lang, 2000; 2006; Lang et al., 1999). On a structural level (Atkinson & Shiffrin, 1968), the goal of advertising is therefore to transmit the information via sensory memory to short-term memory—and working memory in particular—and through working memory to long-term memory. Only a fraction of the information that enters sensory memory is chosen to be actively processed in working memory. This is where information is transformed to a mental representation, and then transmitted for further elaboration. A higher elaboration ultimately leads to stronger long-term memory because more links can be formed in the association network (Lang, 2000).

LC4MP also acknowledges the limited capacity of information processing resources that can be allocated for and among the tasks of encoding, storing, and retrieving information when viewing an ad. In cognitive psychology, the term "*cognitive load*" refers to the total amount of mental effort being used in the working memory for task performance (Duncan & Owen, 2000; Lavie, 2005; Westbrook & Braver, 2015). Because mental effort is defined as a subjective state, it tends to vary across individuals depending on their working memory capacity, perceived efficacy, personal factors, and motivational state (Westbrook & Braver, 2015). LC4MP assumes that the distribution of the limited pool of cognitive resources for memory processes is moderated by two factors: the viewer's motivation and the media context. In this model, motivation is considered from a cognitive perspective considering two motivation systems, the appetitive and aversive, evolved through evolution (Lang, 2000, 2006; Lang et al., 1999). Specifically, the motivation to allocate more resources for the encoding and storage of information can be automatically activated by arousing advertising content. In contrast, resources allocated for the active information processing, which results in a higher cognitive workload, can be driven by a viewer's processing goals, such as their desire to view an ad for learning purposes instead of entertainment (Lang, 2000). The automatic and voluntary mechanisms that drive attention and memory storage are further discussed in *section 3.3.4.* Because the media context consists of various streams of information provided by different forms of communication, the demand for cognitive resources as dictated by the advertising

message may also impact information processing (Lang, 2000). For example, it has been shown that a too-heavy cognitive load caused by stimuli that are too complex or arousing impairs task performance and memory formation (Gendolla, Wright, & Richter, 2012; Kahneman, 1973).

In summary, based on the review of ELM and LC4MP theories, it can be concluded that the processing of advertising information consists of a complex interplay between different processes that control how advertising information is funneled to the consumer. Additionally, both attention and memory have been identified as vital processes in the success of advertising penetration. These cognitive constructs are further described from the perspective of cognitive neuroscience in the following section.

3.3.4.   Attention and Memory

Attention is the cognitive and behavioral capability of the brain to focus on a discrete aspect of information, such as an object or task, and to maintain focus while disregarding other perceivable information (Anderson, 2005; Duchowski, 2002; Gottlieb et al., 2014; Kahneman, 1973). Attention is flexible and its definition includes both covert and overt responses to the environment, including any changes in space, in objects, in particular properties of objects, or in specific scenes (Kahneman, 1973; Lang, 2000). According to Kahneman (1973), attention can be described by several functions, including selectivity and intensity. Selectivity refers to the ability to prioritize specific task over other tasks or specific aspects of information over other aspects. A person's selectivity is controlled by two independent yet interactive attentional mechanisms, namely, the *"bottom-up"* automatic, stimulus-induced orienting response and the *"top-down"* voluntary, goal-driven response (Corbetta & Shulman, 2002; Itti, 2000; Itti & Koch, 2001; Pinto et al., 2013). These mechanisms help bring certain information from a *"low-attention"* state to a *"high-attention"* state. The intensive aspect of attention incorporates both the state of arousal—in particular, the cognitive aspect of arousal defined as *"tonic arousal"* or *"alertness"* (Oken, Salinsky, & Elsas, 2006)—and the cognitive effort and motivation to sustain the attention (Kahneman, 1973). Thus, higher-level cognitive processing (i.e., elaboration or comprehension) may require different levels of attention allocated to different pieces of information or to different aspects of the ad-viewing task. This would result in different learning outcomes for the presented advertising or brand information.

Visual attention. Visual attention is defined as a combination of 1) the brain's ability to selectively filter visual properties from sensory information in the visual environment by eye and head movements and 2) fixations on one region of the visual field at the expense of other regions (Anderson, 2005; Pieters, Rosbergen, & Hartog, 1996). Visual attention is fundamental for acquiring information about brands (Pieters & Warlop, 1999). According to Greenwald and Leavitt (1984), the *"conceptual analyses"* of the presented stimuli or information can only occur before or during the *"perceptual processing"*. Perceptual processing includes the focal attention and examination of the sensory features of information. Conceptual processing, on the other hand, is defined as elaborative efforts in ELM or active processing of information in the working memory in LC4MP. Brands include different sensory features that represent brand identity, such as color and size, that are perceptually analyzed and conceptually organized into different categories. These categories include items such as brand name, pictorial elements, or texture elements that represent the whole brand (Pieters & Warlop, 1999). In the TV ad-viewing context, brands not only compete for consumer's attention with other brands but also with the surrounding advertising content as well as other distractions (Boerman, Smit, & van Meurs, 2011). Thus, brand identification is an important step in brand memory formation and in subsequent brand choice (Plassmann et al., 2012). Empirical evidence suggests that people who spend more time visually attending and examining different options eventually prefer the options on which they fixated for the longest time (Glaholt et al., 2010; Pieters, Rosbergen, & Wedel, 1999; Pieters & Warlop, 1999).

As mentioned above, two types of attention mechanisms drive the visual-perception process: *"bottom-up"* and *"top-down"* mechanisms (Corbetta & Shulman, 2002; Itti, 2000; Itti & Koch, 2001; Pinto et al., 2013). *"Bottom-up"* visual attention mechanisms are driven by sensory features of the encountered information, such the different visual features of the stimuli (Itti & Koch, 2001; Wolfe, 2000) or the media decisions employed in the video message (e.g., cuts, edits, movements of scenes, etc.) (Lang, 2000). Visual-search experiments have shown that *"bottom-up"* responses are primarily controlled by saliency filters. These saliency filters automatically select visual information from the visual field based on low-level features of the visual input, such as colors, luminance, size, shape, etc. (Itti & Koch, 2001; Wolfe, 2000). In addition, several experiments also report that automatic visual processing can be induced by higher-level factors, such as emotionally salient information like reward-encoded cues (Rupp & Wallen, 2007), or contrary novel/surprising events (Lang, 2000; Lang, 2006). Researchers have

shown that *"bottom-up"* attention may significantly impact consumer choices. Specifically, salient stimuli can initially attract the eye to the stimuli and lead to an increased likelihood of in-depth elaborative processing (Plassmann et al., 2012). Additionally, visual saliency may bias consumer choices in the supermarket during a cognitively loaded, rapid decision-making situation in a store environment (Milosavljevic, Navalpakkam, Koch, & Rangel, 2012).

"Top-down" visual attention is driven by a recipient's internal and external goals or expectations (Plassmann et al., 2012). While *"bottom-up"* attention refers to the transiently captured, fast, automatic process, *"top-down"* attention refers to the serial process of sustained attention under voluntary control (Corbetta & Shulman, 2002; Pinto et al., 2013). For instance, if certain information can help an individual to attain personal goals, more attention is voluntarily paid to this information than to other information encountered in the visual field. A study on advertising banners has shown that personalized banners attract more attention and engage attention for longer periods of time than non-personalized advertising banners (Bang & Wojdynski, 2016). Another study performed by Pieters and Wedel (2007) has shown that the processing goals of the recipients can impact their responses to specific ad elements. For instance, a study of information processing of print-ads showed that the average duration of fixation on ad elements (e.g., brand or body text) was higher when participants were primed with two learning goals compared with that of the free-viewing condition. Interestingly, there were no differences between the average duration of fixation on ad elements during the free-viewing task and during the ad-appreciation task. Although goals play a significant role in guiding visual attention to specific advertising information, the strongest effects still occur with the first times of ad-exposure as these effects attenuate over time (Pieters et al., 1996; Pieters, Rosbergen, & Wedel, 1999).

Memory. This term is defined as a property of the nervous system, and it is responsible for the acquisition of new knowledge and the retention of existing knowledge and skills (Anderson, 2005). Memory is often depicted as a network of nodes and links connected in a meaningful way to information that is already established and stored in an associative long-term memory network (Collins & Loftus, 1975; Keller, 1987). The proximity of different nodes encoded with bits of information represents the strength of different associations in the neural memory network. Because the nodes are connected to each other in a hierarchy, the activation of one node (e.g., by encoded visual or verbal cues) activates other nodes within the network that

represent a mental image consisting of stored information (Collins & Loftus, 1975). Different types of information may be retained in the ad-viewers memory, such as brand-specific information, advertising-specific information, or a general evaluation of the brand (Keller, 1987). The placement of different cues may help the consumer to more easily retrieve the information later at the point-of-purchase (Keller, 1987). Based on LC4MP, the success of the advertising communication depends on the number of brand and advertising associations created during exposure to advertising information. As more associative links are stored, it becomes easier to retrieve the related information because more cues can trigger the information retrieval since the connections are strengthened (Lang, 2000; 2006; Schacter & Tulving, 1994).

Explicit and implicit memory. There are two categories of memories that can be later retrieved: explicit (declarative) memory and implicit (non-declarative) memory (Schacter & Tulving, 1994; Tulving & Schacter, 1990; Tulving et al., 1982). An explicit memory is collected and learned via active cognition (i.e., via central or high-attention processing). This type of memory underlies conscious recollections about facts and events that facilitate the comparison of information (Squire, 2004). Implicit memory includes procedural memory (e.g., skills and habits), priming and perceptual learning, classical conditioning (e.g., emotional responses and skeleton responses), and non-associative learning. Different neural systems are responsible for the different memory systems, and the neural systems can operate independently or in parallel in support of the behavior (Squire, 1987, 2004). For example, claims in an ad may create a memory in the form of declarative knowledge. Emotionally stimulating visual elements, on the other hand, may be recorded as a non-declarative memory linked to the advertising content or connected with the advertised brand. Explicit memory consists of two types of memories: episodic and semantic memories. Episodic memory includes personally experienced, meaningful events, and semantic memory consists of general knowledge and facts about the world (Tulving, 1985). Implicit memory refers to information and knowledge that is collected and formed by gradually extracting commonalities between series of events under the conscious awareness (Squire, 2004). Implicit memory is dispositional and can be activated by cues linked to the learning context (Squire, 2004). For example, it has been shown that encountered primes (e.g., brand names) in the relevant situations (e.g., shopping context) may activate pre-existing stereotypes, traits linked to the prime, already formed implicit associations or implicit goals pursuit (Bargh & Chartrand, 1999; Fitzsimons, Chartrand, & Fitzsimons, 2008; Huang & Bargh, 2014).

Memory recall and recognition. In the marketing literature, two memory retrieval measures are usually used to tap into the explicit and implicit types of memory and to measure both memory performance and the depth of advertising processing (Gardiner & Parkin, 1990; Singh & Rothschild, 1983; Venkatraman et al., 2015). First, memory recall is used as a measure of explicit memory because it is formed with full attention on the specified information (Gardiner & Parkin, 1990). The recall is generally measured by providing the advertising viewers with either partial cues or asking about their memories without any cues. Even if the consumers are able to recall the advertisement, they may have difficulties in identifying the advertised brand, which can negatively impact subsequent brand choices (Du Plessis, 2005). Thus, brand recognition is another important measure used in the marketing literature. This measure tests both implicit and explicit memories (Heath & Nairn, 2005). Brand recognition can be recorded by asking participants to distinguish the target from novel distractors, for example, by identifying the brand under study from other brands that represent other ads (Du Plessis, 2005; Singh & Rothschild, 1983).

In summary, both ELM and LC4PM view the communication between ad-viewers and advertising message as an interactive process. ELM proposes a multipath approach to advertising processing, namely, that people respond to advertising information differently depending on their motivation and available cognitive resources. LC4MP provides an insightful framework that decomposes the processing of advertising messages into different stages of memory formation. From these theories, it is apparent that the influence of advertising is critically dependent on memory performance. Memory performance is in turn linked to the attention allocated to the exposed ad and the elaborative effort assigned to further cognitively process the information. Two independent yet interactive mechanisms are related to attention processes: *"top-down"* and *"bottom-up"* attention mechanisms. The viewer's motivation to pay attention to the information can be impacted by internal and external goals and his/her expectation. Emotionally relevant, visually salient, or novel stimuli can also trigger automatic attention and thereby increase the possibility for a larger allocation of cognitive resources for information processing. This can ultimately lead to the formation of a stronger memory network, which results in better memory recall and recognition. Given this notion and the insights provided by the compulsive buying literature overview in *Chapter 2*, the thesis hypotheses are discussed below.

3.4. Development of Hypotheses

Based on the derived theoretical insights, it can be assumed that consumers with a high compulsive buying tendency will show differences in their cognitive responses compared to consumers with a low compulsive buying tendency when processing advertising information. Previous research demonstrates that compulsively buying consumers tend to be more influenced by advertising (Mikołajczak-Degrauwe & Brengman, 2014) and branding efforts (Lo & Harvey, 2012; Lejoyeux et al., 2011). In addition, they tend to be more preoccupied with buying activities and more responsive to buying-related cues (Black, 2007; Lejoyeux & Weinstein, 2010; Ridgway et al., 2008). With this in mind, it can be assumed that compulsive buyers would be more willing to engage in the gathering and comprehension of advertising information, which, as discussed above, would lead to more attention allocated to the viewing and processing of brand advertisements. Hence, it can be theorized that consumers with a high compulsive buying tendency (High-CBT group) will be more engaged in an ad-viewing task and will demonstrate a higher cognitive workload than consumers with a low compulsive buying tendency (Low-CBT group).

Previous studies also demonstrate that emotionally relevant information or information that reflects the cognitive goals and motives of the advertising viewer (Corbetta & Shulman, 2002; Itti, 2000; Itti & Koch, 2001) is decoded faster and has a higher likelihood to be processed further in memory. Because compulsive buyers tend to be more emotionally sensitive to buying cues (Trotzke et al., 2014; Trotzke, Starcke, et al., 2015) and to be more interested in brand information (Kukar-Kinney et al., 2012; Lo & Harvey, 2012; Lejoyeux et al., 2011), it can be assumed that they will be more visually reactive to brand information. In particular, it can be hypothesized that consumers with a high compulsive buying tendency will demonstrate higher visual attention on the visual brand elements during exposure to ads in comparison to consumers with a lows compulsive buying tendency.

Finally, based on the theoretical review on information processing of advertisements (e.g., Lang, 2000; 2006) and previous findings in the compulsive buying literature (e.g., Lawrence et al., 2014a), it can also be assumed that consumers with a high compulsive buying tendency will have a better memory of presented advertising information and an increased likelihood of brand recognition compared to consumers with a low compulsive buying tendency.

Thus, following hypotheses are developed:

H1 a-b. The High-CBT group will demonstrate a larger amount of cognitive resources allocated to advertising processing, as indicated by (a) a higher engagement and (b) a higher workload during ad-viewing task compared to the Low-CBT group.

H2 a-b. The High-CBT group will be more visually attentive to brand elements presented during the ad-viewing task, thereby demonstrating (a) faster decoding and (b) a longer examination of visual brand information compared to the Low-CBT group.

H3 a-b. The High-CBT group will show a superior memory performance compared to the Low-CBT group, as indicated by a) a higher association-density score and b) a higher probability for brand recognition.

Two questions were additionally explored in this study. Firstly, this study was primarily designed to simulate the context of exposure to TV-ads. Thus, a variety of advertising categories that may be encountered during commercial breaks (namely, fashion, food, fast-moving-consumer-goods, social cause) were included in the experiment. In the previous studies in the compulsive buying literature, certain researchers limited their research foci to the effects of specific product categories on consumer behavior or decision-making. These researchers primarily focused on fashion products (e.g., Johnson & Attmann, 2009; Park & Burns, 2005; Lo & Harvey, 2011) or items representing self-identity (i.e., cosmetics or jewelry). Thus, to provide additional insights into information processing for different ad-categories in compulsive buying, the impact of the advertising category on each hypothesized effect was also explored.

Second, based on the overviewed literature, attention allocated to advertising or brand information viewing and processing often leads to better memory (Lang, 2000; 2006; Lang et al., 1999). However, there is little empirical evidence from EEG studies that also used self-reported measurements that proves this relationship when viewing video commercials (e.g., Appel, Weinstein, & Weinstein, 1979; Rothschild & Hyun, 1990; Weinstein, Appel, & Weinstein, 1980). Furthermore, it is not yet known whether the potential relationship between self-reported memory and the attention allocated to advertising processing differs depending on the consumer's compulsive buying tendency. To gain additional insights into this question, the

links between attention indexes and memory performance measures and the moderating impact of compulsive buying tendency group on these relationships were also explored.

3.5. Method

To test the hypotheses, a 2 x 4 factorial, ad-viewing laboratory experiment was conducted with 52 female participants using a stationary eye-tracking technique to capture ocular responses in combination with a mobile EEG headset to record neural responses. The study consisted of four steps: (1) Selection and recruitment of participants, (2) Data collection, (3) Data pre-processing, and (4) Data analysis. Each step is described in a section below.

3.5.1. Selection and Recruitment of Participants

This study was a part of a larger study of the effects of advertising on consumer behavior (N=103; 51% women and 49% male; age ranges from 20-35 years old; M= 27.4; SD =3.1). In this doctoral thesis, only the female sample was selected for further analysis. The in-depth argumentation for this delimitation was provided in the *Research Approach section, Chapter 1.2.2*. Thus, fifty-two participants whose ages ranged from 20 to 35 years (M = 26.5, SD = 2.56) were studied. The participants were recruited from the Copenhagen and Frederiksberg regions in Denmark using online and direct-recruitment procedures. All participants were right-handed with normal or corrected-to-normal vision. None of the participants reported any indication of neurological or psychiatric conditions. Four participants who failed to indicate one or more compulsive buying items on the compulsive buying evaluation instrument were removed from the analysis. The participants were treated in accordance to the ethical guidelines introduced by the American Psychological Association (1992). All participants provided informed consent and underwent an in-depth debriefing procedure after the experiment. Participation in the study was voluntary, and four participants randomly selected from the entire study pool of 103 participants were given a shopping voucher for 500 Danish kroner (~ 71 US$) and four movie tickets.

3.5.2.   Measures

Compulsive buying tendency measure. A scientifically validated and internationally acknowledged measure, Compulsive Buying Scale (Valence et al., 1988) (N=48, M=31.7, SD= 9.20, range: 13-63), was chosen as the primary method to assess a consumer's compulsive buying tendency in this experiment for several reasons. First, Compulsive Buying Scale (Valence et al., 1988) is one of the most widely used screeners in studies conducted in Canada, Europe, and the UK. Second, this scale captures both the financial and psychological aspects of compulsive buying (Dittmar, 2005). In the tested sample, the chosen assessment tool demonstrated a high internal validity and reliability (α= .86). The convergent validity of the chosen instrument was verified using Compulsive Buying Index (Ridgway et al., 2008), which was incorporated in the study as an additional compulsive buying tendency measure. Due to the high, statistically significant correlation between the two measures (r = .63, $p < .0001$), it was verified that Compulsive Buying Scale shows a high convergent validity for measuring a consumer's compulsive buying tendency (Field, 2013).

Attention indexes during advertising processing. Using neurophysiological measures for cognitive processing has been widely accepted in the literature (Davis, Riedl, vom Brocke, Léger, & Randolph, 2015). In this study, attention processes were measured through validated EEG measures of engagement and cognitive workload (Berka et al., 2005, 2007; Johnson et al., 2011). These measures have been proven to track both the phasic and tonic changes in cognitive states (Berka et al., 2005). The reliability and validity of the extracted metrics were previously validated in simple and complex experimental tasks for both laboratory and real-life experimental settings and across multiple subjects and conditions (e.g., Brookhuis & De Waard, 1993; Gevins, Smith, McEvoy, & Yu, 1997; Wilson, 2002; Stikic et al., 2014). For example, the B-Alert models for engagement and workload were previously applied in sleep-deprivation studies (e.g., Johnson et al., 2011) and deadly force judgment (e.g., Johnson et al., 2014). These models have also been used in decision-making research, including studies exploring donation behavior (e.g., Correa, Stone, Stikic, Johnson, & Berka, 2015), team performance (e.g. Waldman et al., 2013), or team collaboration (e.g. Stevens et al., 2009).

Increases in engagement and cognitive workload indexes have been linked to memory encoding, where higher levels of both cognitive states were positively linked to a better performance in learning and memory tasks (Berka et al., 2007). Additionally, both indexes were shown to increase with task difficulty. In particular, the engagement level increased according to the demand for sensory processing, and the cognitive workload increased with the demand for executive processing (ibid). A high engagement is related to high attentiveness, and a low engagement is linked with a loss of situational awareness. A low workload index may indicate boredom or inattentiveness, while an extremely high workload may reflect information processing faults caused by frustration, confusion, or struggling due to an information overload (Berka et al., 2007). Previous studies report that the two measures can often operate independently because they have different functional properties depending on the tasks (ibid). Additionally, these measures can be poorly correlated (e.g., Stevens et al., 2013; Stikic et al., 2014). For example, in a study on the dynamics of a problem-solving task, Stevens et al., (2013) reported that the correlation between engagement and cognitive workload was r = -.19 (+/- .24). In conclusion, researchers often use the engagement and cognitive metrics as two separate indicators of different aspects of attentional processes (e.g., Correa et al., 2015).

Engagement index. Engagement refers to the resources allocated for sensory and attention-related processing, such as information-gathering, visual scanning, auditory processing, and selective and sustained attention allocation to one aspect of the environment while ignoring other distractions (Anderson, 2005; Berka et al., 2007; Johnson et al., 2011; Westbrook et al., 2004).

Workload index. The cognitive workload metric indicates the cognitive processes that are linked to the domain of the executive function. The cognitive workload is quantified as an increase in the allocation of mental resources during tasks involving executive function, working memory, integration of information, analytic reasoning, or the elaboration of information (Berka et al., 2007).

The extraction of the metrics followed the scientifically validated procedure, utilizing the modeling system designed by ABM B-Alert that was included in the proprietary acquisition software (for a detailed description, see Berka et al., 2004; 2007; Johnson et al., 2011). The incorporated modeling system provides a highly sensitive method to monitor the neural cognition signatures in both real-time and off-line analyses (Stevens et al., 2009). The models for each cognitive state (namely, engagement and cognitive workload) were individualized for each participant using discriminant coefficients derived during three 5-min neurocognitive assessment tasks (i.e., 3CVT, APVT, VPVT) (for description, see *Appendix 2).* Both models relied on linear and quadratic discriminant function analyses (DFA) and employed different regions of EEG sites and model-selected variables, including combinations of the power in each of the 1-Hz bins from 1-40 Hz, the ratios of the power bins, event-related power measurements, and wavelet transform calculations (Berka et al., 2004; 2007). The models derived the coefficients for a discriminant function that provided classification probabilities (0.1-1, 0.1: low probability, 1: high probability) for each one 1-second interval (Berka et al., 2004, 2007; Johnson et al., 2011). Specifically, the individualized B-Alert *EEG-based engagement* model identified and classified the level of an individual's state into different levels of alertness ranging from inattentive/fatigue to highly engaged (i.e., vigilant and alert) (Johnson et al., 2011). The B-Alert *EEG-based workload* model (Berka et al., 2007) identified and classified the level of an individual's state into different levels of the experienced cognitive workload, which ranged from a low-workload cognitive state to a high-workload cognitive state (i.e., 0.1- 1). The average probability level for each EEG-index was calculated for each ad per each participant. The procedure for the extraction of each metric is described in-depth in Appendix 3.

Visual-attention measures. Two visual-attention constructs were employed to study visual attention to visual brand information. These constructs included Time to First Fixation (TTFF) and Time Spent (TS) fixating within predefined area of interest (AOI; i.e., visual brand elements AOI). TTFF reflects the speed of decoding, whereas TS serves as a proxy for brand - examination time. In the marketing literature, these measures are often applied to study the effectiveness of brand communication techniques such as video, print ads, or online banners (e.g., Lohse, 1997; Maughan, Gutnikov, & Stevens, 2007; Pieters & Wedel, 2004). The average TTFF and TS on AOI of visual brand elements were calculated for each ad per each participant.

Time to first fixation (TTFF) on a defined area of interest measures instant responses that are not driven by conscious deliberation. More emotionally charged stimuli take less time to be detected, which is indicated by a faster first fixation (Duchowski, 2002, 2007; Gidlöf et al., 2013; Rupp & Wallen, 2007).

Time spent (TS) on a defined area of interest reveals the greater differentiation of the visual stimulus amongst other stimuli. The TS fixating on the AOI reflects the attention engagement that can be an indication for the depth of cognitive processing, general interest, confusion, or memory processes (Holmqvist et al., 2013). Moreover, it has been shown that longer fixations on advertisements correlate with positive evaluations of those advertisements and subsequent preferences during choice (Maughan et al., 2007).

Memory-performance measures. Two measures were used to study the penetration of advertising efforts after viewing the ads, which serves as a proxy for memory recollections of advertising information.

Association-density score is an indicator of how well information was stored in memory (Lang, 2000). The score was measured via a cued-recall test performed after the ad-viewing task. By showing a frame of a previously presented advertisement, each participant was asked to provide any information they remembered about or associated with the exposed frame of the ad. The numbers of reported associations were calculated for each viewed advertisement per each participant during the data pre-processing stage, which is described in *section 3.5.4.*

Brand recognition measured whether participants could link the viewed ad with a specific brand. Thus, each participant was asked to choose from six brand logos presented visually, that is, to identify which brand logo should be matched with the presented advertisement frame. Their answers were coded as correct if they chose the brand logo that corresponded to the presented ad frame and incorrect if participants chose a brand logo that was not related to the previously shown advertisement.

The measured variables are presented in Table 3-1.

Variables	Data collection tools	Indicators
Compulsive buying tendency		
Compulsive Buying Scale (Valence et al. 1988)		1-5 (1: strongly disagree - 5: strongly agree)
Compulsive Buying Index (Ridgway et al., 2008)		1-7 (1: strongly disagree/never - 7: strongly agree/very often)
Attention indexes during advertising processing		
Engagement	EEG	Average probability level: 0.1-1 (0.1: low - 1: high)
Workload	EEG	Average probability level:0.1-1 (0.1: low - 1: high)
Visual attention to visual brand elements AOI		
Time to first fixation	Eye-tracking	Average time span in milliseconds of the first fixations on AOIs of visual brand elements
Time spent fixating	Eye-tracking	Average of the total fixation durations on AOIs of visual brand elements in milliseconds
Memory performance		
Association density score	Cued- recall test	Number of associations (total number of factual, positive, and negative associations)
Brand recognition	Recognition test	Choice of matching brand logo from a set of 6 brand logos

Table 3-1. Overview of measures

3.5.3.   Design and Procedure

Development of Stimuli

This study aimed to simulate a TV ad-viewing context. Thus, the experimental stimuli were chosen so that a spectrum of ad categories was included in the experiment. The stimuli choice was ultimately limited to four different branded product categories that are often encountered during commercial breaks (namely, social cause, fashion, fast-moving consumer goods including household items and low-priced beauty products, and food products). In total, 16 advertisements, four ads from each ad category, were chosen for the experiment. To control for

the impact of brand knowledge and brand perception (Lo & Harvey, 2011), brands ostensibly unknown to Europeans were selected for stimuli exposure. The ads promoting selected brands were taken from American websites and pre-tested on a small sample of respondents to verify that they were not encountered in Denmark before the actual experiment. In addition, the duration of each ad was taken into consideration, with a desired ad length of approximately 30 to 40 seconds. The specific ad features, including visual complexity, emotionality, and other features, were not controlled for during the experiment. The potential limitations on and implications for the study results are discussed in the *Discussion* in *section 3.8.* The overview of the chosen commercial content and the advertising messages for each advertising category are presented in Appendix 4, Table 8-4.

Ad-Viewing Task: Study Design

The ads were presented on a Tobii T60 XL high-resolution eye-tracker synchronized with an ABM B-Alert X10 EEG headset that measured the mental reactions at the time of ad-viewing. To better resemble commercial breaks commonly encountered while watching television, the ad-exposure in this study was forced. Two blocks of eight randomly assigned ads were presented in between two short documentaries (i.e., a National Geographic documentary and a Lonely Planet documentary). To control for the primacy and recency effects on memory recollection, the ad exposure was randomized within the block (Janhke, 1965). Hence, the exposure to the commercials consisted of four phases: (1) exposure to the first documentary, (2) exposure to the first block of advertisements, (3) exposure to the second documentary, and (4) exposure to the second block of advertisements (see Figure 3-1).
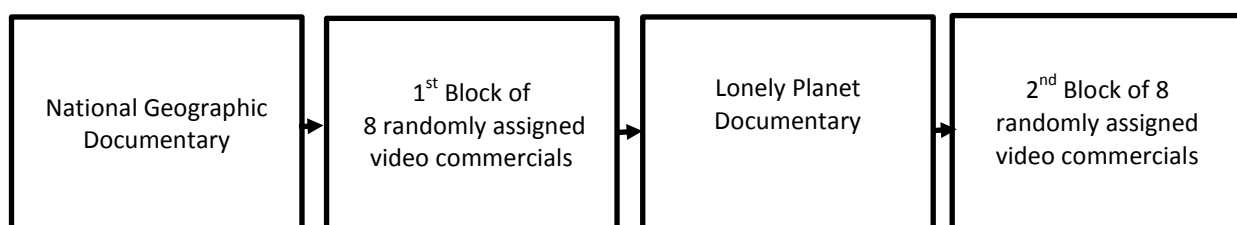

Figure 3-1. Design of ad-viewing task

To recreate the environment that would better reflect the context of TV-advertising viewing in a real life, two screens exposing distracting visual images were aligned with the eye-tracker. In total, 225 different objects consisting of reinforcing properties such as art pictures, faces, landscapes, and words were shown on the screen during the ad-viewing task (see Figure 3-2).
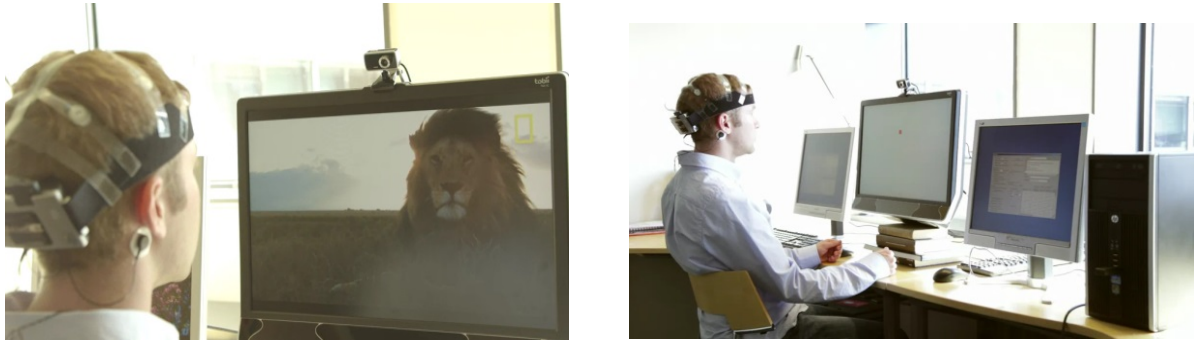
Figure 3-2. Simulated ad-viewing task. The test subject is mounted with a mobile ABM B-Alert X10 EEG headset synchronized with Tobii T60XL high resolution stationary eye-tracker.

Data Recording

Neurophysiological measures of engagement, cognitive workload, and visual attention (TFF, TS on AOI) were collected by recording the responses during the presentation of stimuli on the Attention Tool Version 4.5 (iMotions Inc. www.imotionsglobal.com). The eye-tracking data were recorded with a Tobii T60XL binocular eye-tracker running at 60 Hz with a 1920x1200-pixel screen resolution. EEG data was continuously tracked using a wireless EEG sensor headset, B-Alert X 10 (http://advancedbrainmonitoring.com/xseries/) that was synchronized with the eye-tracker. The EEG data were sampled at 256 Hz. The headset had nine electrodes located at Fz, F3, F4, Cz, C3, C4, POz, P3, P4, POz according to the standardized 10/20 international system (Jasper, 1958) (see *Appendix 3, Figure 8-1*). A non-lateralized reference procedure was used to locate the reference electrodes on the mastoid bone behind each ear. The

electrocardiography electrodes were placed on the right collarbone and the lower left rib. To optimize the data, an impedance check was completed before each recording session to ensure that the impedance was kept below 40 kΩ. The signals were recorded with a band-pass filter (0.5-65Hz) at 3dB attenuation. An algorithm with the automatic identification and decontamination of artifacts caused by motion-induced spikes, QRS complexes, excursions, or saturations (Berka et al., 2004) was incorporated into the system. Artifacts caused by blinking and excessive muscle activity were identified and decontaminated via a wavelet transform in the time domain (Berka et al., 2004, 2007) throughout data acquisition. The data were transmitted wirelessly via Bluetooth to a host computer.

To assure internal validity, each participant went through a consistent treatment during the testing procedure. To control for any physiological and neurobiological artifacts, participants were also controlled for caffeine and/or alcohol intake. In particular, the study participants were asked not to consume any products with caffeine or alcohol before the experiment. Participants were seated in an armless chair in a fixed position, 60 centimeters in front of the screen, and instructed to sit as still as possible while focusing on the tasks. During testing, the experimenter controlled the motions of the study participants through observation, notification, and corrections of any extraordinary movements if necessary. Before the start of each experiment, participants underwent the B-Alert baseline test, which consists of three neurocognitive assessment tasks (for description see *Appendix 2)*, and the 9-point eye-tracking calibration procedure. The resulting neurocognitive benchmark tasks lasted 15 minutes and allowed for the correction of the neurophysiological indexes due to individual variability in neural responses. Each participant was trained before they started the tasks to minimize effects caused by practice.

After the ad-viewing task, each participant completed a 10-minute distraction test. Then, each participant filled in the self-report tests for cued advertising recall and brand recognition. Finally, descriptive sample characteristics, including age, education, nationality, family history of neurological disorders, and health-related questions were collected (see Figure 3-3).
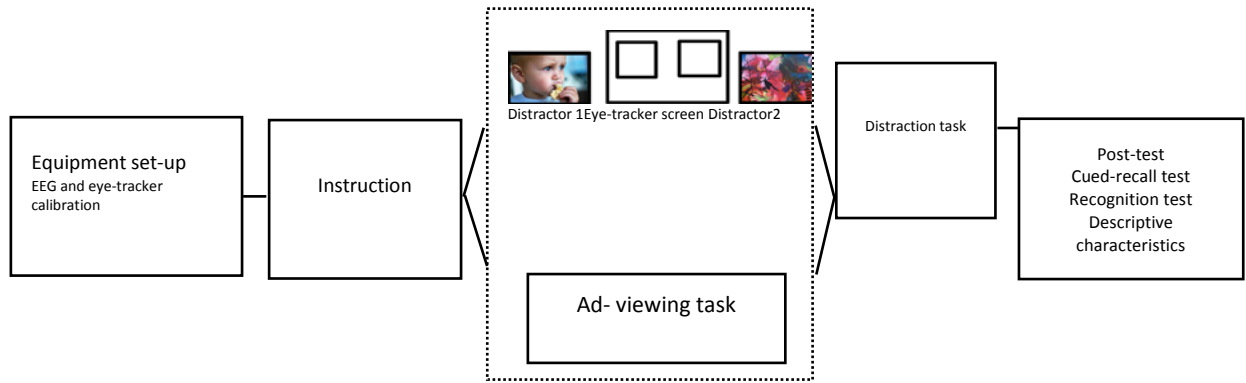
Figure 3-3. Experimental procedure. Participants were first set up with the equipment. Then they were instructed about the experiment and asked to complete the ad-viewing task. After they finished the ad-viewing task, each participant completed a distraction task, a cued-recall test, a brand-recognition test, and finally a post-test questionnaire.

3.5.4.   Data Pre-Processing

The data were pre-processed in the biometric platform Attention Tool 5.0 (www.imotionsglobal.com). First, the synchronized dataset was manually examined. Each video recording was preprocessed by manually inspecting and coding the data for further analysis. The post-markers in the video timeline were identified for the neurophysiological EEG data pre-processing purposes and the areas of interest (AOIs) were identified for the eye-tracking data extraction. Then, all relevant data (e.g., Subject ID, time stamp, and visual fixation) were exported to a CSV file. The invalid data points for the EEG metrics were manually removed. As previously described in *section 3.5.2.,* the EEG classification algorithms were fit to each individual based on the reference data from the neurocognitive assessment data (i.e., the benchmark tasks) (Berka et al., 2005, 2007; Johnson et al., 2011). Noise-reduction algorithms automatically removed any artifacts before the B-Alert metrics were calculated during data acquisition.

To answer the specific hypotheses on the differences in visual attention (i.e., TTFF and TS) between the groups, the regions of interest were specified. Here, the regions of interest related to the brand information—and the visual brand elements in particular —included the brand name,

product information, and pictorial brand information. AOIs were manually drawn, frame by frame, by indicating a moving AOIs in each video commercial (see Figure 3-4). After extracting the final dataset, blink artifacts were removed manually. Then, the average TTFF and TS on AOI of visual brand elements for each advertisement per each participant were calculated.
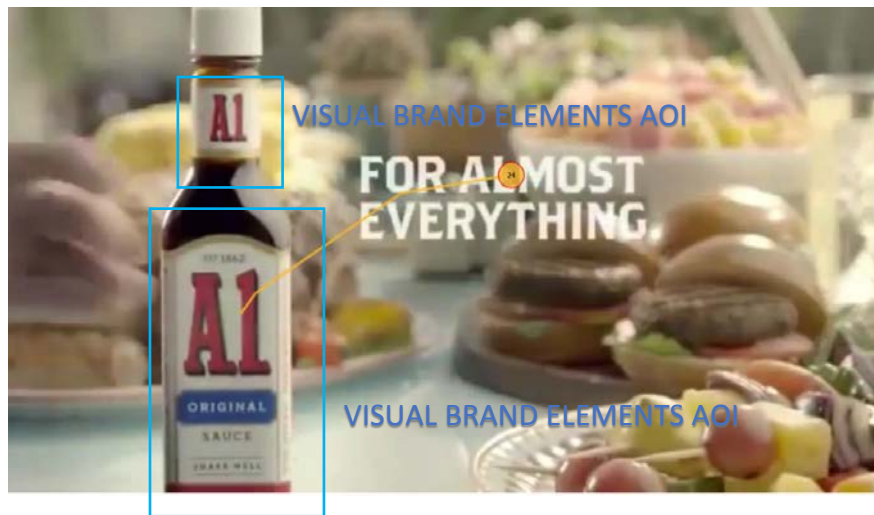
Figure 3-4. Definition of Area of Interest (AOI) for visual brand elements.

To test hypothesis H3 a, an association density score was formed during data pre-processing. To quantify the associations, the relevant information was first identified. The information that was provided by each participant for each advertisement was subjectively evaluated as to whether the information featured positive, negative, and/or factual meaning. For example, a response in which the participant indicated that shown ad induced him/her to "*feel sorry, anger, sadness, shocked,*" was coded as featuring zero positive associations, zero factual associations, and four negative associations, summing up to a total of four reported associations. Another statement, such as "*I think this ad made me think about clothes for the family*" consisted of one factual association (i.e., "*clothes for the family*") and zero other associations, as we can disregard the phrase "*I think this ad made me think.*" Because the primary interest of this study was the examination of the differences in memory performance for the established neural networks, three clusters of associations were summarized in the continuous association-density score for each ad.

3.6. Results

After pre-processing the data, statistical data analyses were performed using the statistical software JMP 13 (SAS Inc.) and IBM SPSS Statistics 24 (SAS Inc.). *P*-values of .05 were assumed to represent statistical significance. Additionally, a confidence level of .1 was also considered.

3.6.1.   Sample Characteristics

To compare the variables representing participant demographic and compulsive buying tendency, independent *t*-tests and X^2 tests were conducted. The compulsive buying tendency scores in the tested sample were normally distributed, as the Shapiro-Wilks test was not significant (W = .96, *p* = .13). The main goal of this thesis was to explore the differences between two consumer segments, namely, the consumer groups with high and low compulsive buying tendency. Thus, to segment the samples, the methodology proposed by Horváth and Birgelen (2015) and Lee and Workman (2015) was used. According to this methodology, the choices of the participants were marked with numbers representing a total score (M= 32.5, SD = 8.94, range: 13-49) that were ultimately divided into three compulsive buying tendency (CBT) categories, indicated as "*Low,*" "*Medium,*" and "*High*" in the current sample. Thus, 33% of the respondents with the highest CBT scores were grouped into the High-CBT group (N= 16, M = 41.9, SD = 2.74, range: 38 – 49) and 33% of the respondents with the lowest CBT scores were grouped into the Low-CBT group (N = 16, M =22.1, SD = 5.44, range: 13 – 28). The Medium-CBT group consisted of the participants falling in between these ranges (N= 16, M = 33.4, SD = 2.73, range: 29-37). The scores of the groups differed significantly (F (2, 47) =106, *p* <.0001). Due to the focus on the differences between the two extremes of the tested sample, representing a high and a low CBT, the Medium-CBT group was dropped from subsequent analyses (see Figure 3-5). The chosen groups did not differ in their average age (t (25.7) =1.41, *p* = .91).
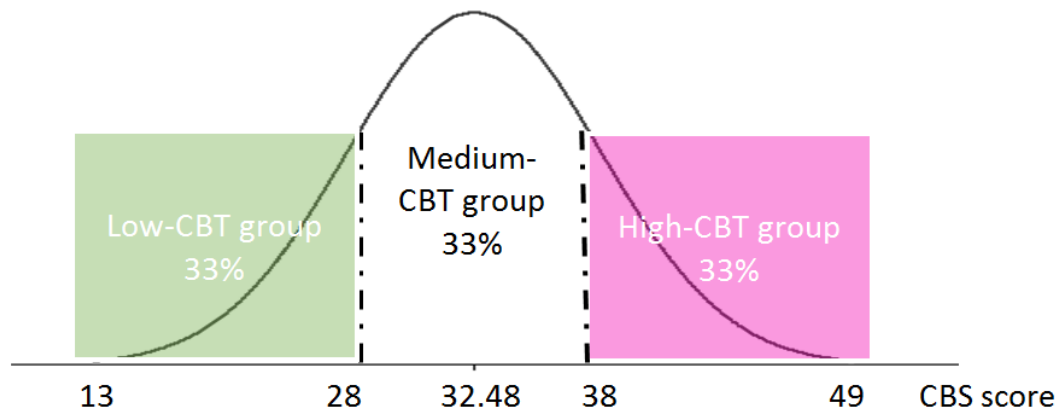
Figure 3-5. Grouping into the high and low CBT groups.

The presented data analyses were supplemented by additional data analyses in which hypothesized relationships and exploratory questions were also explored for the entire sample of consumers based on their CBT scores calculated using Compulsive Buying Scale (Valence et al., 1988). The results are reported in Appendix 5.

3.6.2. Description of Dependent Variables

The correlations between all dependent variables were studied by calculating Pearson's correlation coefficients (r) for the normally distributed data and Spearman's correlation coefficients (r_s) for the data that were not normally distributed (Bishara & Hittner, 2012). The analyses revealed several significant correlations. First, attention engagement was negatively correlated with both the cognitive workload (r = -.16, p <.0001) and the reported association-density score (r_s = -.17, p <.0001). The cognitive workload was positively correlated with the reported association-density score (r_s = .13, p <.0001). Additionally, the reported association-density score was negatively correlated with the probability of brand recognition (r_s = -.065, p=.072), but this correlation was only marginally significant. Furthermore, the TTFF to the visual brand elements presented during ad-viewing was positively correlated with time spent looking at the visual brand elements (r_s = .12, p =.001). Additionally, the TS values for looking at the visual brand elements was positively correlated with both the reported brand-association score (r_s = .10, p=.006), and the brand-recognition probability (r_s = .20, p <.0001). Finally, the

TTFF to the visual brand elements during the ad-viewing task also demonstrated a marginally significant positive correlation with the self-reported brand-recognition probability ($r_s = -.070$, $p = .051$). All other correlations were statistically non-significant (all $ps < .52$). The correlation matrix is presented in Table 3-2.

N =48		Engagement	Workload	TTFF	TS	Association density score	Brand recognition
Engagement	Correlation	r = 1	**r =-.16**	N/A[3]	N/A	$r_s = -.17$	$r_s = -.018$
	P (2-tailed)	.	**<.0001***	N/A	N/A	**<.0001***	.61
Workload	Correlation	**r =-.16**	r = 1	N/A	N/A	$r_s = .13$	$r_s = -.003$
	P (2-tailed)	**<.0001***	.	N/A	N/A	**<.0001***	.93
TTFF	Correlation	N/A	N/A	$r_s = 1$	$r_s = .12$	$r_s = -.017$	$r_s = -.070$
	P (2-tailed)	N/A	N/A	.	**.001***	.64	**.051****
TS	Correlation	N/A	N/A	$r_s = .12$	$r_s = 1$	$r_s = .10$	$r_s = .20$
	P (2-tailed)	N/A	N/A	**.001***	.	**.006***	**<.0001***
Association density score	Correlation	$r_s = -.17$	$r_s = .13$	$r_s = -.017$	$r_s = .10$	$r_s = 1$	$r_s = -.065$
	P (2-tailed)	**<.0001***	**<.0001***	.64	**.006***	.	**.072****
Brand recognition	Correlation	$r_s = -.018$	$r_s = -.003$	$r_s = -.070$	$r_s = .20$	$r_s = -.065$	$r_s = 1$
	P (2-tailed)	.61	.93	**.051****	**<.0001***	**.072****	.

Table 3-2. Correlation matrix for dependent variables, *p< .05, **p <.1.

3.6.3.   Hypothesis Testing and Exploratory Analysis

Because each participant viewed and evaluated more than one video commercial, the individual attention and memory responses were not independent. Thus, the effects of interest for each hypothesis (namely, H1a-b, H2a-b, and H3a-b) and exploratory question were assessed via mixed-effects regression models. These models estimated fixed and random effects accounting for the repeated design and within-participant variation (West, Welch, & Galecki, 2006; for its application, see Landwehr, Wentzel, & Herrmann, 2013). Linear mixed models (LMM) were calibrated using the statistical software JMP 13.0 (SAS Inc.). Generalized linear mixed models

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[3] EEG-attention measures and visual attention measures were studied as separate constructs in individually extracted data sheets, thus the relationships between these measures were not explored.

(GLMM), which allow the assessment of a binomial dependent variable, were estimated using the statistical software SPSS 24 (SAS Inc.). The top-down model-structuring approach introduced by Verbeke and Molenberghs (2000) was followed to create the final model. The analyses began with the testing of the most complex model, including dependent variables, fixed effects, and two random factors (namely, *"Subject ID" and "Stimulus Name"*). Then, each model with deducted factors was tested to see whether the model was improved. The best-fitting model was assessed by evaluating the model fit information criteria and selecting the structure with the smallest Akaike's Information Criteria and Bayesian Information Criterion. The models were fitted and compared using restricted maximum likelihood methods. Only the best-fitting models are further reported for each hypothesis and exploratory question in the data analyses section. The normalization for non-normally distributed interval variables of interest was achieved by log-transforming the EEG data, visual attention data, and self-reported memory-performance data. For each model, post-hoc, pairwise, Tukey-Kramer tests were conducted to explore individual effects. *P* values of .05 were taken to indicate significance. Additionally, a confidence level of .1 was also considered.

Hypothesis H1 a-b: Attention during Advertising Processing

To test hypothesis H1a-b, the differences in two attention measures (namely, engagement and cognitive workload) for advertising processing in the two CBT groups were studied using estimated LMMs. According to hypothesis H1a-b, the High-CBT group should allocate more cognitive resources to advertising processing tasks than the Low-CBT group, thereby indicating (a) a higher engagement and (b) a higher workload during ad-viewing task. The effect of the ad category on the differences in engagement and workload between the groups was also explored. To this end, the differences in engagement and workload were analyzed for the entire ad-viewing span for both groups.

H1 (a): engagement. To test H1a, the effects of the *"CBT-group"* (High-CBT, Low-CBT), *"ad category"* (fashion, FMCG, food, social cause)[4], and the interaction between *"CBT-group"* and

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[4] In the subsequent data analyses, the two terms *"CBT-group"* and *"ad-category"* are respectively used to refer to the High-CBT/Low-CBT groups and fashion/FMCG/food/social cause ad categories without any explicit specifiction.

"ad category" on engagement were assessed via LMM. The engagement was modeled as a dependent variable, all estimated effects were included as fixed factors, and *"Subject ID"* was modeled as a random intercept. The data analysis revealed that the engagement level experienced by the High-CBT group was higher than the engagement level experienced by the Low-CBT group (see Table 3-5). However, this difference between the groups was not statistically significant (F (1, 30) = 2.03, *p* = .16). In addition, the data analyses also demonstrated that, although the effect of interaction between *"CBT-group"* and *"ad category"* was also non-significant (F (3,474) = .45, *p* = .72), the direct effect of *"ad category"* (F (3, 474) = 3.45, *p* =.017) on engagement proved to be significant. The table with the parameter estimates for the deducted model is provided below (see Table 3-3).

Effect	β	SE	df	t	p
Intercept	**.42**	**.027**	**30**	**15.6**	**< .0001***
CBT- group[High-CBT]	.038	.027	30	1.42	.16
Ad category[Fashion]	.006	.007	474	.96	.34
Ad category [FMCG]	**-.021**	**.007**	**474**	**-3.22**	**.0014***
Ad category [FOOD]	.007	.007	474	1.10	.27
CBT- group[High-CBT] *Ad category[Fashion]	.001	.007	474	.15	.88
CBT- group [High-CBT] *Ad category[FMCG]	-.007	.007	474	-1.00	.32
CBT- group [High-CBT] *Ad category[FOOD]	.006	.007	474	.88	.38

*Table 3-3. Solutions for fixed effects, *p< .05, **p <.1.*

To further investigate the effect of ad category on engagement, post-hoc Tukey-Kramer pairwise analyses were conducted. The resulting analyses indicate that lower engagement levels were experienced while watching FMCG ads as compared to watching video commercials from the other ad categories, including social cause (MD = -.030, *p* =.038*), [5]fashion (MD =-.028, *p* =.052**),[6] and food ads (MD = -.029, *p* =.042*) (see Table 3-5 and Figure 3-6). All other effects between the ad categories proved to be non-significant (all *ps* > .10).

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[5] MD: difference in means
[6] * p < .05, ** p < .1.
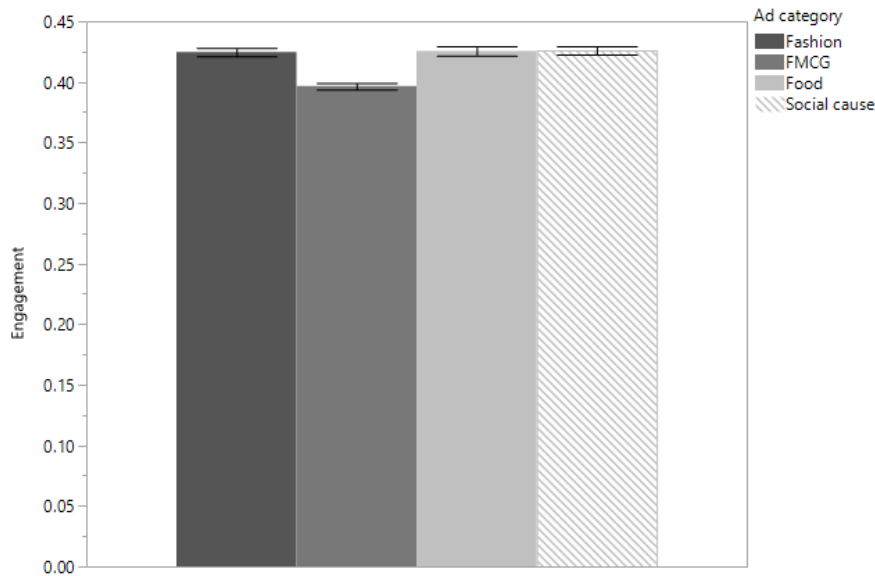
Figure 3-6. Mean engagement levels during ad-viewing times per ad category. Whiskers indicate the standard error. The ad-category effect was driven by the responses to FMCG ads because lower average engagements were shown for the FMCG ad category in comparison to the other three ad categories.

H1 (b): workload. To test H1b, an LMM including the workload as a dependent variable; *"CBT-group," "ad category,"* and their interaction as fixed factors; and *"Subject ID"* and *"Stimulus Name"* as random factors was estimated. The resulting analyses showed that, even though the High-CBT group demonstrated a slightly higher workload during the ad-viewing task, this difference was non-significant ($F_{(1, 30)} = 2.13$, $p = .15$) (see Table 3-5). The effect of *"ad category"* ($F_{(3, 12)} = 1.30$, $p = .33$) and the effect of interaction between *"CBT-group"* and *"ad category"* ($F_{(3,462)} = .18$, $p = .91$) on cognitive workload were also non-significant. The table with parameter estimates for the model is provided below (see Table 3-4).

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Effect	β	SE	df	t	p
Intercept	**.55**	**.014**	**38**	**38.8**	**< .0001***
CBT- group[High-CBT]	.019	.013	30	1.46	.15
Ad category[Fashion]	-.008	.010	12	-.82	.43
Ad category [FMCG]	.014	.010	12	1.40	.19
Ad category [FOOD]	-.014	.010	12	-1.39	.19
CBT- group[High-CBT] *Ad category[Fashion]	.0008	.003	462	.25	.80
CBT- group [High-CBT] *Ad category[FMCG]	.0002	.003	462	.05	.96
CBT- group [High-CBT] *Ad category[FOOD]	.001	.003	462	.39	.69

*Table 3-4. Solutions for fixed effects, *p < .05, **p <.1.*

Table 3-5 summarizes the means, standard errors, and confidence intervals of the dependent variables (engagement and cognitive workload).

Variable	CBT-group	Ad cat. CBT-gr.*Ad cat.	M (SE)	95%CI		Statistics
				LL	UL	
Engagement	High-CBT		.46 (.038)	.38	.53	F (1, 30) = 2.03,
	Low-CBT		.38 (.038)	.30	.46	p = .16
		FMCG	.40 (.028)	.37	.48	
		Fashion	.42 (.028)	.34	.45	F (3, 474) = 3.45,
		Food	.43 (.028)	.37	.48	***p =.017****
		Social cause	.43 (.028)	.37	.48	
		High-CBT, FMCG	.43 (.039)	.35	.51	F (3, 474) = .45,
		High-CBT, Fashion	.46 (.039)	.38	.54	p = .72
		High-CBT, Food	.47 (.039)	.39	.55	
		High-CBT, Social cause	.46 (.039)	.38	.54	
		Low-CBT, FMCG	.37 (.039)	.29	.44	
		Low-CBT, Fashion	.39 (.039)	.31	.46	
		Low-CBT, Food	.38 (.039)	.30	.46	
		Low-CBT, Social cause	.39 (.039)	.31	.47	
Cognitive workload	High-CBT		.57 (.019)	.53	.61	F (1, 30) = 2.13,
	Low-CBT		.53 (.019)	.49	.57	p = .15
		FMCG	.56 (.017)	.53	.60	F (3, 12) = 1.30,
		Fashion	.54 (.017)	.51	.58	p =.33
		Food	.54 (.017)	.51	.57	
		Social cause	.56 (.017)	.52	.59	
		High-CBT, FMCG	.58 (.022)	.54	.63	F (3, 462) = .18,
		High-CBT, Fashion	.56 (.022)	.52	.61	p = .91
		High-CBT, Food	.56 (.022)	.51	.60	
		High-CBT, Social cause	.57 (.022)	.53	.62	
		Low-CBT, FMCG	.54 (.022)	.50	.59	
		Low-CBT, Fashion	.52 (.022)	.48	.57	
		Low-CBT, Food	.52 (.022)	.47	.56	
		Low-CBT, Social cause	.54 (.022)	.50	.59	

Table 3-5. Means, standard errors, and confidence intervals for engagement and cognitive workload levels, * p <.05.

Figure 3-7 demonstrates the average fluctuations in engagement and workload responses over the course of the ad exposure.
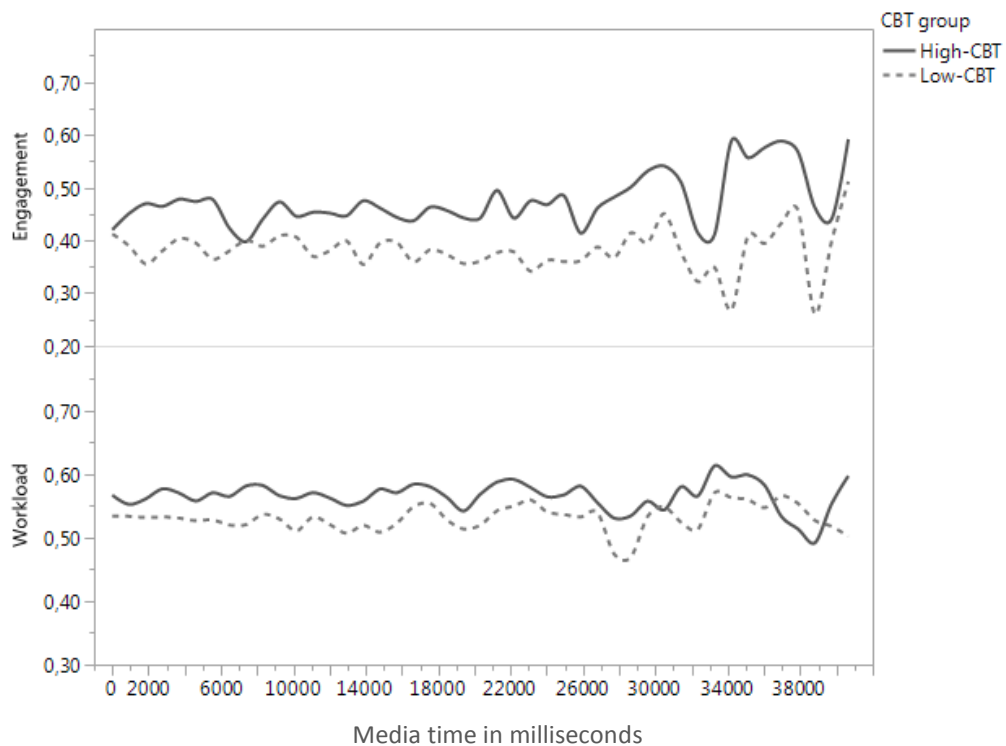
Figure 3-7. Mean engagement and workload levels depicted during ad-viewing time over entire period of exposure to ads. Although the High-CBT group showed relatively higher engagement and cognitive workload levels during the ad-viewing task than the Low-CBT group, the differences between the groups were non-significant.

In summary, both High- and Low-CBT groups demonstrated relatively equal engagement and workload during the ad-viewing task. There were also no significant differences between two groups in their engagement and cognitive workload levels depending on the advertising category. Thus, hypothesis H1a-b could not be supported.

Hypothesis H2 a-b: Visual Attention to Brand Elements

To test hypothesis H2a-b, the differences of the two CBT groups with respect to their visual attention to brand-element information presented in each advertisement (i.e., average TTFF and time spent within AOI of visual brand elements) were further studied using LMMs. Per the

hypothesis, the High-CBT group should be more visually attentive to brand elements presented during ad-viewing tasks than the Low-CBT group, thereby demonstrating (a) faster decoding and (b) a longer examination of visual brand information. The moderating role of the advertising category for the studied effects was also explored. Thus, differences in visual attention were investigated during the presentation of brand elements during the ad-viewing task.

H2 (a): TTFF on AOI of visual brand elements. To study H2a, the effects of *"CBT-group"*, *"ad category",* and the interaction between *"CBT-group"* and *"ad category"* on TTFF on AOI were studied by estimating an LMM that included *"Stimulus Name"* as a random factor. Data analysis showed that the High-CBT group reacted to the brand-element information 1321 milliseconds slower than the Low-CBT group, but this difference was non-significant at a confidence level of 95%. However, at a 90% confidence level, the difference between the groups became significant (F (1, 492) =3.15 *p* = .077**)[7], which means that the difference is marginally significant. Furthermore, the data analysis revealed that there was no significant *"ad category"* effect (F (3, 12) = 2.35, *p* =.12), but the interaction effect (F (3,492) = 4.67, *p* = .003) on TTFF on AOI of visual brand elements proved to be significant. The table with parameter estimates is provided below (see Table 3-6).

Effect	β	SE	df	t	P
Intercept	170230	2307	12	7.38	<.0001*
CBT- group[High-CBT]	**656**	**369**	**492**	**1.78**	**.077****
Ad category[Fashion]	2163	3995	12	.54	.60
Ad category [FMCG]	-2661	3995	12	-.67	.52
Ad category [FOOD]	**-8070**	**3995**	**12**	**-2.02**	**.066****
CBT- group[High-CBT] *Ad category[Fashion]	-365	640	492	-.57	.57
CBT- group [High-CBT] *Ad category[FMCG]	**-1119**	**640**	**492**	**-1.75**	**.081****
CBT- group [High-CBT] *Ad category[FOOD]	-864	640	492	-1.35	.18

*Table 3-6. Solutions for fixed effects, *p < .05, **p <.1.*

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[7] * p < .05, ** p < .1.

Exploratory post-hoc Tukey-Kramer pairwise comparisons showed that the differences between the two groups were driven by their responses to the social cause ads. Specifically, the High-CBT group reacted to the visual brand elements presented during social-cause commercials 6080 milliseconds slower than the Low-CBT group ($p = .001$) (see Figure 3-8). All other differences between ad categories proved to be non-significant (all $ps > .23$).
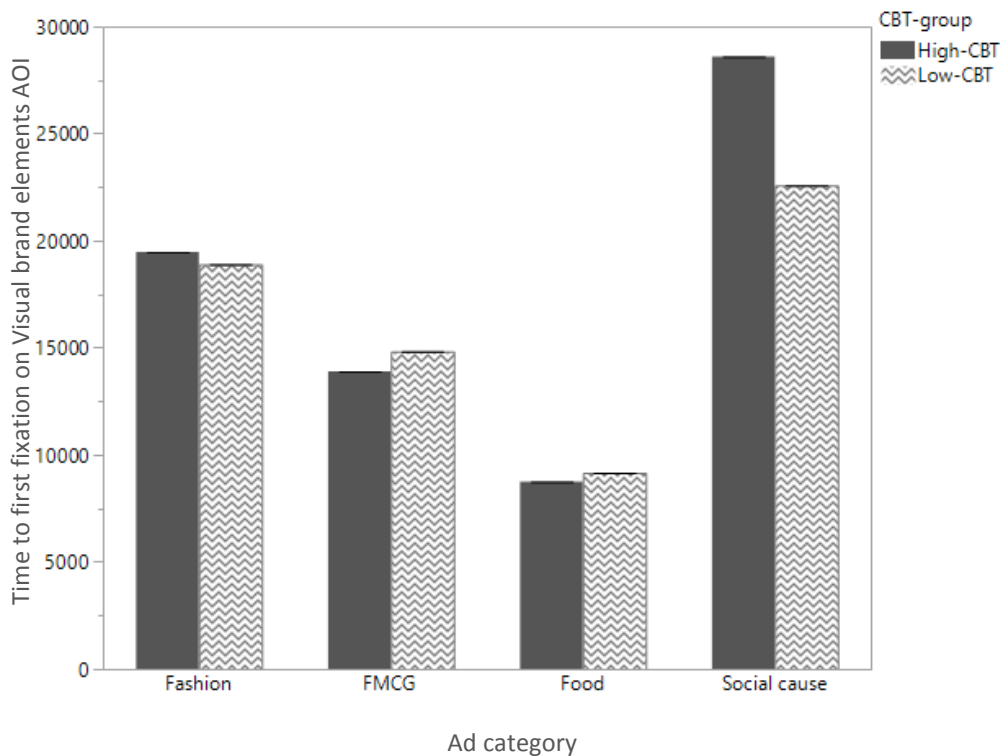
Figure 3-8. Mean time to first fixation on visual brand elements during ad-viewing times for each compulsive buying tendency segment per ad category, provided in milliseconds. Whiskers indicate the standard error. The Low-CBT group showed faster fixation on visual brand information compared to the High-CBT group. A difference between the groups in the decoding speed of the visual brand elements information was only present for the ads promoting social causes.

Table 3-7 summarizes the means, standard errors, and confidence intervals for TTFF on AOI for the visual brand elements per group, separated by ad category.

Variable	CBT-group	Ad cate. CBT- gr.*Ad cat.	M (SE)	95%CI		Statistics
				LL	UL	
TTFF on visual brand elements AOI	High-CBT		17686 (2336)	12623	22748	F (1, 492) =3.15, **p = .077****
	Low-CBT		16374 (2336)	11311	21437	
		FMCG	14369 (4614)	4317	24421	F (3,12) = 2.35, *p* =.12
		Fashion	19193 (4614)	9141	29245	
		Food	8960 (4614)	1092	19012	
		Social cause	25598 (4614)	15546	35650	
		High-CBT, *FMCG*	13906 (4672)	3781	24031	F (3,492) = 4.67, **p = .003***
		High-CBT, *Fashion*	19484 (4672)	9359	29608	
		High-CBT, *Food*	8752 (4672)	1373	18876	
		High-CBT, *Social cause*	28602 (4672)	18477	38727	
		Low-CBT, *FMCG*	14832 (4672)	4708	24957	
		Low-CBT, *Fashion*	18902 (4672)	8777	29027	
		Low-CBT, *Food*	9168 (4672)	957	19293	
		Low-CBT, *Social cause*	22594 (4672)	12470	32719	

Table 3-7. Means, standard errors, and confidence intervals for time to first fixation on AOI of visual brand elements, provided in milliseconds, * p <.05, ** p < .1.

H2 (b): TS on AOI of visual brand elements. To test H2b, the TS looking at visual brand-elements information during ad exposure was tested. An LMM including the logarithmically transformed TS on AOI of visual brand elements as the dependent variable; the *"CBT-group," "ad category,"* and their interaction as fixed factors; and *"Subject ID"* and *"Stimulus Name"* as random factors was assessed. Data analysis demonstrated that there were no significant effects caused by *"CBT-group"* (F (1, 30) = .40, *p* = .53) or *"ad category"* (F (3, 12) = 1.93, *p* = .18), although the interaction between *"CBT-group"* and *"ad category"* on TS on AOI proved to be significant (F (3, 462) = 4.94, *p* = .002). The table with parameter estimates is provided below (see Table 3-8).

Effect	β	SE	df	t	P
Intercept	**5.97**	**.36**	**13.1**	**16.5**	**<.0001***
CBT- group[High-CBT]	.065	.10	30	.63	.53
Ad category[Fashion]	**1.23**	**.61**	**12**	**2.01**	**.068****
Ad category [FMCG]	-.96	.61	12	-1.56	.15
Ad category [FOOD]	.33	.61	12	.53	.61
CBT- group[High-CBT] *Ad category[Fashion]	-.062	.12	462	-.52	.60
CBT- group [High-CBT] *Ad category[FMCG]	**-.22**	**.12**	**462**	**-1.86**	**.064****
CBT- group [High-CBT] *Ad category[FOOD]	-.16	.12	462	-1.38	.17

*Table 3-8. Solutions for fixed effects: *p < .05, **p <.1.*

Exploratory post-hoc individual Tukey-Kramer tests revealed that the High-CBT group spent 227.17 milliseconds longer looking at the visual brand elements than the Low-CBT group, but this difference was only significant for the social-cause ad category (p =.026) (see Figure 3-9). No significant differences were shown for the ads from the other product categories (all *ps* > .30).
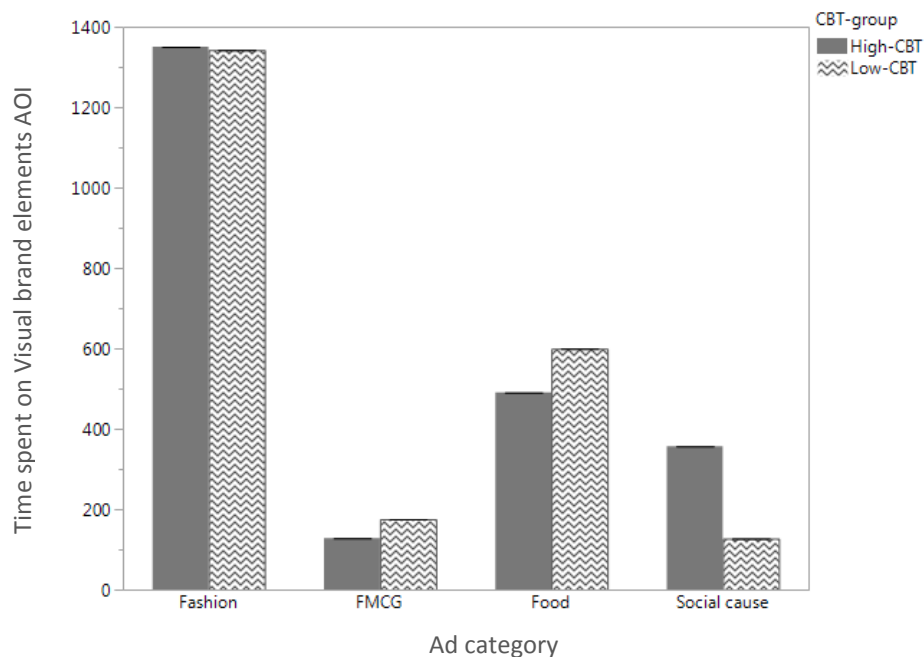
Figure 3-9. Mean fixation duration on visual brand elements presented by ad category. Whiskers indicate the standard error. The High-CBT group demonstrated a longer fixation on visual brand elements than the Low-CBT group only for the social-cause ads.

Table 3-9 summarizes the means, standard errors, and confidence intervals of TS on the AOI for the visual brand elements. The statistics correspond to the data that was transformed back to the original values.

Variable	CBT-group	Ad cat. / CBT-gr.*Ad cat.	M (SE)	95%CI		Statistics
				LL	UL	
TS on visual brand elements AOI	High-CBT		417 (1.46)	186	933	F (1, 30) = .40,
	Low-CBT		366 (1.46)	164	819	p = .53
		FMCG	150 (.72)	31	709	F (3, 12) = 1.93,
		Fashion	1347 (.72)	285	6354	p = .18
		Food	542 (.72)	114	2561	
		Social cause	213 (.72)	44	1010	
		High-CBT, FMCG	128 (2.08)	26	620	F (3, 462) = 4.94,
		High-CBT, Fashion	1350 (2.08)	279	6514	p = .002*
		High-CBT, Food	491 (2.08)	101	2370	
		High-CBT, Social cause	357 (2.08)	73	1725	
		Low-CBT, FMCG	175 (2.08)	36	848	
		Low-CBT, Fashion	1342 (2.08)	278	6475	
		Low-CBT, Food	599 (2.08)	124	2891	
		Low-CBT, Social cause	127 (2.08)	26	617	

Table 3-9. Means, standard errors, and confidence intervals for time spent looking at visual brand elements, provided in milliseconds, * p <.05.

In summary, the High-CBT group reacted to visual brand elements exposed during ad-viewing slower than the Low-CBT group but viewed the brand-elements information longer. However, these effects were only present for the social-cause ad category. Based on these findings, hypothesis H2 a-b could only be partly supported.

Hypothesis H3 a-b: Memory Performance

To address hypothesis H3 a-b, the differences between the two CBT groups in terms of the reported association density and brand recognition, which served as proxies for memory performance, were investigated. According to the hypothesis, the High-CBT group should have a better memory performance than the Low-CBT group, as indicated by a) a higher association-density score, and b) a higher probability for brand recognition. The effect of the ad category on the differences in the memory performance of the two groups was also explored. To test the first part of hypothesis H3 (a), LMMs were estimated using the statistical software JMP 13.0 (SAS Inc.). To test the second part of hypothesis H3 (b), GLMMs, which can investigate binomial data (McCullagh & Nelder, 1989), were estimated using the statistical software IBM SPSS Statistics Version 24 (SAS Inc.).

H3 (a): association-density score. To test H3a, the effects of *"CBT-group," "ad category,"* and their interaction with the logarithmically transformed association-density score included as a dependent variable were studied by estimating an LMM. *"Subject ID"* and *"Stimulus Name"* were included as random factors. This model revealed that the effects of both *"CBT-group"* (F $(1, 30) = .94$, $p = .34$) and *"ad category"* (F $(3, 12) = .65$, $p = .60$) on the association-density score were non-significant. Interestingly, the data analyses also demonstrated a marginally significant interaction effect (F $(3,462) = 2.33$, $p = .073**$)[8] . The table with the parameter estimates is provided in Table 3-10.

Effect	β	SE	df	t	P
Intercept	**1.09**	**.054**	**37.2**	**20.1**	**<.0001***
CBT- group[High-CBT]	.047	.048	30	.97	.34
Ad category[Fashion]	.054	.050	12	1.09	.30
Ad category [FMCG]	-.055	.050	12	-1.11	.29
Ad category [FOOD]	.015	.050	12	.31	.76
CBT- group[High-CBT] *Ad category[Fashion]	.004	.023	462	.19	.85
CBT- group [High-CBT] *Ad category[FMCG]	**-.059**	**.023**	**462**	**-2.55**	**.011***
CBT- group [High-CBT] *Ad category[FOOD]	.026	.023	462	1.12	.26

Table 3-10.Solutions for fixed effects: *p < .05, **p <.1.

[8] * p < .05, ** p < .1.

Table 3-11 summarizes the means, standard errors, and confidence intervals for the indicated associations per group and ad category. The reported numbers are converted to the original values.

Variable	CBT-group	Ad cat. CBT- gr.* Ad cat.	M (SE)	95%CI LL	UL	Statistics
Association density score	High-CBT		2.12 (.073)	1.69	2.62	F (1, 30) = .94,
	Low-CBT		1.84 (.073)	1.45	2.29	*p = .34*
		FMCG	1.82 (.074)	1.43	2.28	F (3, 12) = .65,
		Fashion	2.14 (.074)	1.70	2.28	*p = .60*
		Food	2.02 (.074)	1.60	2.51	
		Social cause	1.94 (.074)	1.53	2.41	
		High-CBT, *FMCG*	1.79 (.091)	1.32	2.35	F (3,462) = 2.33,
		High-CBT, *Fashion*	2.31 (.091)	1.75	1.97	*p = .073***
		High-CBT, *Food*	2.25 (.091)	1.71	2.90	
		High-CBT, *Social cause*	2.17 (.091)	1.64	3.80	
		Low-CBT, *FMCG*	1.85 (.091)	1.38	2.43	
		Low-CBT, *Fashion*	1.98(.091)	1.49	2.59	
		Low-CBT, *Food*	1.81 (.091)	1.34	2.38	
		Low-CBT, *Social cause*	1.72 (.091)	1.27	2.27	

Table 3-11. Means, standard errors, and confidence intervals for the reported number of associations, * p <.05, ** p < .1.

H3 (b): brand recognition. To study H3b, a GLMM featuring brand recognition with a binomial logit distribution as the dependent variable; *"CBT-group," "ad category"* and their interaction as fixed factors; and *"Subject ID"* as a random factor was estimated. The data analysis revealed that the effect of *"CBT-group"* (F (1, 504) =1.16, *p* = .73) on brand recognition was non-significant, but the effect of *"ad category"* (F (3,504) = 2.88, *p* = .035) on brand recognition proved to be significant. Additionally, data analysis also showed a marginally significant interaction effect (F (3,504) = 2.42, *p* = .065**)[9]. The table with parameter estimates is provided below (see Table 3-12).

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[9] * p < .05, ** p < .1.

Effect	β	SE	t	P
Intercept	.38	.28	1.37	.17
CBT- group[High-CBT]	.49	.41	1.19	.24
Ad category[Fashion]	-.42	.37	-1.12	.27
Ad category [FMCG]	.57	.38	1.50	.14
Ad category [FOOD]	**1.59**	**.46**	**3.47**	**.001***
CBT- group[High-CBT] *Ad category[Fashion]	.093	.56	.17	.89
CBT- group [High-CBT] *Ad category[FMCG]	-.25	.56	-.44	.66
CBT- group [High-CBT] *Ad category[FOOD]	**-1.44**	**.61**	**-2.37**	**.018***

Table 3-12. Solutions for fixed effects, *p < .05, **p <.1.

A post-hoc Bonferroni-adjusted pairwise comparison test demonstrated that a higher brand-recognition probability was revealed for the food ad category than for the social-cause ad category (p=.003). The differences in the reported brand-recognition probability for the other ad categories were all statistically non-significant (all *ps* > .096) (see Figure 3-10).
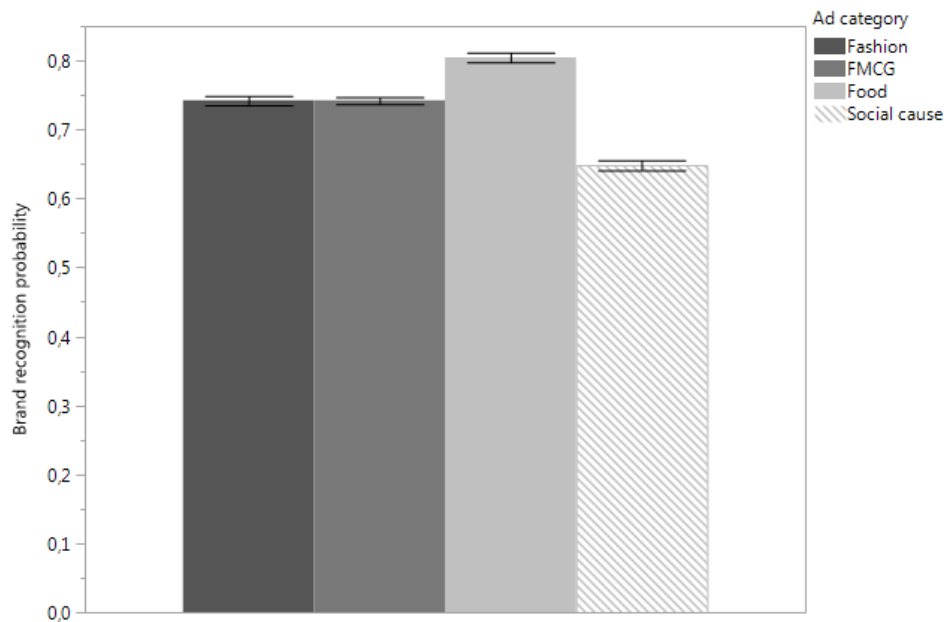
Figure 3-10. Mean brand-recognition probability per ad category. Whiskers indicate the standard error. Better brand recognition was shown for the food ad category as compared to the social-cause ad category.

Table 3-13 summarizes the means, standard errors, and confidence intervals for the indicated brand-recognition probability per group and separated by ad category.

Variable	CBT-group	Ad category	Prob. (SE)	95%CI		Statistics
		CBT-group* Ad cat.		LL	UL	
Brand recognition	High-CBT		.76 (.035)	.68	.82	F (1, 504) =1.16,
	Low-CBT		.74 (.037)	.66	.80	*p* = .73
		FMCG	.75 (.042)	.66	.82	F (3,504) = 2.88,
		Fashion	.75 (.042)	.66	.82	***p = .035****
		Food	.82 (.037)	.73	.88	
		Social cause	.65 (.047)	.56	.74	
		High-CBT, *FMCG*	.77 (.057)	.64	.86	F (3,504) = 2.42,
		High-CBT, *Fashion*	.80 (.053)	.68	.89	***p = .065*****
		High-CBT, *Food*	.74 (.060)	.61	.84	
		High-CBT, *Social cause*	.71 (.062)	.55	.81	
		Low-CBT, *FMCG*	.72 (.061)	.59	.83	
		Low-CBT, *Fashion*	.69 (.063)	.56	.80	
		Low-CBT, *Food*	.88 (.042)	.77	.94	
		Low-CBT, *Social cause*	.60 (.068)	.46	.72	

*Table 3-13. Means, standard errors, and confidence intervals of brand-recognition probability, * p <.05, ** p < .1.*

In summary, the data analyses indicate that there are no significant differences between the groups in their memory-performance measures. In addition, the advertising category had no significant impact on the differences in the reported association-density score or in the brand recognition for both groups. Thus, hypothesis H3a-b could not be supported.

Exploration of Relationships between Attention and Memory Performance

To provide additional insights into the relationships between attention and memory processes in compulsive buying, mixed-effects models were calibrated to the experimental data. First, the links between the attention indexes (i.e., engagement and cognitive workload) and the brand-association density score including *"CBT-group"* as a moderating factor were explored by LMMs. Second, the links between the attention indexes and brand recognition with *"CBT-group"* as a moderating factor were studied using GLMMs. Finally, the links between visual attention to brand elements (i.e., TTFF and TS on AOI) and subsequent brand recognition with *"CBT-group"* as a moderating factor were explored via analyses with the GLMMs. The results indicate that most of the tested effects were non-significant:

- *Engagement and association density.* To test the relationship between engagement and association density moderated by *"CBT-group,"* an LMM was estimated. The logarithmically transformed association-density score was modeled as the dependent variable; engagement, *"CBT-group,"* and their interaction were included as fixed effects; and *"Subject ID"* and *"Stimulus Name"* were added as random factors. The data analysis showed that all effects on association-density score were non-significant (*engagement*: $F_{(1, 373)} = .61$, $p = .43$; *"CBT-group"*: $F_{(1, 29.3)} = 1.14$, $p = .29$; *engagement*"CBT-group"*: $F_{(1, 375)} = .78$ $p = .38$).

- *Workload and association density.* To test the relationship between workload and association density moderated by *"CBT-group,"* an LMM was estimated. The logarithmically transformed association-density score was included as the dependent variable; workload, *"CBT-group,"* and their interaction were modeled as fixed effects; and *"Subject ID"* and *"Stimulus Name"* were included as random factors. The data analyses revealed that all effects on association-density score were statistically non-significant (*cognitive workload:* $F_{(1, 371.7)} = .002$, $p = .97$; *"CBT-group"*: $F_{(1, 30.2)} = .94$, $p = .34$; *cognitive workload*"CBT-group"*: $F_{(1, 418.9)} = 2.43$, $p = .12$).

- *Engagement and brand recognition.* To test the relationship between engagement and brand recognition moderated by *"CBT-group,"* a GLMM was run. Brand recognition with a binomial logit distribution was modeled as the dependent variable; engagement, *"CBT-group,"* and their interaction were included as fixed factors; and *"Subject ID"* was added as a random factor. The data analysis showed that all effects on brand recognition were statistically non-significant (*engagement*: $F_{(1, 508)} = .015$, $p = .90$),

"CBT-group": F (1, 508) = .23, *p* = .63, *engagement* "CBT-group":* F (1, 508) = .65, *p* = .42).

- **TTFF on AOI of visual brand elements and brand recognition.** To test the relationship between TTFF on AOI of visual brand elements and brand recognition moderated by *"CBT-group,"* a GLMM was estimated. Brand recognition with a binomial logit distribution was modeled as the dependent variable; TTFF on AOI, *"CBT-group,"* and their interaction were included as fixed factors; and *"Subject ID"* was added as a random intercept. The data analysis demonstrated that all effects on brand recognition were statistically non-significant (*TTFF:* (1, 508) = .95, *p* = .33; *"CBT-group"*: F (1, 508) = .45, *p* = .50; *TTFF* "CBT-group":* F (1, 508) = 2.33, *p* = .13).

The report on these data analyses can be found in Appendix 6. In the following section, only the statistically significant results of exploratory data analyses are in-depth discussed.

Workload and brand recognition. To test the relationship between cognitive workload and brand recognition moderated by *"CBT-group,"* a GLMM was estimated. Brand recognition with a binomial logit distribution was included as the dependent variable; cognitive workload, *"CBT-group,"* and their interaction were added as fixed factors; and *"Subject ID"* was modeled as a random intercept. The data analysis revealed that the effects of *"CBT-group"* (F (1, 508) = 5.28, *p* = .022) (see Figure 3-11), and the interaction between cognitive workload and *"CBT-group"* (F (1, 508) = 4.97, *p* = .026) on brand recognition-probability were both significant. However, the effect of cognitive workload on brand recognition was non-significant (F (1, 508) = .049, *p* =.83). The table with the model parameter estimates is provided below (see Table 3-14).

Effect	β	SE	t	p
Intercept	-.49	.94	-.52	.61
Cognitive workload	2.73	1.78	1.53	.13
CBT- group[High-CBT]	**3.51**	**1.53**	**2.30**	**.022***
Cognitive workload*CBT group[High-CBT]	**-6.07**	**2.72**	**-2.23**	**.026***

Table 3-14. Solutions for fixed effects, *p < .05, **p <.1. Solutions provided in the log-odds ratio scale.

To specify the significant interaction, spotlight analyses (Krishna, 2016; see also Landwehr et al., 2013) were conducted with the *"CBT-group"* dummy-coded to explore the effects of cognitive workload on brand-recognition probability for each *"CBT-group"* group. As a result of the dummy coding (0 = Low-CBT group, 1 = High-CBT group), all terms that did not interact with the compulsive buying tendency were assessed on the low level of CBT. A GLMM was estimated from this data with the cognitive workload, dummy-coded *"CBT-group,"* and their interaction as predictors; brand recognition with a binomial logit distribution as the dependent variable; and "*Subject ID*" as the random intercept. Next, the dummy coding of the *"CBT-group"* was changed to assess all terms that did not interact with compulsive buying tendency on the high level of CBT. In this case, an inverse coding was used (1 = Low-CBT group, 0 = High-CBT group). The previous model was rerun with the new dummy-coded *"CBT-group"* variable corresponding to the High-CBT group. The resulting data analyses demonstrated that the direction of the cognitive workload's effect on brand-recognition probability differed depending on the "*CBT-group*" (see Figure 3-11). However, although the cognitive workload was proved to operate differently depending on the CBT group (High-CBT group: β= -3.34, SE = 2.06, t = -1.62, p =.11; Low-CBT group: β= 2.73, SE = 1.78, t = 1.53, p =.13), the effects of cognitive workload on brand probability within each "*CBT-group*" category were non-significant.
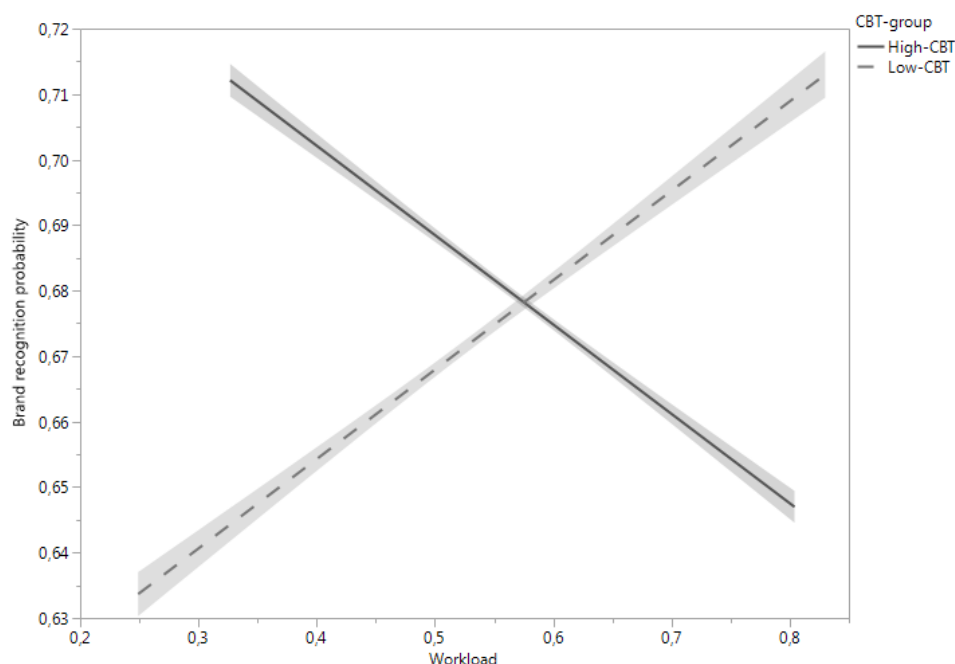
Figure 3-11. The relationship between workload and brand-recognition probability for each CBT group. Whiskers indicate the standard error.

Additional spotlight analyses were performed with the entire sample of consumers (N = 48) (see *Appendix 5, Table 8-14, Figure 8-6*). These data analyses showed that the negative relationship between cognitive workload and brand-recognition probability proved to be significant for the High-CBT group. However, the positive relationship between cognitive workload and brand recognition remained non-significant for the Low-CBT group.

TS on AOI of visual brand elements and brand recognition. To test the relationship between TS on AOI of visual brand elements and brand recognition moderated by *"CBT-group,"* a GLMM was estimated. Brand recognition with a binomial logit distribution was modeled as the dependent variable; TS on AOI, *"CBT-group,"* and their interaction were modeled as fixed factors; and *"Stimuli ID"* was included as a random intercept. The data analysis revealed that the effect of TS fixating on visual brand elements on brand-recognition probability was significant ($F_{(1, 508)} = 11.1$, $p = .001$) (see Figure 3-12). The effects of *"CBT-group"* ($F_{(1,508)} = .029$, $p = .86$) and TS- *"CBT-group"* interaction ($F_{(1,508)} = .86$, $p = .35$) on brand recognition, however, were both non-significant. The table with the model-parameter estimates is provided below (see Table 3-15).

Effect	β	SE	t	p
Intercept	.64	.24	2.66	.008*
TS	.000	.0002	1.87	.062**
CBT- group[High-CBT]	-.059	.35	-.171	.86
TS*CBT-group[High-CBT]	.000	.0003	.93	.35

Table 3-15. Solutions for fixed effects, *p < .05, **p <.1. Solutions provided in the log-odds scale.
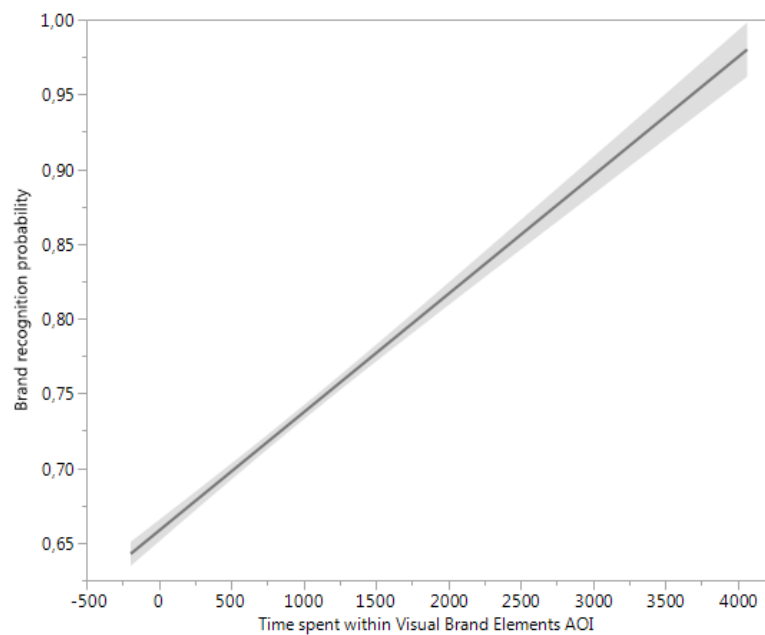
Figure 3-12. The relationship between the time spent fixating on AOI for visual brand elements and reported brand-recognition probability. Time spent variable is transformed back to the original scale and is presented in milliseconds.

In summary, the data analyses showed no significant relationships between the attention indexes representing ad processing and the association-density scores moderated by the CBT group. Moreover, data analyses revealed no significant relationship between the engagement measure and brand-recognition probability for either of the CBT groups. Interestingly, statistical analyses also revealed that the effect of one of the attention indexes, cognitive workload, on brand-recognition probability varied depending on the CBT group. After conducting spotlight analyses on the entire sample of consumers (see *Appendix 5*), the negative relationship between cognitive workload and brand recognition probability proved to be significant for the High-CBT group[10].

In addition, the analysis of the relationships between visual attention to visual brand elements and reported brand-recognition probability showed that only time spent looking at the AOI of the visual brand elements was positively linked to later brand-recognition probability. This effect was not moderated by the CBT group.

3.7. Summary of Results

The study revealed that consumers with a high CBT and consumers with a low CBT demonstrated more similarities than differences in their cognitive responses that underlie information processing when exposed to advertisements. Contrary to what was expected from hypothesis H1a-b, which proposed that consumers with a high CBT would have higher cognitive engagement and cognitive workload levels when viewing ads, the differences between the groups were not statistically significant. However, the two groups differed in their visual attention allocated to visual brand elements presented during the ad-viewing task. In particular, consumers with a high CBT demonstrated a slower decoding time and a longer examination of visual brand elements than consumers with a low CBT. This effect was primarily driven by responses in the social-cause ad category. Based on these findings, hypothesis H2a-b was partly supported. In addition, per the hypothesis H3a-b, it was expected that consumers with a high CBT would demonstrate a superior memory performance indicated by a higher association-density score and a higher probability for brand recognition compared to the consumers with a low CBT. Contrary to what was expected, both groups revealed relatively similar indications of

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[10] This result was significant for the spotlight analyses on the entire sample of participants (N = 48).

their subjective memory for the presented advertising and brand information. Thus, hypothesis H3a-b could not be supported.

Exploratory analyses showed that there were no significant relationships between the attention indexes underlying ad-processing and memory-performance measures, except for a significant interaction between cognitive workload and brand-recognition probability moderated by CBT. This relationship, however, was only significant for the High-CBT consumer group. In particular, a higher cognitive workload during an ad-viewing task for consumers with a high CBT had a negative impact on their subsequent brand-recognition probability.[11] In addition, it was demonstrated that, regardless of the CBT group, the time spent looking at visual brand elements could predict the subsequent brand-recognition probability.

Interestingly, exploratory analyses also demonstrated that, regardless of the CBT level, differences in cognitive responses for the ad-viewers were present for the video commercials promoting different product categories. In particular, significant ad-category differences were observed for the engagement and brand-recognition probability measures. Ad-viewers tend to experience a significantly lower engagement level while watching fast-moving, consumer-goods advertising commercials as compared to watching ads from the other three ad categories. In addition, a better brand-recognition probability was demonstrated for the ads in the food category as compared with the ads from the social-cause category. All other differences between the ad categories for cognitive workload, visual attention measures, and association-density score were non-significant. Possible explanations of the results from both data analyses are discussed in the following section.

A summary of the developed hypotheses, exploratory questions, and findings of the study are presented in Table 3-16.

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[11] This effect was significant only after including all consumers evaluated on their CBT (see Appendix 5).

Supported (+), partly supported (+/-), not supported (-)

Hypotheses	Outcome	Findings
H1 a-b. The High-CBT group will demonstrate a larger amount of cognitive resources allocated to advertising processing, as indicated by (a) a higher engagement and (b) a higher workload during ad-viewing tasks compared to the Low-CBT group. *Exploratory question 1: Will the ad category moderate the hypothesized effects?*	-	There were no significant group differences for (a) engagement or (b) cognitive workload experienced during the ad-viewing task. There were no significant group differences for (a) engagement or (b) cognitive workload experienced during the ad-viewing task based on the ad category.
H2 a-b. The High-CBT group will be more visually attentive to brand elements presented during the ad-viewing task, thereby demonstrating (a) faster decoding and (b) a longer examination of visual brand information compared to the Low-CBT group. *Exploratory question 1: Will the ad category moderate the hypothesized effects?*	-/+	There were significant group differences for (a) decoding time of visual brand information and (b) examination time of visual brand information moderated by the advertising product category. A faster reactivity towards visual brand elements exposed during ad exposure times was demonstrated for the Low-CBT group as compared to the High-CBT group. A longer examination time of visual brand elements was contrarily shown for the High-CBT group as compared to the Low-CBT group. These effects were driven by consumer responses to the social-cause ad category.
H3 a-b. The High-CBT group will show a superior memory performance compared to the Low-CBT group, as indicated by a) a higher association-density score and b) a higher probability for brand recognition. *Exploratory question 1: Will the ad category moderate the hypothesized effects?*	-	There were no significant group differences for memory performance. There were no significant group differences for memory performance based on the presented ad category.

Exploratory question 2	Findings
Will there be any relationships between attention and memory performance measures moderated by CBT-group?	There was a significant negative relationship between cognitive workload and brand-recognition probability for the High-CBT group. [12]
	There was a significant positive relationship between TS on visual brand elements AOI and brand-recognition probability regardless of the CBT-group.

Table 3-16. Summary of hypotheses, exploratory questions, and findings.

3.8. Discussion

To the best of the author's knowledge, this is the first study exploring consumer information processing of advertisements via cognitive responses in compulsive buying. The findings of this study reveal more similarities than differences in the cognitive responses of two consumer segments with a high and low CBT, measured during commercial-viewing. Although the majority of the hypotheses were not supported, the results of this study offer several theoretical, methodological, managerial, and social contributions. The study also facilitates important discussions for future research.

3.8.1. Theoretical and Methodological Discussion

Attention during advertising processing and memory performance. This study contributes to the compulsive buying literature by shedding light on the information processing during exposure to TV-ads. Following theoretical insights, it was hypothesized that consumers with a high CBT as compared to consumers with a low CBT would show higher levels of engagement and cognitive workload during exposure to ads and demonstrate better memory performance after an ad-viewing task. However, both groups showed a relatively equal amount of cognitive resources allocated for information gathering and integration. In addition, both consumer

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[12] This effect was only significant after including the entire sample of compulsive buyers in the spotlight analyses.

segments showed relatively similar results in a cued-recall memory test and a brand-recognition test. Significant differences in engagement were only demonstrated for different advertising categories, regardless of the CBT group. In particular, lower engagement levels were shown for the fast-moving consumer-goods category as compared to the other ad categories. Significant brand recognition differences were also shown for advertising category, where better brand recognition was demonstrated for food ads than for social cause ads. These differences could be potentially explained by variability in the advertising content, specific advertising elements, or their features (e.g., brand exposure time, visual complexity, visual contrast, visual saliency, etc.) (Itti, 2000; Itti & Koch, 2001; Wolfe, 2000). A few theoretical and methodological explanations can be further provided to discuss why the tested consumer groups did not show significant differences in their attention or memory responses.

Theoretically, a high engagement and cognitive workload reflect the *"high-attention state"* necessary for active information learning (Berka et al., 2007; Johnson et al., 2014). Based on the ELM and LC4MP theories, this refers to the central processing of ad-information (Cacioppo & Petty, 1984; Lang, 2000, 2006). Peripheral (i.e., low-attention) processing of ad-information, on the other hand, requires fewer resources to be allocated for information gathering and comprehension because the advertising viewer is *"running in automatic mode"* (Lang, 2000, p 53). According to Heath et al. (Heath, 2001; Heath & Nairn, 2005), although high-attention processing is crucial for building new memories for brands, in the long-term, low-attention processing may have a more influential impact on a consumer's brand choices. Memory theories claim that both explicit memory and implicit memory can operate independently or in parallel (Schacter & Tulving, 1994; Tulving & Schacter, 1990). Thus, advertising claims or story may reside in declarative knowledge. At the same time, emotionally stimulating elements linked to the presented advertising content or connected with the advertised brand may be imprinted in parallel on implicit non-declarative memory (Squire, 1987, 2004). With time and via repeated exposure and conditioning to brands or advertising cues, strong emotional connections can be built in the viewer's memory that can be later activated in the decision context at the point-of-purchase (Bargh & Chartrand, 1999; Fitzsimons et al., 2008; Huang & Bargh, 2014). Thus, it is possible that while both consumer groups process advertising information relatively similarly during the first times of ads exposure, the differences in their responses may appear in the long-term with repeated exposure. Even though the employed brand-recognition test was designed to some extent capture implicit aspects of memory, because implicit memory is only established

with time, the study design and employed memory measures could not investigate the full picture of the implicit effect.

Some other explanations for the presented results could be the ad-exposure context (i.e., TV advertising), the presented advertised product categories, and the experimental sample size. As previously discussed in the *Research Rationale section*, study findings based on self-reports of the influence of advertising in compulsive buying are contradictory (e.g., Kwak et al., 2002; Mikołajczak-Degrauwe & Brengman, 2014). Thus, it may be possible that, consistent with previous results presented by Mikołajczak-Degrauwe and Brengman (2014), the vulnerability of compulsive buyers to advertising information may differ depending on the type of advertising media. For instance, consumers with a high CBT could potentially be just as engaged as prudent consumers when viewing brand advertising during TV commercials but show stronger engagement when viewing brand-advertising information in other types of media channels (e.g., print ads in a magazine, online ads, etc.).

Moreover, to replicate the context for viewing TV-ads, a wide variety of ad categories that are often encountered during commercial breaks (i.e., food, fashion, FMCG, social cause) were included in this experiment. Several studies have previously shown that compulsive buyers tend to be more interested in fashion goods (e.g., Park & Burns, 2005; Lo & Harvey, 2011), items that represent self-identity (i.e., cosmetics and jewelry) (e.g., Dittmar, 2004, 2005), or luxury products (e.g., Lejoyeux et al., 2007). In addition, one study on the influence of advertising indicated that compulsive buyers tend to prefer the ads promoting self-image over ads that promote product benefits (d'Astous & Bellemare, 1989). With this in mind, it could have been expected that the fashion category would have induced stronger responses than the other categories for compulsively buying consumers than for the non-compulsive buyers. However, no group differences in information-gathering, information comprehension (i.e., EEG-attention measures), and memory retrieval of advertising and brand information was determined for any of these categories. According to Johnson and Attmann (2009), compulsively buying consumers may vary not only in their involvement with different product categories but also with specific types of products (i.e., shoes, accessories, books, etc.). Thus, it is possible that a high variability in the provided product categories in combination with a potentially heterogeneous and relatively small sample that features different interests in the specific categories could have affected the results. This should be further addressed in future research.

Another phenomenon that could have affected the results is related to the underlying motivation for the responses in the tested consumer segments. For instance, attention can be driven by both *"top-down"* mechanisms, reflecting a viewer's internal and external goals and expectations (Pieters et al., 1996; Pieters et al., 1999), and *"bottom-up"* automatic mechanisms, reflecting emotionally relevant or visually salient stimulus-induced responses (Itti & Koch, 2001; Wolfe, 2000). Researchers have previously reported that, during buying activities, compulsively buying consumers aim to achieve their interpersonal and personal goals related to the fulfillment of their emotional and social desires (Kukar-Kinney et al., 2009; Lejoyeux et al., 2007). Thus, it can be possible that, even though they are equally engaged in information-gathering and elaboration of the selected information in the working memory, the two consumer segments may be looking for or focusing on different elements, content, or triggers embedded in the commercials. For instance, it has been shown that compulsive buyers report being more concerned about the symbolic meaning of product information than non-compulsive buyers (Lo & Harvey, 2012). In addition, in the context of daily deal promotions, it has been demonstrated that they are more emotionally responsive to social comparisons and time-pressure indicators than prudent consumers (Kukar-Kinney et al., 2016).

In addition, because brand advertising represents the pre-purchase brand touchpoint, it is possible that, although both groups show similar processing patterns when exposed to ads, the outcome of the advertising processing in the context of decision-making or during an actual purchase situation would differ. According to Kukar-Kinney et al. (2012, p.68), compulsively buying consumers tend to behave as *"smart"* buyers because they look for the best value in their choice. The primary focus in compulsive buying is instant gratification. As a result, according to the authors, compulsive buyers may not always want to invest their time in the evaluation of products or their quality (ibid). Because no differences in either the attention during advertising processing or the memory-performance measures were found, an interesting question can be raised regarding the role of the advertising encounter. For example, knowing that a choice or real shopping task would follow after viewing the advertisement may activate their urge and motivation to more actively process the exposed information because that information would be more relevant for their purchasing decisions. Thus, more research is needed to test these assumptions.

Visual attention to brand elements. This study also provides interesting insights for the compulsive buying literature on visual processes occurring in two groups of consumers when viewing social-cause ads. The two segments of consumers showed differences in their visual attention to brand information only for the social-cause ads. Specifically, consumers with a high CBT reacted to visual brand elements presented in the commercials more slowly but viewed the visual brand information for longer. A few explanations can be provided for these findings.

According to Pieters et al., (1996), goals play a very important role in the direction and engagement of visual senses, especially during the first times of advertisements exposure. A study by Pieters and Wedel (2007) showed that fixation duration on different print-ad ad elements may indicate different ad-information processing goals. For instance, during a free-ad viewing task, participants showed shorter fixation duration on the brand elements but longer fixation duration on the pictorial ad elements. During the brand-learning task, on the other hand, the participants showed longer fixation duration on the brand elements and shorter fixation duration on the pictorial print-ad elements. In the present study, when viewing brand-element information presented in social-cause ads, consumers with a high CBT showed a slower decoding and a longer examination time for visual brand elements as compared to the consumers with a low CBT. According to Holmqvist et al. (2011), longer fixation duration could be an indication of both interest and memory processes. Based on the above, it could be suggested that compulsive buyers might view advertisements for brand learning. Non-compulsive buyers, on the other hand, might instead view ads in a more explorative, free-viewing manner. This interpretation should be experimentally tested in future research.

The differences in the visual attention of the two tested groups were significant only for social-cause ads. Different consumer characteristics that were not examined in this study could have impacted these results. Contrary to the other ad categories, which promoted self-rewarding experiences (e.g., the representation of self-identity via fashion items [Dittmar & Drury, 2002] or the *"hedonic spot activation"* via the innate value of food [Peciña, Smith, & Berridge, 2006]), the social-cause ad category endorses altruistic behavior (Guerreiro, Rita, & Trigueiros, 2015; Kim & Johnson, 2013). Previous studies have shown that helping others induces the same mesolimbic reward systems associated with selfish pleasures such as receiving monetary rewards, sex, or eating (Gabbard & Crisp-Han, 2016). Altruistic behavior activates the emotions representing morality, like pride and guilt (Kim & Johnson, 2013), helps to achieve social

validation (Gabbard & Crisp-Han, 2016), and helps to improve health and well-being by reducing depression severity, increasing self-esteem, and increasing life satisfaction due to an identified purpose in life (Wright, 2015). As previously reviewed, compulsively buying consumers often have lower self-esteem (e.g., O'Guinn & Faber, 1989, Black, 2011), higher levels of anxiety or depression (e.g., Black, 2007; Black, 2001; Christenson et al., 1994), stronger need for emotional security (Kyrios et al., 2004), and stronger need for social approval (e.g., Davenport et al., 2012; Roberts & Pirog, 2004; Yurchisin & Johnson, 2004) than non-compulsive buyers. Due to their pre-disposed characteristics and underlying needs, consumers with high CBTs could be more affected by social influence (d'Astous, 1990) than non-compulsive buyers, and this could have caused their increased visual attention to social-cause brands. In addition, according to Faber and O'Guinn (1988, p.474), *"advertising may encourage people with low self-esteem to manifest their problem though buying. They may contribute to the belief that happiness can be found through consumption"*. Because FMCG, food, and fashion ads were designed to reinforce the feeling of *"lack,"* these ad categories could have activated compulsive buyers' preoccupations and urges, distracting their attention from the brand information. Social-cause ads, instead, could have directed the focus of compulsive buyers towards others due to their sensitivity to social comparisons (e.g., Attiq, 2015). This could have positively impacted their judgment about themselves and reinforced their interest in the advertised brands.

Workload and brand recognition. The findings of this study also provide insights on the underlying mechanisms of information processing of advertisements, specifically TV-commercials, in compulsive buying because it examines the relationships between a few crucial cognitive processes. Even though the study did not have a comprehensive amount of participants to yield robust results, the discussed exploratory insights provide some interesting suggestions regarding the different mechanisms occurring in consumer groups with different CBTs. For example, it has been shown that, regardless of the advertising category, the cognitive workload experienced during an ad-viewing task operated differently for each CBT segment. Specifically, spotlight analyses demonstrated that cognitive workload was positively linked to the brand-recognition probability in the Low-CBT group and negatively linked to the brand-recognition probability in the High-CBT group. This effect was only significant for consumers with a high CBT and was only noticeable by performing the spotlight analyses with the full sample of

participants[13]. Several explanations can be provided for these results.

In addition to being a proxy for active memory encoding and storage processes, a high cognitive load can indicate frustration caused by information overload (Berka et al., 2007). According to Lang (2000), cognitive resources that can be allocated amongst different memory processes, such as memory encoding (i.e., attention processes), memory consolidation (i.e., storage processes), and memory retrieval are scarce. In addition, the cognitive capability and availability of cognitive resources for learning advertising information depends on personal factors and can vary between individuals (Cacioppo & Petty, 1984; Lang, 2000). It is therefore possible that, due to the previously discussed pre-disposed personality traits and cognitions (e.g., anxiety, self-identity concerns, etc.) (e.g., Black, 2001, 2007; Dittmar, 2004, 2005), consumers with a high CBT are generally more cognitively overloaded with worries and self-critical thoughts. In addition, the incoming information could have been mentally integrated and manipulated differently in their working memory (Lawrence et al., 2014a). For instance, buying temptations in ads could have potentially activated compulsive buyers tendency to fantasize about buying (e.g., Faber & O'Guinn, 1992; Shoham et al., 2015), maladaptive beliefs regarding the nature of objects (Kyrios et al., 2004; Lejoyeux et al., 2007), or internal conflicts regarding *"ought"* and *"desire"* (Dittmar & Drury, 2000). This could have impaired the memory-formation process, including their ability to effectively build an associative link between the viewed advertising content and the advertised brand logo. Because the cognitive workload operated in the opposite direction for the Low-CBT group, it can be hypothesized that they instead used their limited resources to elaborate on the ad content or brand propositions. These findings call for more future research.

Other relationships between attention and memory. The provided exploratory insights can also contribute to the marketing literature on information processing models and brand touchpoints. In addition, it also provides methodological insights relevant for future research attempts. Contrary to what was expected, no link between the investigated attention indexes and the memory-performance variables was established except for a significant relationship between cognitive workload and brand recognition that was only significant for the High-CBT group. Due to the limited computational capabilities required to work with large datasets, the number of

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[13] Data analyses are presented in the Appendix 5.

studies that previously employed EEG measures in the context of TV-commercial processing is very small (e.g., Nomura & Mitsukura, 2015; Ohme et al., 2010; Rothschild & Hyun, 1990; Smith & Gevins, 2004). In addition, studies that previously correlated the EEG measurements and self-report-based memory measures have revealed inconsistent results (e.g., Appel et al., 1979; Weinstein et al., 1980). Many neuroscience investigation in the marketing and consumer-behavior realm have examined individual psychological constructs rather than researched the complete mechanisms in a holistic way (Shaw & Bagozzi, 2018). According to Rothschild and Hyun (1990), studies that have previously established positive relationships between neurophysiological responses and self-report-based measures in the advertising context explored simpler and shorter advertising stimuli such as print ads. Thus, because commercials consist of large amounts of information that is provided in thirty seconds, the correlation between neurophysiological EEG measures and self-report-based measures can be better captured while using the shorter timespans of commercial exposures (Rotchild & Hyuan, 1990). For instance, the exploratory analysis in the present study demonstrated that the relationship between the time spent looking at visual brand elements—as measured by visual engagement with brand information - and a subsequent reported brand-recognition probability—proved to be significant. Taken together, it is apparent that advertising processing is a very complex, dynamic, and interactive process. Different measures employed in this study could have revealed different aspects of it and had a limited power to provide a full understanding of the actual underlying mechanisms; hence, more research of a similar nature is strongly encouraged.

3.8.2. Managerial and Societal Implications

This research provides some relevant implications for marketers, consumer, and public-policy advocates. First, it advises advertisers to consider the responses of different consumer segments to specific types of ads in different contexts (e.g., TV ads, print ads, etc.) when designing their communication strategies. Second, it offers a general understanding of the effects of branding and marketing communication on problematic buyers. Additionally, the study improves the understanding of consumer behavior that is relevant for the consumer and for public-policy fields concerned about personal and social well-being. This research promotes more mindful buying behavior by offering insights into general processes that underlie advertising information processing, advertising persuasion, and consumer responses to ads. It has been shown that,

while the avoidance of ads does not prevent compulsive buying, a knowledge about persuasion can have a positive impact on consumer beliefs about the power of ads and their influence on their buying behavior (Mikołajczak-Degrauwe & Brengman, 2014). The study results raise an interesting question of whether all marketing efforts should be judged from a negative perspective in terms of their impact on vulnerable consumer groups. It can be questioned whether there are measurable differences in responses to advertising messages for all consumer segments, for instance, consumers with certain levels of CBT, or clinically diagnosed compulsive buyers. Furthermore, if these differences exist, should they be taken into consideration when designing marketing communication or consumer and public policies? By providing awareness about the topic, all the parties involved, including consumers, marketing practitioners, and consumer and public-policy advocates, can be more aware of the compulsive buying phenomenon and the processes that occur during exposure to advertising information. An extended discussion entailing managerial and societal implications is provided in *Chapters 5.4* and *5.5*.

3.8.3. Limitations and Future Research

The present study is just a first step in understanding the underlying processes that occur during consumer interaction with brand advertising in compulsive buying due to the restricted number of participants, specificity of the sample, study design, and chosen methods of data collection.

Sample. The generalizability of the study results is limited by the studied sample. This study approaches compulsive buyers as a homogenous group, so differences within the group of consumers are not explored. In addition, the group is restricted to females and a narrow age bracket (20-35 years old age limit) to better represent the compulsive buyers' target group (Black, 2007; Koran et al., 2006). Additionally, the sample is limited to predominantly Danish test subjects. The number of study participants is relatively small, and thus the obtained results are only tentative and warrant further studies with larger samples. An extended discussion of the limitations concerning the sample and the chosen sampling methods is provided in *Chapter 5.6*. In summary, larger-scale studies are suggested to explore the information processing of advertisements for different consumer segments (e.g., clinically diagnosed samples vs. consumers with high and low compulsive buying tendencies; male vs. female samples; etc.), different countries or regions, different personality traits, and/or other personal characteristics.

Study design. The current experiment is limited to the specific study design and study set-up, including the selected ad-exposure context (i.e., TV advertising) and advertising categories. A wider variety of media channels to which compulsive buyers report being susceptible to (e.g., print magazines ads, online ads, etc.) could be further researched. In addition, a more extensive variety of product categories (e.g., luxury products, ads promoting accessories, etc.) could be tested in future studies. In addition, differences between ads and their impact on consumer attention and memory could be explored by incorporating well-known brands or designer brands (Lejoyeux et al., 2007; Lo & Harvey, 2011). Because this thesis has demonstrated interesting findings regarding social-cause advertisements, more research could be done to better understand the advertising-processing mechanisms and underlying reasons for engagement and cognitive processing, perhaps by incorporating qualitative research methods or personality variables.

Measures and experimental method. By incorporating neurophysiological and physiological methods to study consumer responses during commercial exposure, this study offers important methodological contributions and serves as pioneering research that provides insights into potential limitations that should be addressed in future research.

The previous studies on the influence of advertising in the compulsive buying literature were driven by self-report-based methods and provided only a limited understanding of the impact of advertising. In this study, attention was measured via neurophysiological and physiological measures and memory performance was evaluated by measures that tapped into both the explicit and implicit aspects of behavior. However, both memory recall and brand recognition were tested using methods that relied on self-reporting, which could have prevented the understanding of the full picture of the studied phenomenon. Both subjective and objective measures can be incorporated when measuring both attention and memory performance in future studies to overcome these limitations. In addition, as proposed by Rothschild and Hyun (1990), the neurocognitive responses can attenuate over time, diminishing effects that might be present in a particular fragment of advertising message (Rothschild & Hyun, 1990). In future research, instead of working with aggregate measures, it is suggested that the EEG responses are studied by analyzing the decomposed scenes or specific areas of interest within the advertising message (e.g., exposure of ad-slogan times, product demonstration, etc.). Additionally, qualitative measures can also be incorporated to gain a better understanding of the underlying reasons or

motivation for cognitive measures. Because information processing is a complex interplay between emotions and cognitive responses, other types of neurophysiological measures—such as the prefrontal asymmetry in the gamma-frequency range (for application, see Ohme et al., 2009; 2010; Ravaja, Somervuori, & Salminen, 2013), which serves as a proxy for emotion-driven motivation and approach behavior—or physiological indicators (e.g., galvanic skin response or heart rate measures) (fore review on methods, see Venkatraman et al., 2015) could be incorporated into the battery of employed measures to shed light on processing peculiarities. Finally, this study provided only the first step towards a better understanding of the dynamic and complex processes that occur during the first times of exposure to ads. Both long-term and immediate effects should be further addressed by incorporating adequate measures and measuring the advertising impact in decision-making or purchase situations. Finally, the overall mechanism that can explain different processes and their relationships occurring during exposure to ads in compulsive buying also inspires future investigative studies.

Chapter 4 presents an experimental study on the consumer interaction with the store environment. The study examines the similarities and differences between two groups of consumers with a low and high compulsive buying tendency in their arousal responses and the in-store behavior during a shopping experience in two fashion stores. The chapter begins with a summary of the conducted research and then contains a section on Research Rationale that defines both the study field and research direction.

4. Study II. Interaction with Store Environment: Arousal and In-Store Behavior in Compulsive Buying

> "When I am in the shop, **my brain says no**, **my wallet asks me not to do it**… However, my body reacts. **I have to buy**;
> I have to **make myself happy"**
> – compulsive buyer, 30 years old.

> "Shopping is a **paid happiness**, a boost of self-confidence… It **makes me extraordinary excited and truly happy**"
> – compulsive buyer, 32 years old.

4.1. Study Summary

Aim – to investigate the emotional and behavioral responses that characterize consumer information processing of the store environment during a shopping experience in compulsive buying.

Design/methodology/approach – a field experiment with 42 participants recruited based on pre-defined CBT and fashion-consciousness criteria was conducted in two single-brand fashion-apparel stores (i.e., low-end vs. high-end). A mobile eye-tracker synchronized with an EDA biosensor was employed to record the physiological arousal responses during the shopping experience. Behavioral shopping outcomes were also collected by registering different shopping-behavior variables, such as time spent on shopping, the number of chosen items, and their hypothetical spending. A post-test questionnaire with open-ended questions was used to gather further data about their shopping experience.

Findings – the study findings revealed that the consumers with a high CBT, instead of rewarding themselves by purchasing more items, chose more-expensive items regardless of the fashion-store type (i.e., low-end fashion vs. high-end fashion). There were also significant differences, particularly during the first minute of shopping, in the physiological arousal measures indicating the emotional receptivity of the two CBT groups that varied depending on the retail store type. The consumers with a low CBT demonstrated higher amplitude of emotional reactions in the high-end fashion store than in the low-end fashion store. The consumers with a high CBT, on the other hand, indicated a higher frequency of emotional responses and a shorter duration of these responses at the high-end store than at the low-end store. The physiological arousal experienced during the first minute of shopping in both fashion stores predicted only one of the behavioral shopping-experience outcomes, and this effect was moderated by the CBT group. In particular, in the high-CBT consumer group, an increased likelihood to spend more money for the chosen items was predicted by a higher emotional excitation - indicated by a higher frequency of emotional responses. However, in the low-CBT consumer group, this likelihood was predicted by the stronger experienced emotional intensity - indicated by the higher amplitude of emotional reactions.

Research limitations – although this research provides new insights into the processes occurring in real shopping situations, it is limited to the studied sample, the shopping context, and a specific category of products.

Originality/value - this study responds to the emerging call for and practice of studying choices in natural environments with portable solutions. Understanding real-time decisions with biometric tools can help design more efficient behavioral-monitoring solutions aimed at behavioral change.

Keywords - Arousal, Compulsive buying, Emotion, Hypothetical spending, In-store decisions, Electrodermal Activity

4.2. Research Rationale

As discussed in *Chapter 1.2.1.*, the store environment is chosen as a second brand touchpoint to study the responses that underlie the consumer information processing in compulsive buying. Previous research highlights few streams of interest in the retail design and marketing literature. For example, researchers have studied the theoretical and managerial implications of store design for retail communication (e.g., Ballantine et al., 2015; Kerfoot, Davies, & Ward, 2003; Kotler, 1973; Kumar & Kim, 2014). The primary research areas include the understanding of the impact of store design on brand-related judgments (e.g., Akhter, Andrews, & Durvasula, 1994; Kerfoot et al., 2003); peculiarities of fashion-store design (e.g., Ballantine et al., 2015; Kumar & Kim, 2014); and the role of congruency between the consumer's and retailer's store-image perceptions (e.g., Ballantine et al., 2015; Birtwistle, Freathy, & Clarke, 1999). The impact of the store design elements on consumer emotions and shopping motivation at the point-of-purchase have been also explored (e.g., Donovan, Rossiter, Marcoolyn, & Nesdale, 1994; Groeppel-Klein & Baun, 2001). Moreover, some researchers have highlighted the effects of different aspects of store atmospherics (e.g., Areni & Kim, 1993; Brengman, 2004; Crowley, 1993) while others have emphasized the holistic influence of atmospheric cues on consumer behavior (e.g., Ballantine et al., 2015; Donovan & Rossiter, 1982; Kumar & Kim, 2014).

A few models explaining consumer-store interactions from the information-processing perspective have been proposed in the literature. First, the Mehrabian – Russell Model (Mehrabian & Russell, 1974), which was originally developed for the environmental psychology field, was adopted by Donovan and Rossiter (1982). Although this model highlights the fact that arousal is an essential factor in defining in-store approach behavior, it does not elaborate on which processes underlie the construct of arousal. Second, the Multidimensional Arousal Theory, which was introduced by Boucsein (1988, 2012) in the psychology field, was adopted by Groeppel-Klein and colleagues (e.g., Groeppel-Klein & Baun, 2001; Gröppel-Klein, 2010). This model highlights that arousal is a multidimensional construct. Both models conclude that the emotional processes that occur in a store environment are a crucial factor in determining consumer behavior outcomes at the point-of-purchase.

Based on the compulsive buying literature overview presented in *Chapter 2*, it is fair to claim that the retail environment plays a significant role in compulsive buying, especially while

shopping for fashion products. Almost half (48%) of the buying decisions of compulsive buyers are made in stores while only 24% of those are made by non-compulsive consumers (Lejoyeux et al., 2007). In addition, compulsive buyers are more vulnerable to store atmospherics design (e.g., Prete et al., 2013; Sohn & Choi, 2012; Schlosser et al., 1994) and more responsive to emotional and social rewards encountered in the shopping environment (e.g., d'Astous, 1990; O'Guinn & Faber, 1989).

As highlighted in *Chapter 2*, compulsive buyers demonstrate an enhanced sensitivity to emotionally charged, reward-related cues (Raab et al., 2011; Trotzke et al., 2014; Williams & Grisham, 2012). Additionally, they often emotionally depend on shopping activities (Kukar-Kinney et al., 2009). Cue-reactivity experiments have shown that compulsive buyers' emotional reactions when exposed to shopping cues resulted in an increase in buying urges and higher attention paid to the items of interest (Lawrence et al., 2014a; Trotzke et al., 2014). Additionally, researchers have documented higher levels of absorption, reduced reflexivity, and impairment in compulsive buyers' information processing during shopping (Faber, 2004; Lo & Harvey, 2011). Due to the profound changes in the emotional states, their shopping experience often result in excessive purchasing, such as buying beyond their means, spending more money, shopping for longer periods of time, or acquiring unnecessary items (McElroy et al., 1994).

Contrary to non-compulsive buyers, who often may shop to satisfy utilitarian needs, compulsive buyers are driven by the process of buying itself rather than the outcomes of buying (d'Astous, 1990; Faber & O'Guinn, 1989; Faber et al., 1987; Lejoyeux & Weinstein, 2010). Compulsive buyers demonstrate higher arousal-seeking tendencies and look for a quick *"anxiety-fix"* through the buying activities (Elliott, 1994). Moreover, the buying process in the store environment provides compulsive buyers with a landscape of opportunities to seek social approval and self-confirmation. For instance, they can enhance their self-identity or gain power and prestige through the purchase of products and brands that communicate social status (Bearden & Etzel, 1982; d'Astous, 1990; Dittmar, 2004, 2005; Elliott, 1994). Based on self-reported evidence, compulsive buyers describe that during buying episodes they experience an intensified psychological and physiological emotional pleasure, a feeling of *"high"* or *"emotional lift"* (Faber & O'Guinn, 1992; McElroy et al., 1994; O'Guinn & Faber, 1989; Ridgway et al., 2008; Valence et al., 1988).

Although a vast number of studies investigating the general mechanisms and characteristics of compulsive buyers have been conducted in the field, the attempts to study the actual behavior of the buyers have been missing. The study of the consumer behavior in the actual store environment in compulsive buying is pivotal for the following reasons.

First, the laboratory experiments and simulated shopping tasks that have been used previously to study the compulsive buying behavior have been conducted in highly controlled testing environments. Hence, it is difficult to understand the entire picture of the actual, underlying emotional and behavioral responses that can characterize compulsive buyers' interactions with store environments. A real shopping environment is much more complex than an online or highly controlled laboratory context. It is filled with a vast number of store variables that reinforce consumers' desires and affects their behavior at the point-of-purchase (Ballantine et al., 2015; Donovan & Rossiter, 1982; Tai & Fung, 1997). By manipulating store atmospherics, retailers seek to create more immersive, emotionally arousing, and engaging store environments (Bitner, 1992; Kotler, 1973). This often reduces a consumer's psychological defenses during decision-making and consequently increases the purchase probability (Kerfoot et al., 2003). For example, high-pressure contextual cues, such as sales promotions, visual signs, and the presence of other consumers may strengthen the urge for possessions and activate unconscious goals such as the need for social acceptance or increased self-esteem. Store slogans (e.g., "only a few items left" or "the last day of sales") may reinforce pre-existing fears of missed purchase opportunities. The sales personnel and mannequins may confirm irrational beliefs and induce fantasy-based daydreams regarding future scenarios.

Secondly, although existing experimental studies present scientific evidence for increased emotional responses to exposed shopping cues during simulated choice tasks (e.g., Lawrence et al., 2014a; Raab et al. 2011), these studies are only the first step in understanding information processing in compulsive buying. Emotional responses measured in the shopping environment may differ due to a higher availability of desirable goods and reward-related buying activities. For example, a larger variety of items in the store environment may deplete consumers' self-regulatory resources. This consequently may result in stronger urges to buy, lower resistance to temptation, and an increased willingness to spending more in anticipated circumstances (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister & Vohs, 2007; Vohs & Faber, 2007).

In addition, studies that have explored emotional variability in compulsive buying have primarily relied on self-reports-based methods (e.g., Christenson et al., 1994; Faber & Christenson, 1996; McElroy et al., 1994; Miltenberger et al., 2003). Thus, researchers have only studied what consumers believe they experience prior to, during, and after shopping instead of what actually occurs (Kellett & Totterdell, 2008). However, the emotional responses underlying a shopping experience are time-dependent (Groeppel-Klein, 2005). Emotional changes primarily occur in the interoceptive states of the body resulting in different physiological modifications, such as changes in the arousal system. It is these changes that are translated into behavioral responses and are transformed into cognitive interpretation of the experienced states (Bechara & Damasio, 2005). Moreover, these physiological modifications are induced as a response to cues and situations encountered at the point-of-purchase (Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). Although consumer reflections have provided in-depth insights into the underlying reasons for certain behaviors (e.g., Dittmar & Drury, 2000; Kukar-Kinney et al., 2016; Yurchisin et al., 2014), they cannot fully unravel the responses experienced at the point-of-purchase. The self-reported data inherently feature time lag, as self-reports cannot capture the slightest variations in emotional experiencs at the time of decisions (Groeppel-Klein & Baun, 2001). Additionally, researchers agree that emotional states are difficult to verbalize and to document (Bellizzi & Hite, 1992; Donovan & Rossiter, 1982; Kumar & Kim, 2014) because the memory distortion might make it difficult to recall them after an in-store experience (Donovan et al.,1994).

Hence, this study aims to investigate the emotional and behavioral responses that characterize consumer information processing of the store environment during a shopping experience in compulsive buying. Moreover, the study considers interactions with two different environments that represent two fashion-apparel brands.

The following section provides an overview of the retail and marketing literature on store atmospherics and retail design, primarily focusing on the store atmospheric variables and peculiarities of fashion-store design. Furthermore, two relevant information processing models (i.e., MRM and Multidimensional Arousal Theory) are overviewed. After the theoretical insights, the hypotheses are further developed and tested in the field experiment. Finally, the theoretical, managerial, and social implications of the study findings as well as future research directions are discussed.

4.3. Theoretical Background

4.3.1. Store as a Brand-Positioning Tool: Atmospherics Design

The existing literature has demonstrated that the construction of an effective retail environment is an important strategic decision for retailers and product brands in their marketing strategy (Kotler, 1973; Turley & Milliman, 2000; Turley & Chebat, 2002). Employing store design as a communication tool for brand identity is particularly relevant for the fashion industry, especially for single-apparel retailers adopting the store-as-a-brand positioning strategy (Foster & McLelland, 2015; Kotler, 1973; Kumar & Kim, 2014).

The shopping environment consists of a variety of store and merchandise cues that are intentionally designed to create specific effects in buyers (Kotler, 1970). Since consumers continuously react to every minute change in the retail atmosphere, cue-induced changes shape consumer behavior during the in-store shopping experience and impact their purchase decisions (Turley & Milliman, 2000; Turley & Chebat, 2002). In addition, how consumers experience a store environment affects their perception of the brand image (Kotler, 1973; Turley & Chebat, 2002). In 1986, Baker (1986) proposed the first classification, which is still commonly used, for store atmospheric variables that entails store environment. He classified the relevant cues into the following three groups of variables:

- social cues (e.g., employees and other consumers),
- design cues (e.g., visual elements), and
- ambient cues (e.g., non-visual elements such as lighting, music, or background information).

After a comprehensive review of the store-atmospherics literature, in 2000, Turley and Milliman identified 57 store-environment variables and introduced a new classification for store environment cues. In this new classification, five categories of store variables were introduced, as follows:

- external variables (e.g., exterior signs, size of the building, address and location, or entrances),
- general interior variables (e.g., flooring and carpeting, lighting, music, color schemes, or merchandise),

- layout and design (e.g., placement of merchandise, space design and allocation, placement of cash registers, or furniture),
- point-of-purchase and decorations variables (e.g., point-of-purchase displays, signs and cards, pictures, price displays, or product displays), and
- human factors (e.g., employee characteristics, crowding, density, or customer characteristics).

According to Ballantine et al. (2010), different cues in the environment may serve an attracting or facilitating function. For example, ambient cues such as the volume of the music or ambient lightning may induce arousal and interest, and open space may encourage browsing. Visual and human elements such as shelf design, interactive product displays, or employee behavior may facilitate interactions with products and increase consumers' desires for merchandise. Even though different cues in the store serve individual functions, consumers experience the store holistically rather than perceive each sensory stimulus on an individual basis (ibid). It is important to remember that a shopping experience is more than choosing a product based on a rational evaluation (Fiore & Kim, 2007). A store implicitly communicates information about both the merchandise and the corporate brand value proposition. Physical and social elements in the store, such as the physical store environment or employee service, convey information about the product value and service quality that differentiates the brand from other brands (Baker, Grewal, & Parasuraman, 1994; Kotler, 1973; Kumar & Kim, 2014; Turley & Chebat, 2002). For example, according to Baker et al. (1994), social cues such as a higher number of employees or a greeting from a salesperson are linked with a perception of higher prestige. On the other hand, social cues such as actual or even perceived retail crowding—which is defined as an increased density of shoppers in the store—have adverse effects on perceived store experience, consumer shopping behavior, and consumer perception (e.g., Eroglu, Machleit, & Barr, 2005; Turley & Milliman, 2000). Additionally, visual cues such as point-of-purchase displays, signs with price information, and unique displays have been shown to have a positive impact on sales (e.g., Wilkinson, Mason, & Paksoy, 1982).

4.3.2. Peculiarities of Fashion-Store Design

Fashion-store design is a specific case of retail design. According to Münster and Haug (2017), this type of design involves several tasks. In particular, the store design must communicate the competitive advantage of the brand, facilitate product-consumer interaction, and fulfill the social and hedonic motives of consumers. According to Ballantine et al. (2015), the congruency between store image, merchandise, and product representation is an essential aspect of fashion-store communication. In addition, because hedonic motivation drives fashion consumers, they tend to place a higher importance on store environment than consumers driven by utilitarian motives (Ballantine et al., 2015; Kaltcheva & Weitz, 2006). The task-oriented consumers are focused on their goals; therefore they appreciate well-organized and spacious store environments. On the other hand, the hedonic consumers prefer the experiential qualities of the store and are more vulnerable to hedonic stimulation in the shopping environment (Kaltcheva & Weitz, 2006; Van Rompay et al., 2012).

After Baker (1986) highlighted the three categories of store-atmospherics design, Kumar and Kim (2014) extended his view to fashion-store design by adding the category of store environment cues labeled as merchandise elements. According to the researchers, fashion consumers look for not only unique experiences but also for exclusive products (Kumar & Kim, 2014). According to Kerfoot et al. (2003), in the fashion domain, visual design elements such as shop themes or visual merchandising are crucial elements that positively impact store experience. For example, a study by Ballantine et al. (2015) showed that hung clothing was perceived as more attractive because it provided consumers with a better overview of the garment and allowed them to better visualize different combinations of items. Furthermore, the use of mannequins increased consumer purchases because viewing clothing on the mannequins helped the consumer notice the outfit faster and made their evaluation processes easier. In addition, presenting the merchandise using specific elements such as glass tables, cubes, beautiful displays, and wooden fixtures was perceived as more aesthetically pleasing and led to consumers associating the store with higher prestige.

4.3.3. Models for the Information Processing of Store Environment

In this section, two models employed in the marketing literature (i.e., Mehrabian and Russel model, abbreviated to MRM, and Multidimensional Arousal Theory) are reviewed to provide a theoretical framework for the underlying responses of information processing within the in-store environment.

MRM. In 1974 Mehrabian and Russell developed the first emotion-dominated model in environmental psychology (Mehrabian & Russell, 1974). The MRM, which relies on the Stimulus-Organism-Response (S-O-R) paradigm, claims that the environment (S) impacts internal consumer processes (O), and this results in a consumer response (R). The environment in the model is defined by an *"information rate"* that is measured by the novelty (i.e., an unexpected, surprising, or unfamiliar state) and complexity (i.e., the number of changes or the number of elements) of an environment. Thus, a more novel and complex environment will result in a higher *"information rate."* In addition, the consumer response in the environment is defined by a consumer's approach or avoidance behavior. In particular, approach behavior can be indicated by consumers' willingness to browse or explore the environment longer, and avoidance is an outcome of aversive behavior. According to Donovan and Rossiter (1982), who ported the MRM to the retail setting, there are two primary emotional responses underlying consumer processes (i.e., O) that are induced by the environment: arousal and pleasure. By their definition, arousal is an active, stimulated state, and pleasure is a cognitively interpreted emotional state indicating joy or a good mood (Mehrabian & Russell, 1974, p.19). The adjusted MRM is still the most dominant model in the marketing literature (e.g., Bakker, van der Voordt, Vink, & de Boon, 2014; Donovan et al., 1994; Tai & Fung, 1997). The MRM provides a better understanding of how information encountered in the store environment impacts consumer emotions, thereby triggering stronger approach responses at the point-of-purchase. However, it does not elaborate on which processes underlie the emotional constructs. Thus, to provide more insights necessary for the development of the study hypotheses, the psychophysiological perspectives and Multidimensional Arousal Theory are further reviewed.

Multidimensional Arousal Theory. From the psychophysiological point of view, arousal provides a foundation for the core functions of the human organism, including emotions, attention, consciousness, motivation, information processing, and behavior (Bagozzi et al., 1999; Boucsein, 2012; Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). Arousal can consist of tonic or phasic body reactions that reflect the neuropsychological state of an organism. The term "tonic arousal" refers to a relatively prolonged, slower-changing, general state of being that reflects the emotional activation due to the long-lasting or overly intensive stimuli (Groeppel-Klein, 2005, p.431). "Phasic arousal," on the other hand, is an instantaneous, reactive state of the body to the specific stimuli in the surrounding environment resulting in the short-term changes in arousal level (Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). Skin conductivity generates tonic EDA, but processes initiated by nerve impulses are responsible for phasic EDA. It is the phasic EDA that emerges as electrodermal reactivity (EDR) (Boucsein, 2012; Dawson, Schell, Filion, & Berntson, 2007; Groeppel-Klein, 2005; Steiger, 1988). Phasic arousal can serve as a robust indicator of induced attention that is defined by an organism's reactivity to relevant stimuli and an enhanced processing capability that directs it towards changes in the environment (Barry, 2009; Boucsein, 2012; Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). In addition, phasic arousal has been identified as a driving force of decision-making and approach behavior at the point-of-purchase (Groeppel-Klein, 2005 p.431).

For many decades, arousal was theoretically framed as a unidimensional construct (e.g., Duffy, 1962; Hebb, 1955; Lindsley, 1951; Malmo, 1959). In particular, it was defined as an activation that varied from a resting state on one extreme to panic or excitement on the other. Neurophysiologically, researchers assumed that Reticular Activating System (RAS)—composed of sensory inflow, the reticular formation, and the cortical, thalamic and hypothalamic brain areas—was the fundamental system responsible for arousal formation (Boucsein, 2012). Thus, arousal was believed to be generated via activation of the central nervous system (Duffy, 1962; Hebb, 1955; Lindsley, 1951; Malmo, 1959). Only one dimension of arousal was taken into consideration in the above-mentioned approaches. Therefore, it was assumed that all physiological outcomes of arousal—such as heart rate, blood pressure, EEG, and EDA responses—should correlate due to the activity in the central nervous system (Groeppel-Klein, 2005). However, there were inconsistencies in empirical studies that resulted in the proposal of more complex, multidimensional arousal theories in which different neurophysiological systems can be engaged in various types of arousal processes.

According to Boucsein (2012), the first attempt to replace the unidimensional theories of arousal was introduced by Routtenberg (1968) with their two-arousal hypothesis. By offering to integrate a second arousal system, Routtenberg (1968) extended the prevailing view with a more comprehensive theoretical framework. The novel framework explained how brain and behavior interact during the generation of emotion (Candland, 2003). Per the Routtenberg (1968) theory, there are two arousal systems in the brain that are substrates of emotions. These two systems, which are called *"Arousal System I"* (RAS system) and *"Arousal System II"* (limbic system), are responsible for keeping the vertebrate organism functional. The RAS system is linked to the activation of the cortical arousal and sensory gateway, and it controls drive-related response energy. The limbic system consists of a collection of midbrain reward-related brain structures that control responses elicited by arousing properties of incentive-related stimuli. This system is linked with the pleasure-pain reactions induced by encountered rewards/reward-related stimuli, and for that reason is defined as motivation-driven arousal system. These two systems function simultaneously, and they control the reciprocal relationship between drive and incentive by suppressing one another.

Another theory was subsequently introduced by Pribram and McGuinness (1975), who suggested a three-dimensional arousal theory that reflected a human information processing. Their theory proposed the existence of three interacting neural systems that each represents a different arousal process. The first neural system, called *"Affect Arousal,"* controls phasic physiological responses to stimuli and is related to processes occurring in the amygdala. The second system, referred to as the *"Preparatory"* system, is responsible for activation of tonic physiological responses generated in the basal ganglia and forebrain structures that are important for response preparation. Finally, the third system, which is called the *"Effort"* system, is responsible for the coordination and activation of arousal generated via the hippocampus. According to Boucsein (2012), the *"Affect Arousal"* and *"Effort"* systems may in some ways reflect *"Arousal System I"* in Routtenberg's theory (1968), and the *"Preparatory"* system mimics *"Arousal System II"*.

In 1980, Fowles proposed a three-arousal system model that integrated Gray's two-factor learning theory (see Gray, 1970). In his approach, Fowles (1980) suggested that the activation of the behavioral activation system (BAS), when exposed to reward-encoded stimuli, would be indicated by changes in heart rate. The EDA measures, on the other hand, could indicate the

activation of the behavioral inhibition system (BIS) (for a review, see: Fowes, 1980, Gray, 1970).

Subsequently, a three-dimensional model was introduced by Boucsein (1998). This theory aimed to integrate previous frameworks and use them together to map different dimensions of physiological arousal and system outputs during information processing. This model included knowledge derived from the models provided by Routtenberg (1968), Pribram and McGuinness (1975), Fowles (1980), and Gray (1982) together with insights from DeLong (1983) on basal ganglia and the frontal cortex. The model reflected both the interdependency between arousal and emotion/motivation and the relationship between central and peripheral physiological parameters (Groeppel-Klein, 2005, p.429). The introduced model was adopted and tested in the engineering field (see Boucsein & Backs, 2009). The model has also been discussed in the marketing literature related to decision-making and information processing in the in-store environment (see: Groeppel-Klein, 2005; Gröppel-Klein, 2010; Kroeber-Riel & Gröppel-Klein, 2013). In Gröppel-Klein's model, four systems represent different arousal processes that can each be measured by specific physiological responses and behavioral characteristics. The model is discussed in further detail below (see Table 4-1).

Four-dimensional Model of Arousal	
Arousal system	*Typical Physiological Indication*
System 1: Affect Arousal System and Flight/Fight System	• Increase in frequency and amplitude of the emotionally negatively tuned non-stimulus-specific electrodermal reaction • Increase in heart rate variability
System 2: Effort System	• Decrease in heart rate variability • Changes in EEG (P300 amplitude and frontal Theta – activity) • Increase in recovery times of electrodermal reaction
System 3: Preparatory Activation System	• Increase in heart rate variability • Increase in frequency and amplitude of phasic electrodermal reaction • Changes in EEG (evoked potential)
System 4: General Activation, RAS	• Increase in heart rate, blood pressure, and tonic EDA • Desynchronization of EEG

Table 4-1. Multidimensional arousal theory adopted by Gröppel-Klein, 2010, p.80. Translated from the German language into the English language by the author of this thesis.

The *"General Activation"* system, which was first introduced by Duffy (1962), represents an unspecific arousal system. This arousal system is related to the RAS-system processes that are responsible for an increase or decrease in general arousal (Boucsein, 2012). The output of this system is expressed via changes in the autonomic nervous system such as an increase in heart rate, blood pressure, and tonic EDA as well as changes in EEG data, expressed in gamma frequency reflecting the "desynchronized" EEG (Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). The *"General Activation"* is experienced as a "*vigilant feeling and alert state of mind"* (Groeppel-Klein, 2005, p.429). The responses of this system can be activated by both external stimuli and metabolic processes such as expectations and thoughts (Boucsein, 2012).

The *"Affect Arousal"* system is the primary component of arousal, and it is linked to amygdala processes responsible for focusing attention and eliciting the orienting reflex response. In psychophysiological research, the orienting reflex is defined as a direct response to environmental changes that directs attentional processes to the novel stimulus (Barry, 2009). From the marketing perspective, the orienting reflex can represent the attention directed towards specific products or visual displays at the point-of-purchase (Gröppel-Klein, 2010). The *"Affect Arousal"* system also engages the ventromedial hypothalamus, which is responsible for immediate flight/fight responses (Boucsein, 2012; Boucsein & Backs, 2009). On the other hand, the amygdala-striatum system responds to the events in the environment, specifically to different cues with instant emotional/affective attributes (Bechara, 2005). The physiological outcomes of *"Affect Arousal"* system include phasic cardiovascular changes and tonic electrodermal variations. This system reflects the emotional component of the arousal, and it is experienced as negative emotions and defense responses when activated (Groeppel-Klein, 2005). Additionally, the activation of this system can impinge on the *"Preparatory Activation"* system.

The *"Preparatory Activation"* system—which is centered in the basal ganglia—is linked to a higher readiness for somatomotor activity, and it is closely related with the behavioral activation system introduced by Fowles (1980) (Boucsein, 2012). This arousal system reflects the motivational component of arousal because, when activated, mental expectations are transformed into the preparation of the body for action (Groeppel-Klein, 2005). The outcomes of this state include changes in tonic cardiovascular system or phasic EDA responses. The phasic EDA responses are indicated by changes in the amplitude or frequency of the stimulus-induced skin conductance responses (SCRs), which may reflect approach behavior and/or positive emotions (ibid). According to Boucsein and Backs (2009), the straightforward chain of

stimulus-response events—expressed through the direct communication between the *"Affect Arousal"* system (attention) and the *"Preparatory Activation"* system (approach behavior)— can be interrupted by the *"Effort"* system. The *"Effort"* system can be activated by the novelty, stress or induced emotional load of the event. This system is responsible for the prevention of immediate action and the reinforcement of deliberate analytic processes. It is expressed by a decrease in heart-rate variability, an increase in EDR recovery times, an increase in the evoked EEG potential (P300 amplitude), and an increase in the ongoing theta brain wave activity (measured by EEG) (Boucsein & Backs, 2009).

The above-mentioned systems are independent yet interrelated, because processes are interactive and feature complex interrelationships. According to Groeppel-Klein and Baun (2001, p.414), when studying the impact of in-store stimuli on consumer behavior in the marketing field, the *"Preparatory Activation"* system and the *"Affect-Arousal"* system (to a lesser extent; specifically, the attention and orienting reflex) are of vital importance.

In summary, on one hand, the store design and environmental variables have an important impact on the brand image. On the other hand, the store environment is filled with tangible and intangible elements that can induce emotions such as pleasure and arousal that lead to increase in approach motivation. Specific elements, marketing information, and social factors in the store environment may impact consumers' choices. The emotions of the shopper are important, because positive changes and emotional stimulation during shopping are positively correlated with a higher willingness to pay more money for the chosen items, a longer time spent shopping, and more impulsive decision-making. Given these theoretical insights, the study hypotheses are developed below.

4.4. Development of Hypotheses

As elaborated in *Chapter 2*, the descriptive evidence in the compulsive buying literature shows that compulsive buying is linked to a tendency to overshop and overspend (McElroy et al., 1994). Despite the ability to recognize during shopping that specific desirable objects might be useless afterwards, compulsive buyers tend to make non-optimal choices. Hence, they often buy beyond their means, spend more money than they can afford, and shop for longer periods of

time (McElroy et al., 1994). On one hand, compulsive buying is a complex phenomenon linked to continuous-buying binges, which seek immediate gratification and are induced by the emotional and social rewards gained during the buying experiences (Arnold & Reynolds, 2003; d'Astous, 1990; O'Guinn & Faber, 1989). As noted in previous research, compulsive buyers describe their experiences during buying episodes as intensified psychological and physiological states such as feelings of *"high"* or an *"emotional lift"* (e.g., Faber & O'Guinn, 1992; McElroy et al., 1994; Ridgway et al., 2008). Additionally, a field experiment has previously shown that excitement during buying and shopping episodes tend to be more pronounced at the beginning of a shopping experience (Kellett & Totterdell, 2008). On the other hand, compulsive buyers are driven by increased emotional sensitivities to buying-related cues. When these cues are encountered at the point-of-purchase, they can induce hedonic pleasure and increase a consumer's purchase probability (Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). Thus, it can be assumed that consumers with a high CBT and those with a low CBT will display different emotional responses and shopping outcomes, which underlie their information processing in the store environment.

Finally, it is expected that these differences between the two groups (i.e., High-CBT and Low-CBT) will be affected by the store environment, specifically the type of fashion store. As discussed earlier in this thesis, the store environment conveys brand image (Kotler, 1973; Turley & Chebat, 2002). The design of store atmospherics implicitly communicates information about the merchandise as well as corporate brand value. The physical and the social store elements convey information about the brand quality and its potential compared to other brands (Baker et al., 2002; Kotler, 1973; Kumar & Kim, 2014; Turley & Chebat, 2002). Additionally, as elaborated in *Chapter 2*, consumers prone to compulsive buying report to be more prompted by the high-end fashion contexts than by the contexts of the unbranded budgetary suggestions (Lo & Harvey, 2011). Following these observations, it is theorized that the behavioral and emotional responses both between and within the two groups will differ depending on which fashion brand the store environment represents (i.e., low-end vs. high-end fashion). Thus, the following hypotheses are developed:

H1 a-c. CBT groups will show significant differences in their behavioral shopping outcomes. The High-CBT group, when compared to the Low-CBT group, will demonstrate (a) a longer time spent on shopping, (b) a higher number of chosen items, and (c) a higher hypothetical spending during a shopping experience. This effect will differ depending on the fashion-store type: namely, there will be a stronger effect in the high-end fashion store compared to the low-end fashion store.

H2 a-c. CBT groups will show significant differences in their emotional responses at the beginning of a shopping experience in each fashion store. The High-CBT group, when compared to the Low-CBT group, will demonstrate (a) a higher emotional excitation, (b) a stronger intensity of emotional reactions, and (c) a shorter duration of emotional responses. This effect will differ depending on the fashion-store type: namely, there will be a stronger effect in the high-end fashion store compared to the low-end fashion store.

To provide additional insights on the processes underlying interactions with the in-store environment, two research questions were additionally explored. First, following theoretical assumptions developed in the second hypothesis, the first question investigated whether the two CBT groups would also show significant differences in their emotional responses during the entire shopping trip. In addition, the first question also explored whether those differences would be impacted by the fashion-store type. Secondly, in the previous marketing literature, the in-store emotional processes (e.g., changes in SCR peak frequency and SCR peak amplitude) have been linked to approach behavior at the point-of-purchase (e.g., Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). However, to the best of author's knowledge, no previous studies have experimentally explored or/and established these relationships in the compulsive buying case. Thus, the second question aimed to determine whether there would be any significant relationship between the emotional responses and the behavioral shopping outcomes, and whether those relationships would differ depending on the CBT group. Exploratory analyses for the second question were performed for two shopping phases: during the first minute of the shopping and also over the entire shopping period in both fashion stores. [14]

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[14] Shopping phases are described in more detail in the method section.

4.5. Method

To test the hypotheses, a mobile, in-store experiment was run with a 2 x 2 factorial design. The experimental data was collected using the portable EDA biosensor, which was synchronized with the mobile, eye-tracking device to measure ocular responses. Forty-two women were tested in two single-brand representing fashion-apparel stores (i.e., low-end fashion store and high-end fashion store). The study consisted of four steps: (1) Selection and recruitment of participants, (2) Data collection, (3) Data pre-processing, and (4) Data analysis. These steps are described in the following sections.

4.5.1. Selection and Recruitment of Participants

As introduced in the *Research Approach section, Chapter 1.2.2,* the study was limited to female participants. The sample was recruited in two stages. In the first stage, 241 women—with ages ranging from 20 to 35 years (M=26.2, SD = 3.41) and who lived in Copenhagen or the surrounding area—filled in an online questionnaire that included demographic information, their fashion consciousness, and variables to measure their CBT. To evaluate their CBT, Compulsive Buying Scale (Valence et al., 1988) (N=241, M=37.3, SD= 9.40, range: 13-63), and the Compulsive Buying Index (Ridgway et al., 2008) (N=241, M=15.4, SD=4.92, range=6-28) were incorporated into the questionnaire. The questions were distributed via social media and public announcement. The fashion-consciousness of the study participants was evaluated using the 5-point Likert scale, ranging from 1 (Not at all interested) to 5 (Very much interested). Based on the standardized, scientifically validated procedure (Dittmar, 2004; Valence et al., 1988), all consumers were grouped into the high-CBT group ("High-CBT") or low-CBT group ("Low-CBT"). In the second stage, 42 women were invited to participate in the study. The sample of women (M = 27.2, SD =3.59, age range 20-35 years) had equal amounts of high-CBT and low-CBT participants, all of whom indicated either a medium, high, or very high interest in fashion on the fashion-conscious scale (i.e., a 3, 4, or 5, respectively) and were acceptably close in terms of their age, income and occupation. Due to the self-reported suspicion of emotion-related issues, such as depression or mood disorders, two participants were excluded from the sample.

All subjects were treated according to the ethical guidelines introduced by American Psychological Association (1992). Therefore, all participants were informed that they were participating in a study on compulsive buying behavior. During enrollment, each participant was introduced to the experimental procedure and accepted their participation in the experiment by reading and signing a form confirming their informed consent. After the experiment, each of the participants went through the personal debriefing procedure. To control for variations in physiological states, the intake of stimulating substances such as caffeine or sugar was restricted beginning approximately two to three hours before the experiment. Participants were also asked about any neurological or psychiatric conditions and risk of pregnancy. Participation in the study was voluntary, and four randomly selected participants would be given the chance to win their choice of goods to be realized for up to 1000 Danish kroner (~143 US$).

4.5.2. Measures

Compulsive buying tendency measure. The scientifically validated and internationally acknowledged Compulsive Buying Scale (Valence et al., 1988) was chosen as the primary method to assess, classify, and recruit the study sample. The scale showed a high internal validity and reliability (α= .86). In the tested sample, the construct validity of the scale indicated one factor that explained 38.9% of the variance (Bartlett's test of sphericity p <.001, Kaiser - Meyer-Olkin measure of sampling Adequacy = .89). The psychometric properties of the chosen technique and its modifications have been tested previously by various researchers (d'Astous, 1990; Dittmar et al., 1996; Hanley & Wilhelm, 1992; Neuner et al., 2005). The convergent validity of the chosen method was verified using the Compulsive Buying Index (Ridgway et al., 2008), which resulted in a Pearson's correlational coefficient of r = .77 ($p < .001$) between the two metrics. Because the correlation coefficient between the two scales was sufficiently high, it was verified that Compulsive Buying Scale (Valence et al., 1988) has a high convergent validity and can therefore be used to evaluate CBT construct (Field, 2014).

Behavioral measures for shopping outcomes. Three variables of interest were chosen to measure the behavioral shopping-experience outcomes: 1) time spent in the shop, 2) number of chosen items and 3) hypothetical spending. Each variable was calculated for each participant in each fashion store (i.e., low-end and high-end).

Time spent on shopping was extracted during the data pre-processing stage by calculating the time allocated for shopping, beginning with the moment the participant entered the store and ending when they reached the cashier. The time spent in the shop was extracted in seconds for each fashion store per each participant.

Number of chosen items was defined as the total number of items chosen and presented to the cashier in each fashion store for each participant.

Hypothetical spending was calculated as the cumulative price in Danish kroner of all items chosen in each fashion store by each participant. This variable indicated the maximum amount of hypothetical financial resources that each participant accepted sacrificing in exchange for the products offered. This measure is a reliable proxy of the motivational driver of choice (Plassmann, O'Doherty, Shiv, & Rangel, 2008).

Emotional responses for shopping experience. The emotional responses underlying the shopping experience were studied by extracting physiological phasic arousal measures. The tonic arousal is measured by the skin conductance level (SCL), which quantifies the amount of conductance or resistance of the skin. The SCL indicates an emotional activation that is both slower to occur and change, and lasts longer. The SCL is often affected by various external factors such as climate conditions, temperature, or individual physiological differences including skin temperature, evaporative water loss, and skin moisture. Phasic arousal, which is identified by phasic skin-conductance changes and referred to as either EDRs or stimulus-specific SCRs, reflects fast-changing skin conductance/reactivity levels (Boucsein, 2012; Dawson et al., 2007; Steiger, 1988). Phasic responses indicate an instant, reactive state of the body to stimuli in the surrounding environment, and they serve as a robust indicator for information processing in in-store settings (Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). In this study, three EDR parameters obtained from the EDA's phasic component were extracted and analyzed to study the multidimensional aspect of arousal processes. Physiological measures were extracted for a given time-window (namely, during the first minute of shopping and during the whole shopping experience) in each store condition (namely, in a FF and HF stores) for each participant.

SCR peak frequency was calculated as the cumulative number of SCR peaks (i.e., EDR's) in a given time window in each store condition for each participant. The SCR frequency indicates a general excitation in response to the environment (Steiger, 1988).

SCR peak amplitude was extracted for each identified SCR peak as the difference between SCR value at the onset and the SCR value at a peak (i.e., the maximum value between each SCR peak onset and offset). Then, the average SCR peak amplitude was calculated for each predefined time-window in each store condition for each participant. The SCR amplitude reflects the emotional strength of the response, i.e., intensity, and it has been defined in the literature as the height of a single response induced by a stimulus (Boucsein, 2012).

SCR peak duration was extracted for each identified SCR peak as the difference between the SCR peak time and the SCR peak offset. The average peak duration was calculated for each predefined time-window in each store condition for each participant. According to Venables (1975), SCR duration is an index that reflects the intake of information, where a short recovery time can indicate an *"open attentional gate"* and a longer recovery can indicate a *"closed attentional gate."* In light of this, a longer SCR recovery time could indicate behavioral inhibition driven by executive processes (Boucsein & Backs, 2009).

Previous literature has demonstrated that correlations between these measures can be low (e.g., Venables, 1975). Thus, each parameter may serve as a proxy for different processes that occur during information processing (Cacioppo, Tassinary, & Berntson, 2007).

Post-test questionnaires. The post-test reflections on general shopping behavior, shopping experience, and brand-related variables were measured using a questionnaire that consisted of both multiple-choice and open-ended questions. The study participants were asked about their shopping frequency, average number of actively used credit cards, and average spending per each shopping trip. Additionally, the participants were asked to reflect on their shopping experiences by answering the following questions: *"Could you please explain your choice in Store 1 and Store 2? Why did you choose, what you chose in Store 1 and Store 2?"* To study the brand-related variables for each store, the participants were asked to indicate their liking and

familiarity for each brand as well as to evaluate the positioning strategy of the tested brands on the 10-point Likert scale.

All measures included in the experiment are presented in Table 4-2, given below.

Variables	Data collections tools	Indicators
Recruitment procedure		
Demographic information		
Fashion interest	Self-report based scale	0-4 (not at all, 4 – very much)
Age	Self-report	Years
Income	Self-report based scale	Categories: < 20 000 dkk, 20 000 – 32 000 dkk, > 32 000 dkk
Occupation	Self-report based scale	Categories: Student, Part-time, Full-time work
Compulsive buying tendency	Compulsive Buying Scale (Valence et al. 1988)	1- 5 (1: strongly disagree, 5: strongly agree)
	Compulsive Buying Index (Ridgway et al., 2008)	1-7 (1: strongly disagree/never, 7: strongly agree/very often)
Experiment procedure		
Behavioral measures for shopping outcomes in each store		
Time spent on shopping		Total time in seconds
Number of chosen items		Total number of chosen items
Hypothetical spending		Total price in DKK

Emotional responses underlying shopping experience:
(1) for the first minute of shopping experience and 2) for the entire shopping experience in each fashion store)

SCR frequency	Skin Conductance Response	Sum of SCR peaks
SCR peak amplitude	Skin Conductance Response	Average size of SCR peaks in micro-Siemens (μS)
SCR peak duration	Skin Conductance Response	Average time of SCR peaks in milliseconds

Post-test reflections on general shopping behavior, shopping experience, and brand-related variables

General shopping behavior		
Frequency of shopping	Self-report based scale	Categories: Once per day, few days per week; once per week; once per month; few times per month; every few months
Average spending per time	Self-report based scale	DKK
Number of active cards	Self-report based scale	Number of cards
Shopping experience		
Shopping explanation	Self-report	Open question
Brand related variables		
Brand liking score	Likert-scale	0-10 (0: not at all, 10- very much)
Brand familiarity score	Likert-scale	0-10 (0: not at all, 10- very much)
Brand positioning indicator	Likert-scale	0-10 (0: low-end, 10- high-end)

Table 4-2. Overview of measures

4.5.3. Design and Procedures

Development of Stimuli

To create the experimental conditions for different store types, two internationally well-known stores were chosen, one each for the low-end and high-end fashion segments. The two stores were located in the same shopping mall in Copenhagen, Denmark. Both stores featured different atmospherics designs and merchandising strategies; in particular, they featured different pricing strategies, material quality in their products, numbers of collections, and store-environment designs. Both stores were single-brand, fashion-apparel providers that employed experience-oriented marketing strategies. As mentioned in the previous section, the participants' self-reported brand liking and brand familiarity were assessed as control variables for the chosen brands. Because the low-end store strategy was targeted towards inexpensive and "fast" fashion—so-called because collections are renewed more often due to the fast-changing fashion trends—the low-end store is hereafter also referred to as the fast-fashion store (FF). The high-end store, on the other hand, employs a different type of strategy with regard to the offered products, where exclusivity, design, and uniqueness of the fashion items are highlighted. Thus, the high-end store is hereafter also referred to as the high-fashion store (HF).

In-store Task: In-store Study Design

Each participant accomplished a shopping trip including a visit to two fashion stores (i.e., FF and HF) where they performed two shopping tasks resulting in a "shopping experience" in each fashion store. To avoid multiple treatment interference, each participant was randomly assigned the order of the FF or HF stores. The randomization was determined such that the order was balanced both between the two CBT-groups and within each CBT group (i.e., in the Low-and High-CBT segments). To reduce external effects such as crowding factors or time-of-day-induced fatigue, the testing time was also taken into consideration.

The study began in the lab, where the eye-tracking glasses and EDA biosensor were mounted on the test subject. The two devices were then synchronized for the mobile data collection. After thorough instruction on the experimental procedure, the data recording began and the participant was invited to follow the experimenter to the shopping mall. To assure internal validity, each participant was given consistent treatment during the testing procedure.

Before the start of the experiment, each participant was provided printed instructions for the shopping tasks. In these instructions, participants were told that they would be visiting two stores where they would be asked to shop as they normally would and that they would shop for as long as they wanted, up to twenty minutes in each shop. The participants were also instructed to be aware of the attached sensors, which meant they could not try on the clothing while making their choices. To increase the external validity of the study, the participants were told that four of them would be randomly chosen to receive 1000 DKK to have one of their choices realized. The presented instructions encouraged participants to optimize their shopping choices instead of reporting their subjective estimates on their potential preferences. This allowed a better estimation of the actual amount of money that they would be eager to sacrifice for the shopping and acquisition of the chosen items.

After proceeding to the shopping mall, the experimenter asked the participant to stop in front of whichever store was randomly assigned as the first one, either the FF or HF store, facing away from the entrance. At this time, a timer was set. Then, a sign with the printed brand logo was shown for 6 seconds to familiarize the participant with the store. After the sign was removed, the participant was asked to turn around and begin their shopping trip. For each shopping experience in each store, the experimenter registered the subject's choices, specifically 1) the number of items chosen and 2) their hypothetical spending. After the first shopping task, the experimenter guided the participant to the second store for the second task, which followed the similar procedure. Then, the participant was invited back to the lab where she completed the post-test questionnaire and was debriefed about the experimental procedure. The experimental design is presented in Figures 4-1 and 4-2.

Figure 4-1. Test subject in the FF store (left) and HF store (right). The woman is equipped with a wireless mobile eye-tracker synchronized with an EDA biosensor.
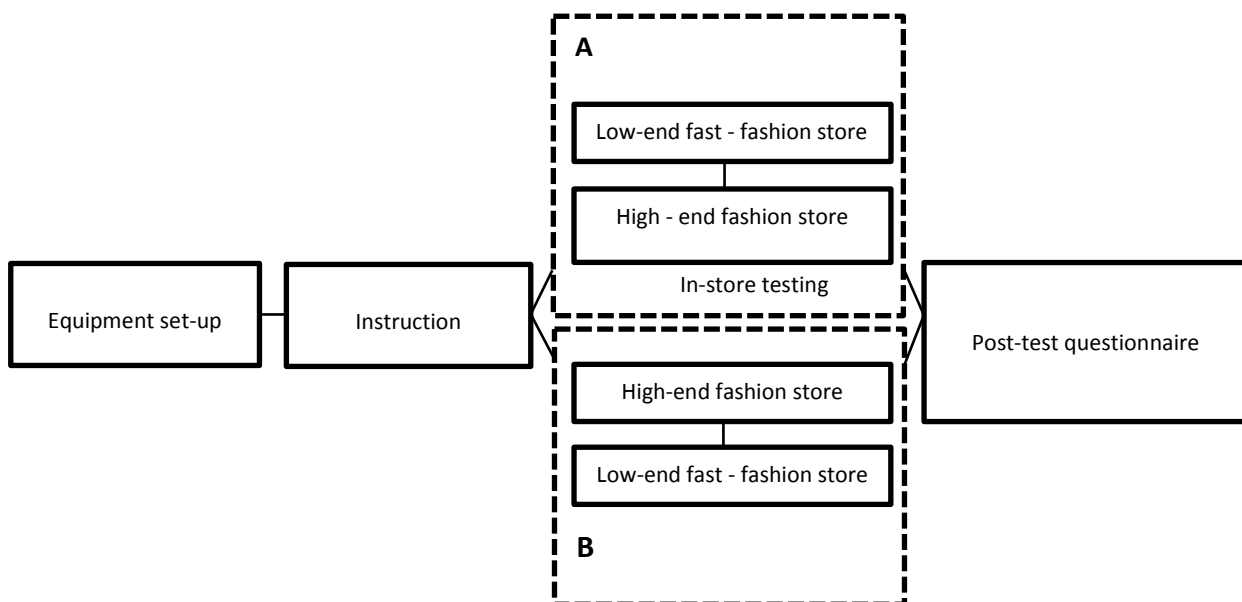
Figure 4-2. Experimental design. Participants were randomly assigned to a store order indicated by conditions A or B. The randomization was counterbalanced within and between the High-CBT and the Low-CBT groups. First, the biosensors were mounted, and then participants were invited to read the instructions and follow the experimenter to the shopping mall. After the in-store shopping tasks, each participant was invited to the lab, where they filled out the post-test questionnaire on their shopping behavior, shopping experience, and brand-related variables. EDA and eye-tracking data were recorded throughout the shopping period.

The eye-tracking data was collected using a wireless, head-mounted monocular mobile eye-tracker (Tobii Glasses 1, www.tobii.com) sampled at 33 Hz. The eye-tracking data was synchronized with a mobile biosensor for EDA (http://www.shimmersensing.com//) sampled at 51.2 Hz that measured the changes in the electrical properties of the skin in micro-Siemens (μS). The EDA was measured by exosomatic recording registering the direct current by two non-intrusive Shimmer electrodes (http://www.shimmersensing.com//). The electrodes were placed on the palmar surface of the middle and ring fingers on the non-dominant hand. Specifically, the sensors were placed on the proximal phalanx to reduce potential artifacts caused by grasping products during the shopping experience. The eye-tracking glasses were integrated with a camera that recorded the entire experiment. The recording was used in the data pre-processing stage for post-marker identification and diagnostic observation of the individual in-store behavior patterns.

The EDA-measuring Shimmer sensor system was first mounted, calibrated and validated. Then, the participants were equipped with the eye-tracking glasses. To ensure the precision and accuracy of the visual data collection, subjects underwent a 9-point calibration procedure. The EDA sensor was wirelessly connected to the computer that had an integrated biometric platform *Attention Tool version 7.2* (www.imotionsglobal.com) employed for EDA data recording. This software also provided a running time-stamp that was used to synchronize the recorded mobile eye-tracking data with the EDA data during the data pre-processing stage. After successfully calibrating the eye-tracking glasses, the experimenter initiated the running time-stamp exposed on the computer screen and asked participant to look at the screen. Meanwhile, the eye-tracking and EDA data recordings were initiated. The portable computer was stored in a backpack that was given to the participants to be carried during the entire experiment.

4.5.4. Data Pre-processing

The data pre-processing was carried out offline in the biometric platform *Attention Tool version 7.2* (www.imotionsglobal.com). The eye-tracking and EDA biosensor data were first synchronized using the data from the running time stamp for each recording. Each person's

responses were manually inspected visually and coded with post-markers that were added to the timeline of the recorded shopping experience in each fashion store. In particular, the following time periods were marked: 1) the first minute of the shopping experience (from the instant they entered the store to the end of the first minute of shopping), and 2) the entire shopping experience (from the instant they entered the store to the moment they reached the cashier) (see Figure 4-3).

Figure 4-3. Manual identification of the post-markers for the beginning of the shopping experience and the whole shopping experience per each video recording for each test person (output from iMotions Attention Tool software).

After extracting the combined dataset, the EDA data was pre-processed offline in Matlab (www.mathworks.com) using the following procedure. To remove high-frequency artifacts such as motion-induced, high-amplitude spikes and to subtract the tonic SCL—thereby maintaining the phasic level of the signal and detect the SCR peaks (i.e., event-related SCRs)—a median filter was first applied (Pratt, 1978) (see Figure 4-4). For each data sample, the median filter computed the median EDA response using a moving window of +/- 4 seconds. This value was then subtracted from the initial value of the sample to result in the phasic signal. After data filtering, the SCR peaks were detected by identifying peak onset (> .01uS) and offset (<0 uS).

To be classified as a stimulus-elicited SCR peak, the phasic signal point was required to exceed a minimum amplitude-threshold criterion of .01uS (Dawson et al., 2007; Levinson & Edelberg, 1985). The algorithm then examined the original data and determined the maximum-curvature value between each onset-offset pair that was registered as a peak (see Figure 4-5). For each participant in each store per defined time-windows, the total number of peaks (i.e., SCR frequency), average SCR peak amplitude, and average SCR peak duration were calculated and subsequently analyzed.
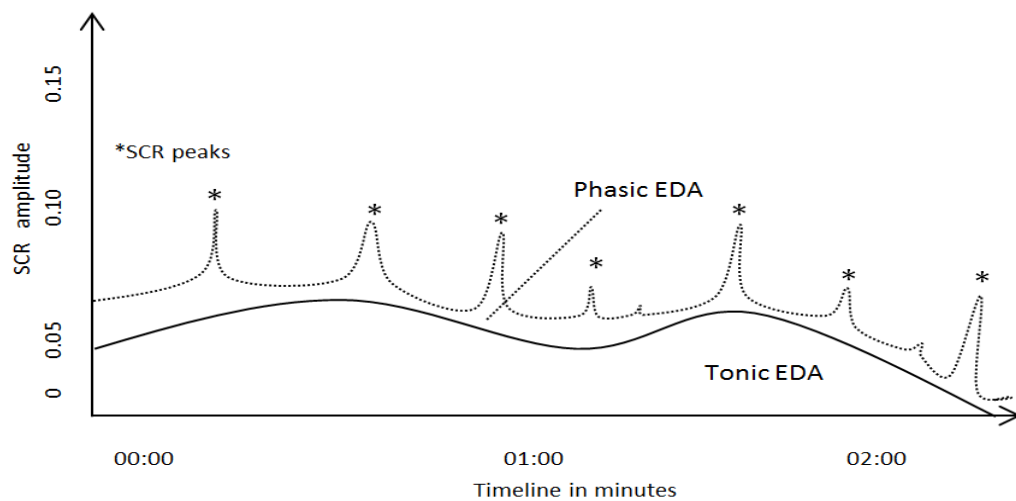
Figure 4-4. Simplified depiction of tonic and phasic activity and SCR peaks in the raw EDA data. The illustration for the procedure is adapted from iMotions GSR guide book (https://imotions.com/gsr-guide-ebook/).
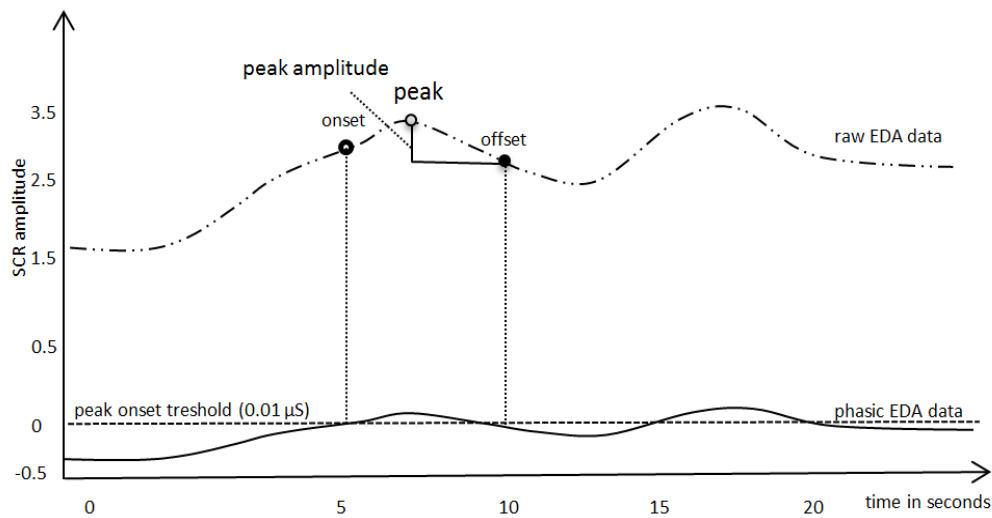
Figure 4-5. Simplified depiction of peak-detection procedure. To be considered a SCR peak, the phasic response was required to exceed a minimum-amplitude criterion of .01uS. The illustration is adapted from the iMotions GSR guide book (https://imotions.com/gsr-guide-ebook/).

4.6. Results

After the data pre-processing stage, statistical data analyses were performed using the statistical software JMP 13.0 (SAS Inc.). To compare the variables reflecting demographics, CBT, general shopping behavior, brand familiarity, brand liking, and brand perception, independent *t*-tests, and X^2 tests were run. A *P* value of .05 was considered to be significant. Additionally, a confidence level of .1 was also investigated.

4.6.1. Store-Manipulation Check

To validate the manipulation condition, each participant reported the subjective positioning of each tested brand by categorizing it towards high-end or low-end fashion category on the 10-point Likert scale. The study results indicated a significant difference in the perceived positioning strategy for both fashion brands (M $_{HF}$= 7.88, SD $_{HF}$ = 1.49; M $_{FF}$= 3.12, SD $_{FF}$ = 2.11; *t* (70) = 11.6, *p* < .0001 (paired sample t-test)).

4.6.2. Sample Characteristics

No differences between the studied segments were shown in age (t (37.3) = -1.44, p=.15), income (X^2 (1) = .48, p=.49), or occupation (X^2 (2) = 3.10, p =.22). The average ages in the High-CBT and Low-CBT groups were 26 years and 28 years, respectively. 57.5% of the entire sample indicated that they earned less than 20 000 DKK per month, and 42.5% of the participants reported that they earned 20 000 to 32 000 DKK per month. 63.1% of women in the High-CBT group and 52.4% women in the Low-CBT group indicated that they earned less than 20 000 DKK, whereas the remaining test subjects reported that they earned 20 000 to 32 000 DKK per month. The majority of the recruited sample was working full-time (60%). 47.4% of the participants grouped to the High-CBT group and 71.4% of participants grouped to the Low-CBT group indicated that they worked full-time. 36.8% of the participants from the High-CBT group and 14.3% of the participants from the Low-CBT group reported that they worked part-time. The remaining test subjects were students. There were no indicated significant differences between the two groups in their general shopping behavior (*credit cards in active use*: X^2 (3) = 4.11, p =.25; *spending per shopping trip:* t (32.4) = .66, p=.51) except for their frequency of shopping (X^2(4) = 11.6, p =.021). The majority of participants reported that they actively used only one (52.5%) or two (40%) credit cards. The High-CBT group reported a higher frequency of shopping than the Low-CBT group. Specifically, the Low-CBT group indicated that they often shopped once per month (57.1%), a few times per month (23.8%), or every few months (14.29%). The High-CBT group, on the other hand, indicated that they often shopped a few times per month (36.8%), once per week (21.1%), or once per day or a few days per week (15.8%). The data for the demographics, shopping behavior, and CBT characteristics are presented in Table 4-3.

	High-CBT (N = 19)	Low-CBT (N=21)	Statistics	
	M (SD)	M (SD)		
Age	26.3 (3.41)	27.9 (3.51)	$t = 1.44$	$p = .15$
Income			$X^2 = .48$	$p = .49$
Number of credit cards			$X^2 = 4.11$	$p = .25$
Spending per shopping trip (DKK)	818 (457)	945 (700)	$t = -.66$	$p = .51$
Frequency of shopping behavior			$X^2 = 11.6$	**$p = .021*$**
Mean CBS scores	47.3 (3.73)	29.6 (5.87)	$t = 11.5$	**$p < .0001*$**

Table 4-3. Sample characteristics[15], *p < .05.

4.6.3. Description of Dependent Variables

Pearson's correlation coefficients (r) were calculated to study the relationships between any normally distributed variables and Spearman's correlation coefficients (r_s) were calculated to examine the relationships between variables that were not normally distributed (Bishara & Hittner, 2012). The data analysis showed that there was a significant positive correlation between the time spent on shopping and the number of items chosen during the shopping trip ($r_s = .41$, $p<.0001$). All other variables representing behavioral outcomes did not show any significant correlations (*time spent on shopping and hypothetical spending:* $r_s = -.16$, $p = .24$; *the number of items chosen and hypothetical spending:* $r_s = .15$, $p = .27$). Additionally, none of the SCR measures showed any significant correlations with the other SCR measures (*SCR peak frequency and amplitude:* $r_s = -.15$, $p = .25$; *SCR peak frequency and duration:* $r_s = .090$, $p=.50$; *SCR peak amplitude and duration:* $r_s = -.20$, $p = .12$). However, positive correlations between the average SCR peak frequency and both the total time spent on shopping ($r_s = .70$, $p <.0001$) and the total number of chosen items ($r = .30$, $p = .021$) were observed. Additionally, there was a positive correlation between the average SCR peak amplitude and the hypothetical spending ($r_s = .30$, $p = .020$) and between the average SCR peak duration and the total time spent on shopping ($r_s = .32$, $p = .013$). All other correlations between the different dependent measures proved to be statistically non-significant (all *ps* >.12). The correlation matrix exploring the relationships between the behavioral outcomes and emotional responses underlying the shopping experience is presented in Table 4-4.

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[15] Results provided for the sample of 40 participants. The effects of the explored variables were also validated on the sample of 30 respondents in the physiological data analysis stage.

N =30		Time spent on shopping	Number of items chosen	Hypothetical spending	SCR peak frequency	SCR peak amplitude	SCR peak duration
Time spent on shopping	Correlation	$r_s = 1$	**$r_s =.41$**	$r_s = -.16$	**$r_s =.70$**	$r_s = -.14$	**$r_s = .32$**
	P (2-tailed)	.	**< .001***	.24	**< .0001***	.29	**.013***
Number of items chosen	Correlation	**$r_s =.41$**	$r = 1$	$r_s =.15$	**$r =.30$**	$r =.090$	$r_s =.15$
	P (2-tailed)	**<.0001***	.	.27	**.021***	.49	.23
Hypothetical spending	Correlation	$r_s = -.16$	$r_s =.15$	$r_s = 1$	$r_s = -.029$	**$r_s =.30$**	$r_s =.19$
	P (2-tailed)	.24	.27	.	.82	**.020***	.15
SCR peak frequency	Correlation	**$r_s =.70$**	**$r =.30$**	$r_s = -.029$	$r = 1$	$r = -.15$	$r_s =.090$
	P (2-tailed)	**<.0001***	**.021***	.82	.	.25	.50
SCR peak amplitude	Correlation	$r_s = -.14$	$r =.090$	**$r_s =.30$**	$r_s = -.15$	$r = 1$	$r_s = -.20$
	P (2-tailed)	.29	.49	**.020***	.25	.	.12
SCR peak duration	Correlation	**$r_s = .32$**	$r_s =.15$	$r_s =.19$	$r_s =.090$	$r_s = -.20$	$r_s = 1$
	P (2-tailed)	**.013***	.23	.15	.50	.12	.

*Table 4-4. Correlation matrix for dependent variables, *p<.05, **p <.1.*

4.6.4. Hypotheses Testing

To account for the repeated design and within-participant variation, mixed-effects regression models (West et al., 2006, for an application, see Landwehr et al., 2013) were assessed during hypothesis testing using the statistical software JMP 13.0 (SAS Inc.). Each hypothesized effect was tested by estimating LMMs. The top-down model-structuring approach introduced by Verbeke and Molenberghs (2000) was followed to structure the final model. The best-fitting model was assessed by evaluating each model's fit information criteria and selecting the structure with the smallest Akaike's Information Criteria and Bayesian's Criterion. The models were fitted and compared using restricted maximum-likelihood methods. The normalization for non-normally distributed interval variables of interest was achieved by log-transforming the behavioral and physiological data. For each model, post-hoc pairwise Tukey-Kramer tests were run to study the individual effects. *P* values of .05 were taken to be significant. Additionally, a confidence level of .1 was also investigated.

Hypothesis H1 a-c: Behavioral Shopping Outcomes

To test hypothesis H1 a-c, three behavioral measures were studied: namely, time spent on shopping, number of items chosen, and hypothetical spending. It was expected that the High-CBT group, compared to the Low-CBT group, would demonstrate (a) a longer time spent on shopping, (b) a higher number of items chosen, and (c) higher hypothetical spending during the shopping experience. This effect was expected to differ depending on the type of fashion store, with a stronger effect in the high-end fashion store than in the low-end store.

H1(a): time spent on shopping. To test H1a, the differences in time spent on shopping were studied. An LMM was estimated that featured the logarithmically transformed time spent on shopping as the dependent variable and *"CBT-group," "type of store,"* and the interaction between *"CBT-group"* and *"type of store"* as fixed factors. To control for intra-subject variability, a *"Subject ID"* was added as a random intercept. To control for brand-related variables, reported brand-liking and brand-familiarity scores were also included in the model as covariates. Because both variables indicated no significant influence on the studied dependent variable, they were removed from subsequent analyses (*brand liking: F* $(1, 58.4) = 1.80, p = .19$; *brand familiarity*: $F (1, 63.7= 1.20, p = .28)$.

A model was then recalibrated with *"CBT-group," "type of store"* and the interaction between *"CBT-group"* and *"type of store"* modeled as fixed factors and *"Subject ID"* included as a random intercept. The data analysis showed no significant effect of *"CBT-group"* $(F (1, 38) =.11, p = .74)$ or of the interaction between *"CBT-group"* and *"type of store"* $(F (1, 38) = .005, p = .94)$ on the time spent on shopping. However, the data analysis did reveal a significant effect of *"type of store"* $(F (1, 38) = 32.6, p < .0001)$ on the time spent on shopping. Data analysis showed that consumers shopped 90.6 seconds (i.e., about 1.51 minutes) longer in the FF store than in the HF store (see Figure 4-6). The table with the parameter estimates from the final model is provided below (see Table 4-5).

Effect	β	SE	df	t	p
Intercept	**6.02**	**.061**	**38**	**97.9**	**<.0001***
CBT- group [Low- CBT]	-.021	.061	38	-.34	.74
Type of store[FF]	**.18**	**.032**	**38**	**5.71**	**<.0001***
CBT- group [Low- CBT] * type of store[FF]	.002	.032	38	.070	.94

*Table 4-5. Solutions for fixed effects, *p < .05.*
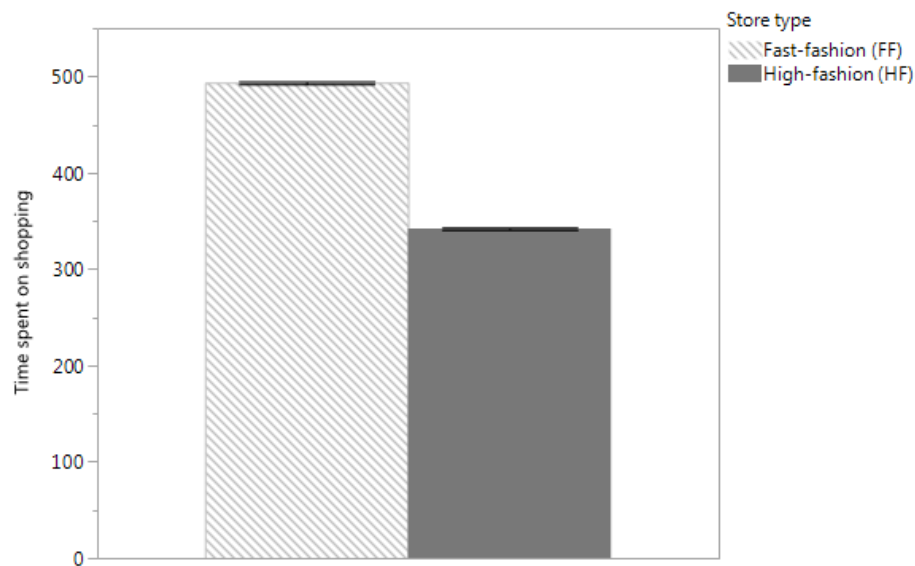
Figure 4-6. Mean time spent on shopping in both fashion stores provided in seconds. More time was spent in the low-end fashion store as compared to the high-end store. Whiskers indicate the standard error. The time spent on shopping is transformed back to the original scale.

H1(b): number of items chosen. To test H1b, the differences in the total number of chosen items were investigated. An LMM was estimated with *"CBT-group," "type of store"* and their interaction modeled as fixed factors, and *"Subject ID"* was included as a random intercept. Additionally, brand-liking and brand-familiarity scores were modeled as covariates. Because both variables demonstrated no significant effect on the total number of selected items (*brand liking: F* (1, 56.9) = 3.30, *p = .075; brand familiarity: F* (1, 61.32 = .02, *p* = .88), they were removed from subsequent analyses.

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A model was then recalibrated with *"CBT-group,"* *"type of store"* and the interaction between *"CBT-group"* and *"type of store"* modeled as fixed factors and *"Subject ID"* included as a random intercept. The analysis of the estimated LMM showed that the effects of "CBT-group" (F (1, 38) = 2.58, p = .12) and the interaction between *"CBT-group"* and *"type of store"* (F (1, 38) = .12, p = .73) on the number of items chosen were both non-significant. However, the data analysis also revealed that the effect of *"type of store"* (F (1, 38) = 88.4, p <.0001) on the number of items chosen was significant. Data analysis demonstrated that the subjects chose over twice as many items in the low-end fashion store compared to the high-end fashion store (see Figure 4-7). The table with the parameter estimates from the final model is provided below (see Table 4-6).

Effect	β	SE	df	t	p
Intercept	**3.26**	**.25**	**38**	**13.1**	**<.0001***
CBT- group [Low- CBT]	-.40	.25	38	-1.61	.12
Type of store[FF]	**1.29**	**.14**	**38**	**9.41**	**<.0001***
CBT- group [Low- CBT] * type of store[FF]	.048	.14	38	.35	.73

*Table 4-6. Solutions for fixed effects, *p< .05.*
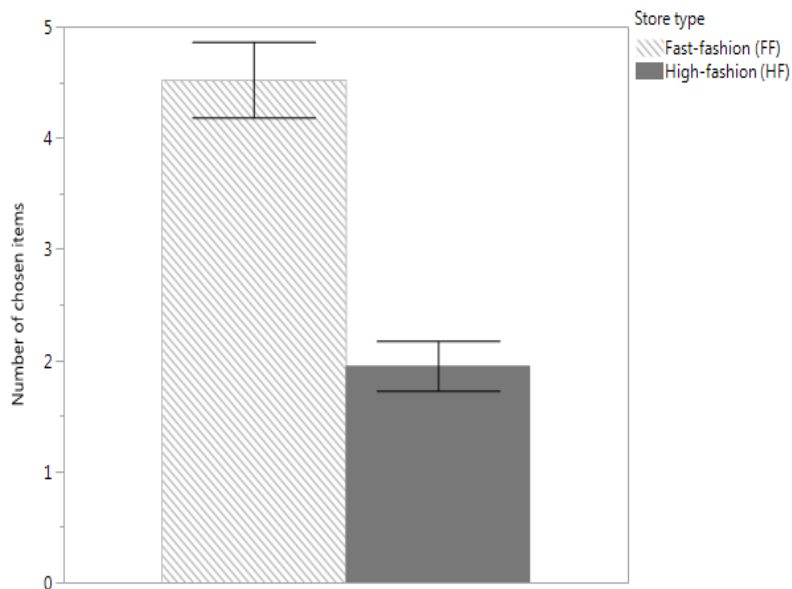
Figure 4-7. Number of chosen items in both stores. A higher average number of chosen items was reported in the low-end fashion store than in the high-end fashion store. Whiskers indicate the standard error. The data provided is transformed back to the original scale.

In summary, the findings demonstrated that participants spent more time shopping and chose more items in the low-end fashion store than in the high-end fashion store, regardless of their CBT group. These results can be explained by the fact that the low-end fashion store had both a larger size and a wider variety of products than high-end fashion store.

H1 (c): hypothetical spending. To test the H1c, the differences in the hypothetical spending were tested. An LMM was estimated that featured the logarithmically transformed hypothetical spending as a dependent variable; *"CBT-group," "type of store,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. Brand-liking and brand-familiarity scores were also modeled as covariates. Because both brand-related variables demonstrated no significant effect on hypothetical spending (*brand liking: F* $(1, 64.8) = 3.34$, *p* = .072*; brand familiarity*: *F* $(1, 69.1 = .003$, *p* = .96), they were removed from subsequent analyses.

An LMM was recalibrated with the logarithmically transformed hypothetical spending as the dependent variable; *"CBT-group," "type of store,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. The data analysis demonstrated that the effects of *"CBT-group"* (*F* $(1, 38) = 5.13$, *p* = .029) and *"type of the store"* (*F* $(1, 38) = 48.8$, *p* <.0001) on hypothetical spending were significant, but the effect of the interaction between *"CBT-group"* and *"type of store"* (*F* $(1, 38) = .18$, *p* = .67) on hypothetical spending was non-significant. The table with the parameter estimates of the model is provided below (see Table 4-7).

Effect	β	SE	df	t	p
Intercept	**7.14**	**.080**	**38**	**89.3**	**<.0001***
CBT- group [Low- CBT]	**-.18**	**.080**	**38**	**-2.26**	**.029***
Type of store[FF]	**-.36**	**.051**	**38**	**-6.98**	**<.0001***
CBT- group [Low- CBT] * type of store[FF]	.022	.051	38	.42	.67

*Table 4-7. Solutions for fixed effects, *p< .05.*

The post-hoc effects analyses demonstrated that, regardless of the fashion store type (i.e., low-end or high-end fashion), consumers with a high CBT were hypothetically willing to spend on average 460 DKK more during their shopping trips than consumers with a low CBT. In addition, regardless of their CBT, consumers were hypothetically willing to spend more money in the high-end fashion store (MD = 928) than in the low-end fashion store (see Figure 4-8).
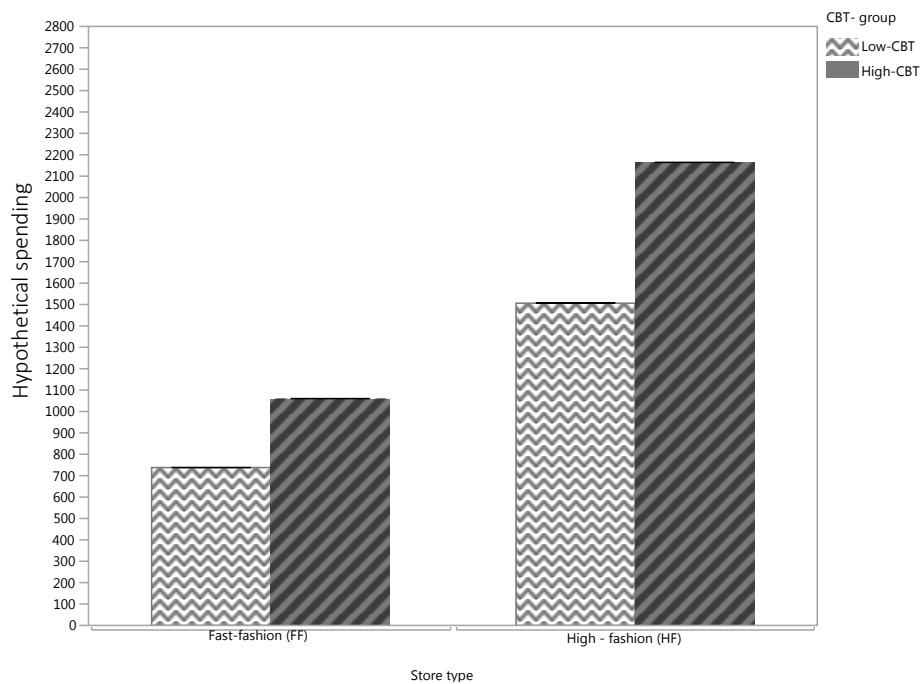
Figure 4-8. Mean amount of money hypothetically allocated for acquiring the chosen items in both fashion stores for both groups of consumers. A higher average hypothetical spending was demonstrated by the High-CBT group in both stores. Whiskers indicate the standard error. The data provided is transformed back to the original scale.

Table 4-8 summarizes the means, standard errors, and confidence intervals of the dependent variables: namely, time spent on shopping, number of selected items, and hypothetical spending. The data provided is transformed back to the original scale.

Variable	CBT-group	Store type CBT-group*ST	M (SE)	95%CI		Statistics
				LL	UL	
Time spent on shopping	High-CBT		420 (1.09)	351	503	$F (1, 38) =.11$, $p = .74$
	Low-CBT		403(1.09)	339	478	
		Fast-fashion	494 (1.07)	430	568	$F (1, 38)=32.6$, ***p <.0001****
		High-end fashion	342 (1.07)	298	393	
		High-CBT, *FF*	503 (1.10)	411	615	$F (1, 38)= .005$, $p = .94$
		High-CBT, *HF*	350 (1.10)	286	428	
		Low-CBT, *FF*	485 (1.10)	400	587	
		Low-CBT, *HF*	334 (1.10)	276	405	
Number of items chosen	High-CBT		3.66 (.36)	2.93	4.39	$F (1, 38) =2.58$, $p = .12$
	Low-CBT		2.86 (.34)	2.16	3.55	
		Fast-fashion	4.55 (.28)	3.98	5.11	$F (1,38) = 88.4$, ***p <.0001****
		High-end fashion	1.97 (.28)	1.40	2.54	
		High-CBT, *FF*	4.90 (.41)	4.07	5.72	$F (1, 38) = .12$, $p = .73$
		High-CBT, *HF*	2.42 (.41)	1.60	3.25	
		Low-CBT, *FF*	4.19 (.39)	3.41	4.97	
		Low-CBT, *HF*	1.52 (.39)	.74	2.31	
Hypothetical spending	High-CBT		1514 (1.12)	1198	1916	$F (1, 38)= 5.13$, ***p = .029****
	Low-CBT		1054 (1.12)	843	1318	
		Fast-fashion	884 (1.10)	731	1068	$F (1,38) = 48.8$, ***p <.0001****
		High-end fashion	1808 (1.10)	1495	2185	
		High-CBT, *FF*	1036 (1.14)	787	1364	$F (1, 38) = .18$, $p = .67$
		High-CBT, *HF*	2214 (1.14)	1682	2915	
		Low-CBT, *FF*	753 (1.14)	580	979	
		Low-CBT, *HF*	1476 (1.14)	1136	1917	

*Table 4-8. Means, standard errors, and confidence intervals of time spent on shopping provided in seconds, number of items chosen during shopping experience, and hypothetical spending given in Danish krone, * p <.05.*

In summary, the results demonstrated that the two groups showed differences in their hypothetical spending for the chosen items. In particular, consumers with a high CBT were willing to spend more money than consumers with a low CBT regardless of the fashion store type. Additionally, the two groups did not differ in the amount of time that they spent on shopping or in the number of items that they chose during their shopping trips. Thus, hypothesis H1a-c could be partly supported.

Hypothesis H2 a-c: Emotional Responses during the First Minute of the Shopping Experience

Due to the loss of physiological data during the data pre-processing stage, the data for ten participants were excluded from the physiological data analysis. Hence, the SCR analyses were run on a sample of 30 participants (n $_{High-CBT}$=15, M $_{High-CBT}$ = 47. 7, SD $_{High-CBT}$ = 3.70, range $_{High-CBT}$ = 43-55; n $_{Low-CBT}$ = 15, M $_{Low-CBT}$ = 29.7, SD $_{Low-CBT}$ = 6.11, range $_{Low-CBT}$ = 21- 41; t (23.1) = 9.72, p < .001).

To study hypothesis H2 a-c, three physiological variables were studied during the first minute of the shopping experience (namely, SCR peak frequency, SCR peak amplitude, and SCR peak duration). According to the deducted hypothesis, the High-CBT group, compared to the Low-CBT group, should demonstrate (a) a higher emotional excitation, (b) a stronger intensity of emotional reactions, and (c) a shorter duration of the emotional responses experienced during the first minute of shopping in each fashion store. This effect was expected to differ depending on the type of fashion store, with a stronger effect in the high-end fashion store than in the low-end store.

H2 (a): SCR peak frequency. To test the H2a, the differences in the SCR peak frequency during the first minute of shopping were investigated. An LMM was estimated with the SCR peak frequency as the dependent variable; *"CBT-group," "type of store,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. Brand liking and familiarity variables were also included in the model as covariates. Because both brand liking and familiarity variables showed no significant effects on SCR peak frequency, they were removed from subsequent analyses (*brand liking: F* (1, 50.2) =.12, *p* = .73*); brand familiarity*: *F* (1, 50.1) = 2.38, *p* = .13).

The model was then recalibrated without the brand-liking or brand-familiarity scores. The data analysis revealed two marginally significant effects, namely the *"type of store"* (F (1, 28) = 4.19, p = .050**)[16] and the interaction between *"CBT-group"* and *"type of store"* (F (1, 28) = 4.19, p = .050**)[17]. The effect of *"CBT-group"* (F (1, 28) = .12, p = .73) on SCR peak frequency was determined to be non-significant. The table with parameter estimates of the final model is provided below (see Table 4-9).

Effect	β	SE	df	t	p
Intercept	9.90	.67	28	14.8	<.0001*
CBT- group [Low- CBT]	.23	.67	28	.35	.73
Type of store[FF]	-.90	.44	28	-2.05	.050**
CBT- group [Low- CBT] * type of store[FF]	.90	.44	28	2.05	.050**

Table 4-9. Solutions for fixed effects, *p < .05, **p <.01

The post-hoc Tukey-Kramer analyses showed that a higher average number of emotional peak reactions was experienced in the high-end fashion store than in the low-end store. The differences between the stores were driven by the responses of the High-CBT group (MD = 3.60, p = .035). In other words, during a high-CBT consumer's first minute of shopping, the high-end fashion store evoked more emotional excitation responses than the low-end fashion store (see Figure 4-9).

[16,17] Significant effect at the 90% of confidence level, **p< .1.
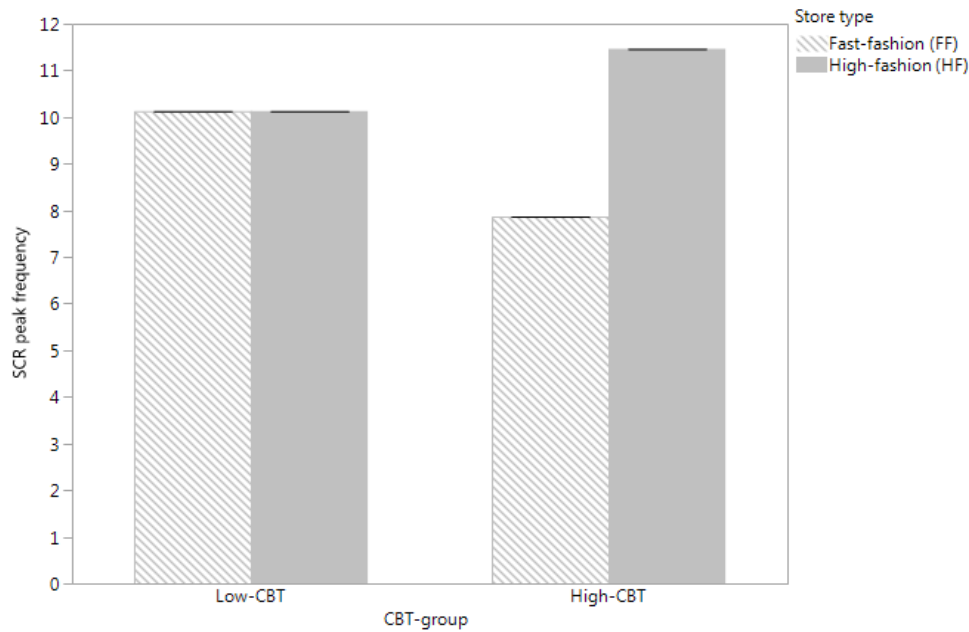
Figure 4-9. Mean SCR peak frequency experienced during the first minute of shopping in both fashion stores for both consumer groups. A higher average peak number of emotional responses was shown for the high-end fashion store compared to the low-end fashion store, but only in the High-CBT group. Whiskers indicate the standard error.

H2 (b) SCR peak amplitude. To test H2b, the differences in the SCR peak amplitude during the first minute of shopping were studied. An LMM was estimated that featured the logarithmically transformed SCR peak amplitude as a dependent variable; *"CBT-group," "type of store,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. Brand liking and brand familiarity variables were also added to the model as covariates. The two covariates demonstrated no significant impact on the studied outcome; thus, they were removed from subsequent analyses (*brand liking: F* $(1, 36.2) = 2.65$, *p = .11); brand familiarity*: $F (1, 36.1) = .10$, *p = .76*).

The LMM was recalibrated using the logarithmically transformed SCR peak amplitude as the dependent variable; *"CBT-group," "type of store,"* and their interaction as fixed factors; and *"Subject ID"* as the random intercept. The statistical data analysis showed no significant effect of *"CBT-group"* ($F (1, 28) = .52$, p = .48) on the SCR peak amplitude. However, the effects of

"type of store" (*F* (1, 28) = 5.61, *p* = .025*)* and the interaction between *"CBT-group"* and *"type of store"* (*F* (1, 28) = 7.9, p = .009) on the SCR peak amplitude were significant. The table with the parameter estimates of the final model is provided below (see Table 4-10).

Effect	β	SE	df	t	p
Intercept	**-2.60**	**.10**	**28**	**-24.9**	**<.0001***
CBT- group [Low- CBT]	.075	.10	28	.72	.48
Type of store[FF]	**-.093**	**.039**	**28**	**-2.37**	**.025***
CBT- group [Low- CBT] * type of store[FF]	**-.11**	**.039**	**28**	**-2.82**	**.009***

Table 4-10. Solutions for fixed effects, *p < .05.

The post-hoc analyses exploring the interaction effect demonstrated that consumers experienced higher-intensity emotional responses in the high-end fashion store than in the low-end fashion store, but this effect was only present for the Low-CBT group (MD = .69, *p* = .005) (see Figure 4-10). All other effects were non-significant (all *ps* >.36) (see Figure 4-10).

H2 (c) SCR peak duration. To test H2c, the differences in the SCR peak duration during the first minute of shopping were tested. An LMM was estimated with the logarithmically transformed SCR peak duration as a dependent variable; *"CBT-group," "type of store,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. Brand liking and brand familiarity variables were also included in the model as covariates. Because brand familiarity variable demonstrated no significant impact on SCR peak duration (*F* (1, 34.1) = .62, *p* = .44*)*, it was removed from subsequent analyses.

The model was recalibrated with *"CBT-group," "type of store"* and their respective interaction included as fixed factors and *"Subject ID"* added as a random intercept. Statistical data analysis revealed that the effect of *"CBT-group"* (*F* (1, 27.9) = 1.36, *p* = .25) on SCR peak duration was non-significant; however, the effects of *"type of store"* (*F* (1, 27.42) =15.98, *p* = .0004*)* and the interaction between *"CBT-group"* and *"type of store"* (F (1, 27.1) = 5.28, *p* = .030) on SCR peak duration, controlled for brand liking, proved to be significant. The post-hoc analyses on the resulting effects showed that consumers demonstrated a longer emotional response in the low-end fashion store than in the high-end fashion store; however, this effect was only prominent in

the High-CBT group (MD =180, p = .0007) (see Figure 4-10). All other effects were non-significant (all ps >.10). The table with parameter estimates of the estimated model is provided below (see Table 4-11).

Effect	β	SE	df	t	p
Intercept	4.99	.23	52.9	21.4	<.0001*
CBT- group [Low- CBT]	-.15	.13	27.9	-1.17	.25
Type of store[FF]	.17	.044	27.4	4.00	.0004*
CBT- group [Low- CBT] * type of store[FF]	-.098	.042	27.1	-2.30	.030*
Brand liking	.078	.030	34.9	2.59	.014*

*Table 4-11. Solutions for fixed effects, *p < .05*

Table 4-12 summarizes the means, standard errors, and confidence intervals of the dependent variables (namely, SCR peak frequency, SCR peak amplitude, and SCR peak duration) for the first minute of each shopping experience in each store. The data is provided in the original values.

Variable	CBT- group* Store type	M (SE)	95%CI		Statistics
			LL	UL	
SCR peak frequency	High-CBT, *FF*	7.87(1.13)	5.59	10.1	F (1, 28) = 4.19,
	High-CBT, *HF*	11.5(1.13)	9.19	13.7	*p = .050**
	Low-CBT, *FF*	10.1 (1.13)	7.86	12.4	
	Low-CBT, *HF*	10.1 (1.13)	7.86	12.4	
SCR peak amplitude	High-CBT, *FF*	.070 (.007)	.051	.096	F (1,28) =7.97,
	High-CBT, *HF*	.068 (.007)	.049	.093	*p = .009*
	Low-CBT, *FF*	.065 (.007)	.047	.090	
	Low-CBT, *HF*	.098 (.007)	.071	.13	
SCR peak duration	High-CBT, *FF*	369 (33.1)	254	469	F (1, 27.1) =5.28,
	High-CBT, *HF*	213 (56.2)	174	402	*p = .030*
	Low-CBT, *FF*	223 (37.4)	172	340	
	Low-CBT, *HF*	192 (26.2)	134	362	

*Table 4-12. Means, standard errors, and confidence intervals of SCR peak frequency, SCR peak amplitude provided in micro-Siemens, and SCR peak duration provided in milliseconds for each type of store, * p <.05, ** p<.1.*

Figure 4-10 illustrates the emotional responses experienced by both groups during the first minute of the shopping experience at each fashion store. A difference in the duration of emotional responses for the two stores was present only in the High-CBT group; specifically, the average SCR peak duration during the shopping experience in the low-end fashion store was longer than the duration in the high-end fashion store. A significant difference in the average SCR peak amplitude indicated during the first minute of shopping experience for two stores was present only for the Low-CBT group.
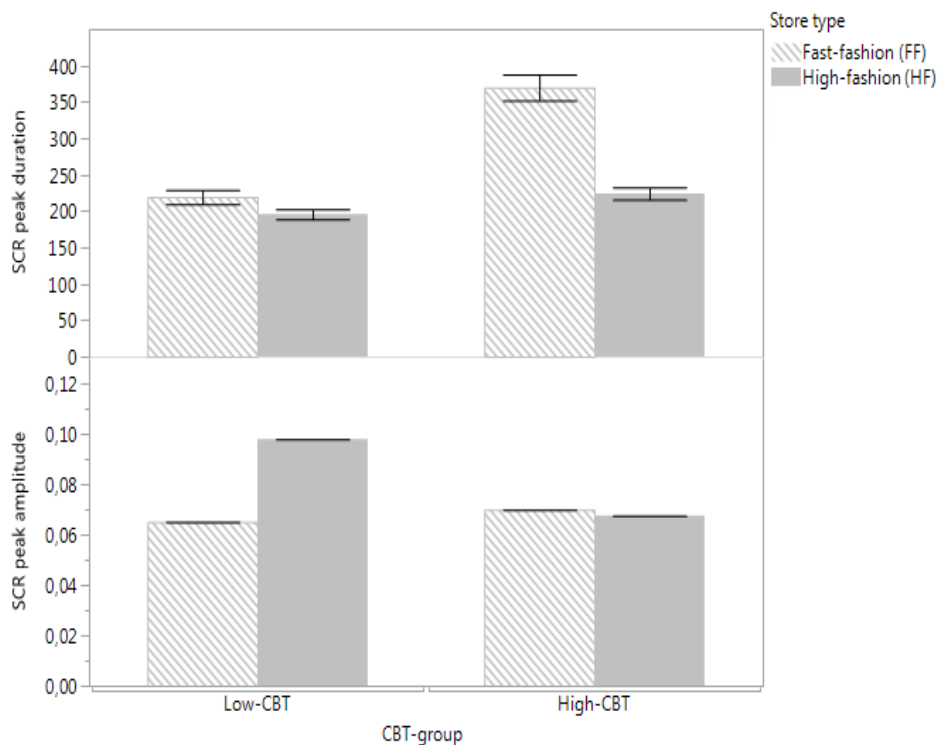
Figure 4-10. Mean SCR peak duration and amplitude experienced during the first minute of the shopping experience in both fashion shops for both consumer groups. Whiskers indicate the standard error. A higher average peak duration and a lower average peak amplitude were demonstrated in the low-end fashion store than in the high-end fashion store. Although the duration effect was present only for the High-CBT group, the amplitude changes were present only for the Low-CBT group. This indicates two different physiological responses patterns for the high and low CBT groups.

In summary, the findings showed that, during the first minute of the shopping experience, the consumers with a high CBT and those with a low CBT experienced the store stimulation differently. The High-CBT group demonstrated a higher number of emotional reactions and a shorter duration of induced arousals by external cues in the high-end fashion store compared to the low-end fashion store. The Low-CBT group, on the other hand, showed no differences in the number of emotional responses between the shops, but they did demonstrate a larger amplitude of emotional reactions in the high-end fashion store compared to the low-end fashion store. Thus, hypothesis H2a-c could be partly supported.

4.6.5. Exploratory Analysis

To provide additional insights into the processes that underlie consumer interaction with the store environment in compulsive buying, two questions were additionally explored:

- *Would the two CBT-groups show significant differences in their emotional responses that underlie their shopping experience during the entire shopping experience in each fashion store, and would those differences be impacted by the fashion store type?*
- *Would there be any significant relationships between the emotional responses underlying the shopping experience and the behavioral shopping outcomes, moderated by the CBT group, for the first minute of the shopping experience and for the entire shopping experience in both fashion stores?*

To answer these questions, first, the differences in the SCR response—in particular, *SCR peak frequency, SCR peak amplitude, and SCR peak duration*— between CBT groups were studied for the whole shopping experience with the fashion-store type as a moderating factor. Secondly, the relationships between the emotional responses underlying the shopping experience and the behavioral shopping outcomes were examined with CBT group as a moderating factor. Exploratory analyses for the relationships were performed for each phase of the shopping experience, i.e., during the first minute of the shopping and over the entire shopping experience in each fashion store.

Exploration of Emotional Responses during the Entire Shopping Period

Following the same data-analysis procedures as in the previous sections, LMMs were estimated with each SCR measure for the entire shopping experience in each shop as a dependent variable and *"CBT-group," "type of store,"* and their interaction as fixed factors. To account for the intra-subject variability, *"Subject ID"* was added as a random intercept. To control for brand liking and brand familiarity effects, these variables were included as covariates. In all tested models, the brand-familiarity and brand-liking variables had no significant effects (*brand liking:* all $ps > .63$, *brand familiarity*: all $ps > .24$) on the studied outcomes, so they were removed from subsequent analyses. In the following section, the calibrated models for each studied emotional response are reported.

SCR peak frequency. First, differences in the SCR peak frequency for the entire shopping period were studied. An LMM including SCR peak frequency as dependent variable; *"CBT-group," "type of store,"* and their interaction as fixed factors; and *"Subject ID"* a random intercept was estimated. Brand liking and brand familiarity were modeled as covariates. The data analysis revealed that all effects were non-significant (*"CBT-group"*: $F(1, 28) = 1.34$, $p = .26$; *"type of store"*: $F(1, 28) = 1.77$, $p = .20$; *"CBT-group" *"type of store"*: $F(1, 28) = .13$, $p = .72$). The table with the parameter estimates of the estimated model is provided below (see Table 4-13).

Effect	β	SE	df	t	p
Intercept	**67.6**	**5.32**	**28**	**12.7**	**<.0001***
CBT- group [Low- CBT]	-6.17	5.32	28	-1.16	.26
Type of store[FF]	4.47	3.37	28	1.33	.20
CBT- group [Low- CBT] * type of store[FF]	1.21	3.37	28	.36	.72

Table 4-13. Solutions for fixed effects, *p < .05.

SCR peak amplitude. Secondly, the differences in the SCR peak amplitude for the entire shopping period were investigated. An LMM that included the SCR peak amplitude as the dependent variable; *"CBT-group," "type of store,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept was estimated. The data analysis revealed that the effects of

"CBT-group" F (1, 28) =.83, *p* = .37*)* and the interaction between *"CBT-group"* and *"type of store"* (*F* (1, 28) =. 54, *p* = .47*)* on the SCR peak amplitude were both non-significant. However, the effect of *"type of store"* (*F* (1, 28) =9.66, *p* = .004) on the SCR peak amplitude proved to be significant. A post-hoc analysis showed that, during the overall shopping experience, the participants demonstrated an SCR peak amplitude that was .015 micro-Siemens higher (indicating a stronger emotional intensity) in the high-end fashion store than in the low-end fashion store. The table with the parameter estimates for the calibrated model is provided below (see Table 4-14).

Effect	β	SE	df	t	p
Intercept	**.087**	**.008**	**28**	**11.4**	**<.0001***
CBT- group [Low- CBT]	.007	.008	28	.91	.37
Type of store[FF]	**-.007**	**.002**	**28**	**-3.11**	**.004***
CBT- group [Low- CBT] * type of store[FF]	.002	.002	28	.74	.47

Table 4-14. Solutions for fixed effects, *p < .05.

SCR peak duration. Finally, the differences in the SCR peak duration for the entire shopping period were examined. An LMM was estimated that included the logarithmically transformed SCR peak duration as the dependent variable and *"CBT-group," "type of store,"* and their interaction as fixed factors. *"Subject ID"* was added to the model as a random intercept. The statistical data analysis showed no significant effect of *"CBT-group"* (*F* (1, 28) = .34, p = .56) or the interaction between *"CBT-group"* and *"type of store"* (*F* (1, 28) = .28, *p* = .60) on SCR peak duration. However, the effect of *"type of store*" (*F* (1, 28) = 10.2, *p* = .003) on SCR peak duration proved to be significant. A post-hoc analysis revealed that participants experienced emotional responses that were 36.4 milliseconds longer in the low-end fashion store than in the high-end fashion store. The table with parameter estimates for the calibrated model is provided below (see Table 4-15).

Effect	β	SE	df	t	p
Intercept	**5.56**	**.15**	**28**	**37.8**	**<.0001***
CBT- group [Low- CBT]	-.086	0.15	28	-.58	.56
Type of store[FF]	**.070**	**.022**	**28**	**3.24**	**.003***
CBT- group [Low- CBT] * type of store[FF]	.012	.22	28	.53	.60

Table 4-15. Solutions for fixed effects, *p < .05.

Table 4-16 summarizes the means, standard errors, and confidence intervals of the dependent variables (i.e., SCR frequency, SCR peak amplitude, and SCR peak duration) calculated for the whole shopping time. The data is provided in the original values. Figure 4-11 presents an illustration of the emotional SCR responses for the entire shopping experience for each fashion store and each CBT group.

Variable	CBT-group	Store type	M (SE)	95%CI		Statistics
				LL	UL	
SCR peak frequency	High-CBT		73.73 (7.53)	58.3	89.2	F (1, 28) = 1.34,
	Low-CBT		61.40 (7.53)	46.0	76.8	*p* = .26
		Fast-fashion	72.0 (6.30)	59.4	84.7	F (1, 28) = 1.77,
		High-end fashion	63.1 (6.30)	50.5	75.7	*p* = .20
		High-CBT, *FF*	77.0 (8.91)	59.1	94.9	F (1, 28) = .13,
		High-CBT, *HF*	70.5 (8.91)	52.6	88.4	*p* = .72
		Low-CBT, *FF*	67.1 (8.91)	49.2	85.0	
		Low-CBT, *HF*	55.7 (8.91)	37.8	73.7	
SCR peak amplitude	High-CBT		.080 (.011)	.058	.10	F (1, 28) =.83,
	Low-CBT		.094 (.011)	.072	.12	*p* = .37
		Fast-fashion	.080 (.008)	.063	.096	F (1, 28) =9.66,
		High-end fashion	.095 (.008)	.078	.11	***p = .004***
		High-CBT, *FF*	.071 (.011)	.048	.094	F (1, 28) =.55,
		High-CBT, *HF*	.089 (.011)	.066	.11	p = .47
		Low-CBT, *FF*	.088 (.011)	.065	.11	
		Low-CBT, *HF*	.010 (.011)	.077	.12	
SCR peak duration	High-CBT		284 (1.23)	185	435	F (1, 28) = .34,
	Low-CBT		239 (1.23)	156	366	*p* = .56
		Fast-fashion	279 (1.16)	206	378	F (1, 28) =10.2,
		High-end fashion	243 (1.16)	179	329	***p = .003***
		High-CBT, *FF*	301 (1.23)	196	462	F (1, 28) = .28,
		High-CBT, *HF*	268 (1.23)	174	412	*p* = .60
		Low-CBT, *FF*	259 (1.23)	169	399	
		Low-CBT, *HF*	220 (1.23)	143	339	

Table 4-16. Means, standard errors, and confidence intervals of SCR peak frequency, SCR peak amplitude provided in micro-Siemens, and SCR peak duration provided in milliseconds, * p <.05.
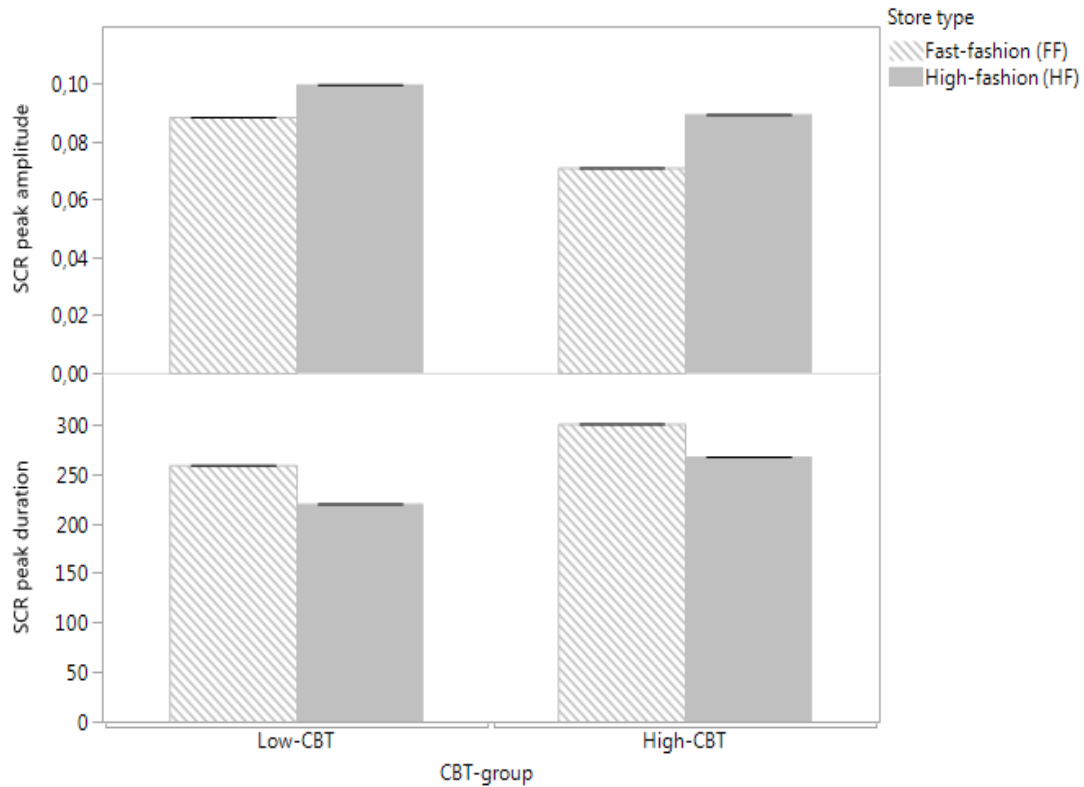
Figure 4-11. Mean SCR peak duration and amplitude experienced during a shopping experience in both shops for both groups. A longer average peak length and lower average peak amplitude were encountered in the low-end fashion store compared to the high-end fashion store. This effect did not differ between CBT groups.

In summary, the data analyses showed that, over the entire shopping experience, there were no differences in the evoked emotional excitation (i.e., experienced emotional peaks), intensity (i.e., experienced SCR peak amplitude), and duration of the emotional reactions between the two CBT groups and between the CBT groups depending on the fashion-store type. However, regardless of their CBT level, the participants showed a generally larger average SCR peak amplitude and shorter SCR peak duration in the high-end fashion store compared to the low-end fashion store. This indicates a more generally emotionally intensified shopping experience in the high-end fashion store than in the low-end fashion store.

Exploration of Relationships between Emotional Responses and Behavioral Outcomes

The relationships between the emotional responses underlying the shopping experience and the behavioral shopping outcomes were further studied using mixed-effects regression models. In particular, the links between each physiological measure (i.e., SCR peak frequency, SCR peak amplitude, and SCR peak duration) and each behavioral shopping outcome (i.e., time spent on shopping, number of items chosen, and hypothetical spending) were examined by estimating LMMs that featured "*CBT-group*" as a moderating factor and "*Subject ID*" as a random intercept. Separate analyses were run for the two phases of shopping (i.e., during the first minute of shopping experience and over the entire shopping period in each fashion store).

For each shopping phase, the relationships between each emotional response variable (e.g., SCR peak frequency) and the logarithmically transformed time spent on shopping were first studied. Secondly, the links between each emotional response variable (e.g., SCR peak frequency) and the number of chosen items were explored. Third, the relationships between each emotional response variable (e.g., SCR peak frequency) and logarithmically transformed hypothetical spending were examined. The results for the relationships between the emotional responses experienced during the first minute of shopping in both stores and the behavioral shopping outcomes are further reported.

Emotional Responses during the First Minute of Shopping Experience and Behavioral Outcomes

In the following section, all non-significant relationships are briefly introduced (for extended analysis report, see Appendix 7, section 8.7).

- *SCR peak frequency and time spent on shopping*. The LMM analysis showed that all estimated effects were non-significant (*SCR peak frequency:* $F_{(1, 55.4)} = .091$, $p = .76$; "*CBT-group*": $F_{(1, 27)} = .60$, $p = .44$; *SCR peak frequency* *"*CBT-group:* $F_{(1, 55.4)} = 1.66$, $p = .20$).

- *SCR peak amplitude and time spent on shopping*. The LMM analysis showed that all estimated effects were non-significant (*SCR peak amplitude*: $F_{(1, 48.8)} = 1.38$, $p = .24$; "*CBT-group*": $F_{(1, 27.2)} = .34$, $p = .57$; *SCR peak amplitude**"*CBT-group*": $F_{(1, 48.8)} = .021$, $p = .88$).

- **SCR peak frequency and number of chosen items**. The LMM analysis showed that all estimated effects were non-significant (*SCR peak frequency:* $F_{(1, 52.1)} = .042$, $p = .84$, *"CBT-group":* $F_{(1, 26.0)} = 1.38$, $p = .25$; *SCR peak frequency *"CBT-group":* $F_{(1, 52.1)} = .012$, $p = .91$).

- **SCR peak amplitude and number of items chosen**. The LMM analysis showed that all estimated effects were non-significant (*SCR peak amplitude:* $F_{(1, 48.8)} = 1.38$, $p = .24$, *"CBT-group":* $F_{(1, 27.2)} = .34$, $p = .57$; *SCR peak amplitude*"CBT-group":* $F_{(1, 48.8)} = .021$, $p = .88$).

- **SCR peak duration and number of items chosen**. The LMM analysis showed that all estimated effects were non-significant (*SCR peak duration:* $F_{(1, 39.2)} = 1.41$, $p = .24$, *"CBT-group":* $F_{(1, 25.8)} = .70$, $p = .41$; *SCR peak duration*"CBT-group":* $F_{(1, 39.2)} = 2.40$, $p = .13$).

- **SCR peak duration and hypothetical spending.** The LMM analysis showed that all estimated effects were non-significant (*SCR peak duration:* $F_{(1, 35.9)} = .043$, $p = .84$, *"CBT-group":* $F_{(1, 21.5)} = 2.69$, $p = .12$; *SCR peak duration*"CBT-group":* $F_{(1, 35.9)} = .057$, $p = .81$).

The statistically significant results for the relationships between the emotional responses underlying the first minute of the shopping experience and the behavioral shopping outcomes during excursion through both fashion stores are further outlined.

SCR peak duration and time spent on shopping. To study the relationship between the SCR peak duration for the first minute of shopping and the time spent on shopping over the entire shopping experience including a *"CBT-group"* as a moderating variable, an LMM was estimated. The logarithmically transformed time spent on shopping was modeled as the dependent variable; SCR peak duration, *"CBT-group,"* and their interaction were included as fixed factors; and *"Subject ID"* was modeled as a random intercept. The LMM analysis showed no significant effect of *"CBT-group"* ($F_{(1, 27.4)} = .051$, $p = .82$) or the effect of interaction between *SCR peak duration* and *"CBT-group"* ($F_{(1, 49.9)} = .49$, $p = .49$) on the time spent on shopping. However, the data analysis revealed a significant effect of the SCR peak duration ($F_{(1, 49.9)} = 5.20$, $p = .027$) on the time spent on shopping (see Figure 4-12). The table with the parameter estimates for the LMM model is provided below (see Table 4-17).

Effect	β	SE	df	t	p
Intercept	**5.78**	**.12**	**41.8**	**50.2**	**<.0001***
SCR duration	**.0007**	**.0003**	**49.9**	**2.28**	**.027***
"CBT-group" [Low- CBT]	-.017	.073	27.4	-.23	.82
SCR duration* "CBT-group" [Low- CBT]	-.0002	.0003	49.9	-.70	.49

*Table 4-17. Solutions for fixed effects, *p< .05.*
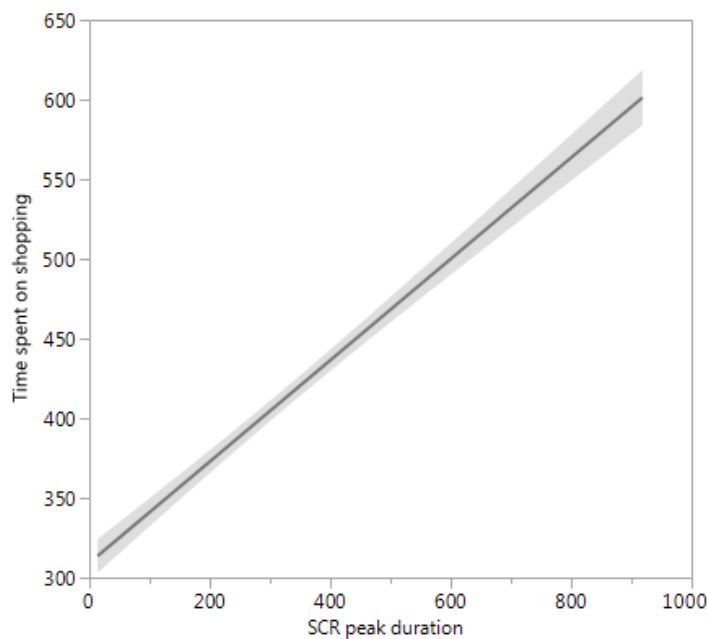
Figure 4-12. A positive direct relationship between the mean SCR peak duration for the first minute of the shopping experience and time spent on shopping for the entire shopping experience. The SCR peak duration is reported in milliseconds, and the time spent on shopping is transformed back into the original scale and depicted in seconds.

SCR peak frequency and hypothetical spending. To study the relationship between the SCR peak frequency for the first minute of shopping and hypothetical spending for the entire shopping experience including a *"CBT-group"* as a moderating variable, an LMM was calibrated. The model included a logarithmically transformed hypothetical spending as the

dependent variable; SCR peak frequency, *"CBT-group,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. The data analysis demonstrated no significant direct effects of SCR peak frequency (F $(1, 55.6) = 2.07$, $p = .16$) or *"CBT-group"* (F $(1, 25.7) = 2.94$, $p = .099$) on hypothetical spending. However, the data analysis did reveal a significant effect of the interaction between SCR peak frequency and *"CBT-group"* (F $(1, 56) = 4.33$, $p = .042$) on hypothetical spending. The table with the model parameter estimates for the LMM is provided below (see Table 4-18).

Effect	β	SE	df	t	p
Intercept	**6.97**	**.22**	**52.8**	**31.5**	**<.0001***
SCR frequency	.029	.020	56	1.44	.16
"CBT-group" [Low- CBT]	-.17	.097	25.7	-1.71	.099
SCR frequency * "CBT-group" [Low- CBT]	**-.041**	**.020**	**56**	**-2.08**	**.042***

Table 4-18. Solutions for fixed effects, *p< .05.

To specify a significant interaction, spotlight analyses (Krishna, 2016; for an application, see Landwehr et al., 2013) were conducted with a dummy-coded *"CBT-group"*. For the first dummy-coding case (0 = Low-CBT group, 1 = High-CBT group), all terms that did not interact with CBT were assessed on the low level of CBT (i.e., Low-CBT). An LMM with SCR peak frequency, dummy-coded *"CBT-group,"* and their interaction as predictors; logarithmically transformed *hypothetical spending* as the dependent variable; and *"Subject ID"* as a random effect was estimated. Next, the dummy coding of the *"CBT-group"* was changed to assess all terms that do not interact with CBT on the high level of CBT (i.e., High-CBT). In this case, reversed coding was used (i.e., 1 = Low-CBT group, 0 = High-CBT group), and the LMM was recalibrated. The data analysis indicated that the SCR peak frequency could significantly predict the hypothetical spending in the High-CBT group (β= .071, SE = .027, t = 2.60, p =.012), but not in the Low-CBT group (β= -.013, SE = .030, t = -.44, p =.66) (see Figure 4-13). In other words, stronger emotional excitation during the first minute of shopping experience could predict a higher potential to spend more money during the whole shopping time only when participants had a high CBT and not when they had a low CBT.
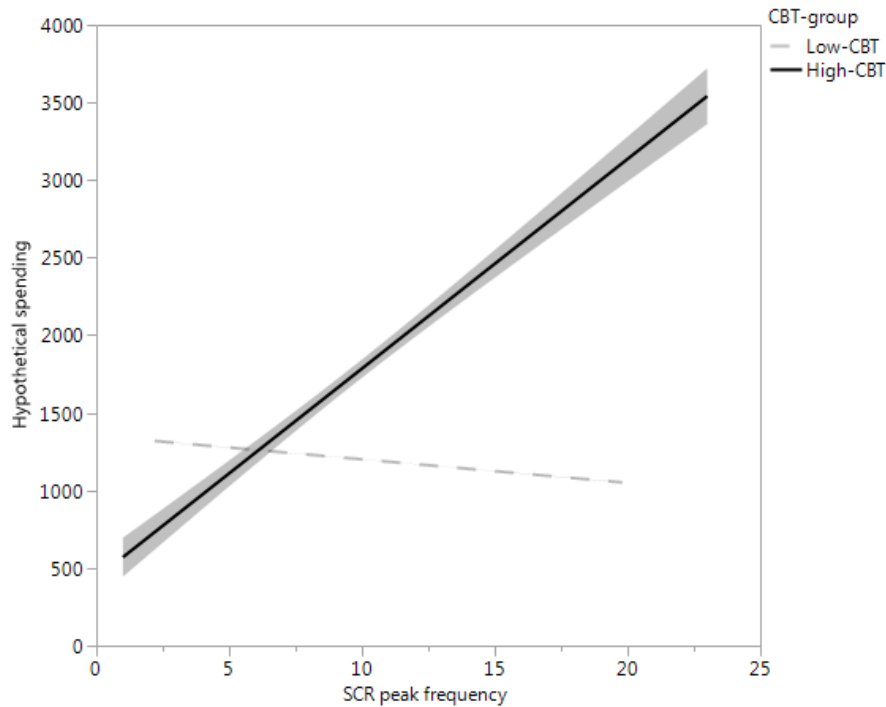
Figure 4-13. The relationship between SCR peak frequency during the first minute of shopping and hypothetical spending by CBT group. The positive relationship between the SCR peak frequency experienced during the first minute of shopping and the hypothetical spending was only present in the High-CBT group. Hypothetical spending is transformed back into the original scale and depicted in Danish krone.

SCR peak amplitude and hypothetical spending. To study the relationship between the SCR peak amplitude for the first minute of shopping and hypothetical spending for the entire shopping experience including a *"CBT-group"* as a moderating variable, an LMM was estimated. The LMM included the logarithmically transformed hypothetical spending as the dependent variable; SCR peak amplitude, *"CBT-group,"* and their interaction as fixed factors; and *"Subject ID"* as the random intercept. The data analysis revealed no significant effects of the SCR peak amplitude (F (1, 39.9) = .37, *p* = .55) or *"CBT-group"* (F (1, 27.0) = 3.62, *p* =.068**)[18] on hypothetical spending. However, the analysis did demonstrate a significant of the interaction effect between SCR peak amplitude and *"CBT-group"* (F (1, 39.9) = 4.66, p = .037) on hypothetical spending. The table with model parameter estimates is provided below (see Table 4-19).

---

[18] Significant at the 90% of confidence level, **p< .1

Effect	β	SE	df	t	p
Intercept	7.12	.18	36.8	40	<.0001*
SCR peak amplitude	1.11	1.83	39.9	.61	.55
"CBT-group" [Low- CBT]	-.17	.089	27.0	-1.90	.068**
SCR peak amplitude* "CBT-group" [Low- CBT]	3.95	1.83	39.9	2.16	.037*

*Table 4-19. Solutions for fixed effects *p< .05, **p<.01.*

To further investigate the indicated effects and specify significant interaction, spotlight analyses (Krishna, 2016; for an application, see Landwehr et al., 2013) were conducted with the *"CBT-group"* dummy-coded following the same procedure as in the previous section. Thus, to study all the terms that do not interact with CBT on the low level of CBT (i.e., Low-CBT), the following dummy coding was used: 0 = Low-CBT group, 1 = High-CBT group. Afterwards, the dummy coding of the *"CBT-group"* was reversed to assess all terms that do not interact with CBT on the high-CBT level (i.e., High-CBT), that is, 1 = Low-CBT group, 0 = High-CBT group. Two LMMs were estimated that included SCR peak amplitude, dummy-coded *"CBT-group,"* and their interaction as predictors; the logarithmically transformed hypothetical spending as the dependent variable; and *"Subject ID"* as a random effect were estimated. The data analysis demonstrated that a significant effect of the SCR peak amplitude on hypothetical spending was only present for the Low-CBT group (β = 5.06, SE = 1.91, t = 2.65, *p* =.011), not for the High-CBT group (β = -2.84, SE = 3.12, t = -.91, *p* =.37) (see Figure 4-14). In other words, a stronger intensity of the emotional response experienced during the first minute of the shopping trip could predict a higher hypothetical spending for participants with a low CBT, not for the consumers with a high CBT.
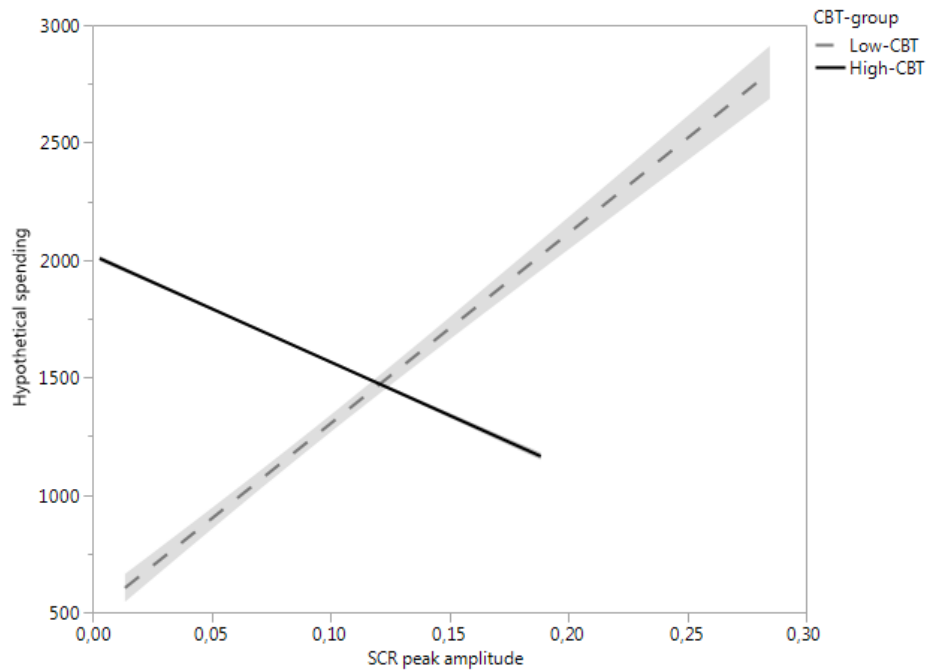
Figure 4-14. The relationship between average SCR peak amplitude and hypothetical spending for the two CBT groups. A positive relationship between the average SCR peak amplitude experienced during the first minute of shopping and hypothetical spending was only present for the Low-CBT group. Hypothetical spending is transformed back into the original scale and depicted in Danish krone.

In summary, the physiological arousal measures experienced during the first minute of shopping experience in each fashion store (namely, SCR peak frequency and SCR peak amplitude) positively predicted only one of the behavioral shopping-experience outcomes (namely, hypothetical spending). This effect was moderated by the CBT group. Specifically, a higher SCR frequency could predict the higher potential for spending more money in the High-CBT group, but a higher SCR peak amplitude could predict higher hypothetical spending in the Low-CBT group. Additionally, the SCR peak duration during the first minute of the shopping experience could directly predict the time spent on the entire shopping experience regardless of the CBT group.

Emotional Responses during the Entire Shopping Period and Behavioral Outcomes

The relationships between the three emotional responses that underlie the entire shopping experience and the three behavioral shopping-experience outcomes moderated by *"CBT-group"* and controlled for the intra-subject variation by including *"Subject ID"* as a random intercept were further explored.

- **SCR amplitude and time spent on shopping**. An LMM analysis showed that all estimated effects were non-significant (*SCR peak amplitude*: F (1, 43.9) = 2.86, *p* = .098; *"CBT-group":* F (1, 25.8) = .25, *p* =.62; *SCR peak amplitude * "CBT-group":* F (1, 43.9) = .0007, p = .98).

- **SCR peak amplitude and the number of items chosen.** An LMM analysis showed that all estimated effects were non-significant: (*SCR peak amplitude*: F (1, 31.4) = .80, *p* = .38; *"CBT-group":* F (1, 24.8) = 1.95, *p* =.18); *SCR peak amplitude *" CBT-group:* (F (1, 31.4) = 1.19, *p* = .28)*.

- **SCR peak duration and number of items chosen**. An LMM analysis showed that all estimated effects were non-significant (*SCR peak duration:* F (1, 27.9) = .25, *p* = .62, *"CBT-group":* F (1, 26.1) = 1.17, *p* =.29; *SCR peak duration*"CBT-group":* F (1, 27.9) = .78, p = .38).

- **SCR peak duration and hypothetical spending.** An LMM analysis showed that all estimated effects were non-significant (*SCR peak duration:* F (1, 27.5) = .57, *p* = .46, *"CBT-group":* F (1, 25.5) = 2.45, *p* =.13; *SCR peak duration*"CBT-group":* F (1, 27.5) = .43, *p* = .52).

The statistically significant results for the relationships between the emotional responses experienced during the entire shopping experience and the behavioral shopping-experience outcomes in both stores are discussed in more detail below.

SCR peak frequency and time spent on shopping. To study the relationship between the SCR peak frequency for the entire shopping experience and the time spent on shopping including a *"CBT-group"* as a moderating variable, an LMM was estimated. The LMM included the logarithmically transformed time spent on shopping as the dependent variable; SCR frequency, *"CBT-group,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. The data analysis demonstrated a direct and significant effect of SCR peak frequency (F (1, 56)

= 56.0 $p < .0001$) on time spent on shopping (see Figure 4-15). All other effects on time spent on shopping were non-significant *("CBT-group"*: $F (1, 28.2) = .008$, $p = .93$); *SCR frequency *"CBT-group"*: $F (1, 56) = .013$, $p = .91$). The table with the model-parameter estimates is provided below (see Table 4-20).

Effect	β	SE	df	t	p
Intercept	**5.35**	**.10**	**52.7**	**52.7**	**<.0001***
SCR frequency	**.010**	**.001**	**56**	**7.24**	**<.0001***
"CBT-group" [Low- CBT]	.005	.050	28.2	.09	.93
SCR frequency * "CBT-group" [Low- CBT]	.0002	.001	56	.11	.91

Table 4-20. Solutions for fixed effects *p< .05.
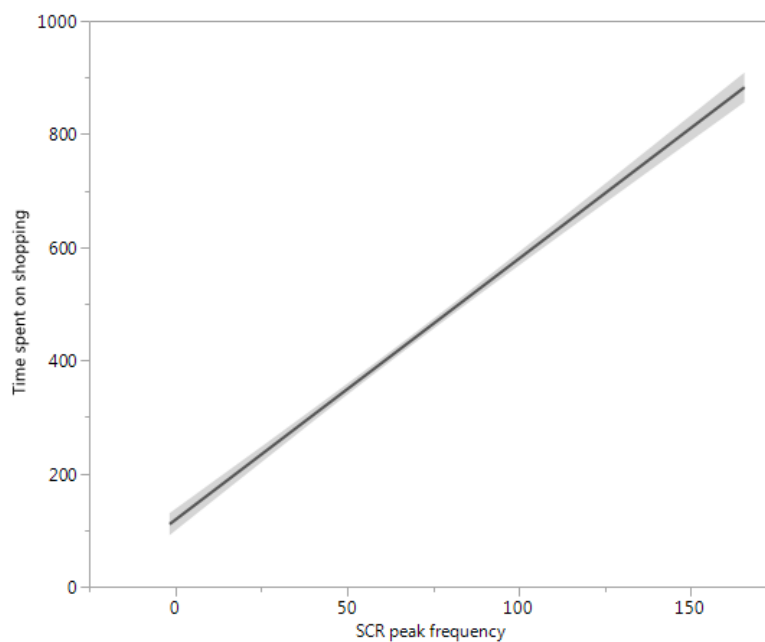
Figure 4-15. The positive relationship between SCR peak frequency and time spent on shopping, independent from CBT. Time spent on shopping is transformed back to the original values and depicted in seconds.

SCR peak duration and time spent shopping. To examine the relationship between the SCR peak duration for the entire shopping experience and the time spent on shopping including a *"CBT-group"* as a moderating variable, an LMM was estimated. The LMM had the logarithmically transformed time spent on shopping as the dependent variable; SCR peak duration, *"CBT-group,"* and their interaction as fixed factors; and *"Subject ID"* as the random intercept. An LMM analysis demonstrated a marginally significant effect of *SCR peak duration* $(F (1, 30.1) = 4.09, p = .052**)^{19}$ on time spent on shopping, but all other effects on time spent on shopping were non-significant (*"CBT-group"*: F (1, 26.3) = .17, p =.69; *SCR peak duration**"CBT-group"*: F (1, 30.1) = .46, p = .50). The table with the model-parameter estimates is provided below (see Table 4-21).

Effect	β	SE	df	t	p
Intercept	**5.81**	**.12**	**29.1**	**47.8**	**<.0001***
SCR peak duration	**.0006**	**.0003**	**30.1**	**2.02**	**.052****
"CBT-group" [Low- CBT]	-.029	.070	26.3	-.41	.69
SCR peak duration * "CBT-group" [Low- CBT]	.0002	.0003	30.1	.68	.50

Table 4-21. Solutions for fixed effects *p< .05, ** p <.1.

SCR peak frequency and the number of items chosen. To study the relationship between the SCR peak frequency for the entire shopping experience and the number of items chosen including a *"CBT-group"* as a moderating variable, an LMM was calibrated. The LMM included the number of items as the dependent variable; SCR frequency, *"CBT-group,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. The LMM analysis showed a significant positive effect of SCR frequency (F (1, 51.5) = 5.18, *p* = .027) (see Figure 4-16) on the number of chosen items, but all other effects on the number of chosen items were non-significant (*"CBT-group"*: F (1, 26.4) = .55, p =.47; *SCR frequency * "CBT-group"*: F (1, 51.5) = .30, p = .58). The table with the model-parameter estimates is provided below (see Table 4-22).

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[19] Significant effect for the 90% level of confidence, **p< .1.

Effect	β	SE	df	t	p
Intercept	2.10	.70	46.1	2.99	.004*
SCR frequency	.022	.010	51.5	2.27	.027*
"CBT-group" [Low- CBT]	-.23	.31	26.4	-.74	.47
SCR frequency * "CBT-group" [Low- CBT]	.005	.010	51.5	.55	.58

*Table 4-22. Solutions for fixed effects *p< .05, **p<.1.*
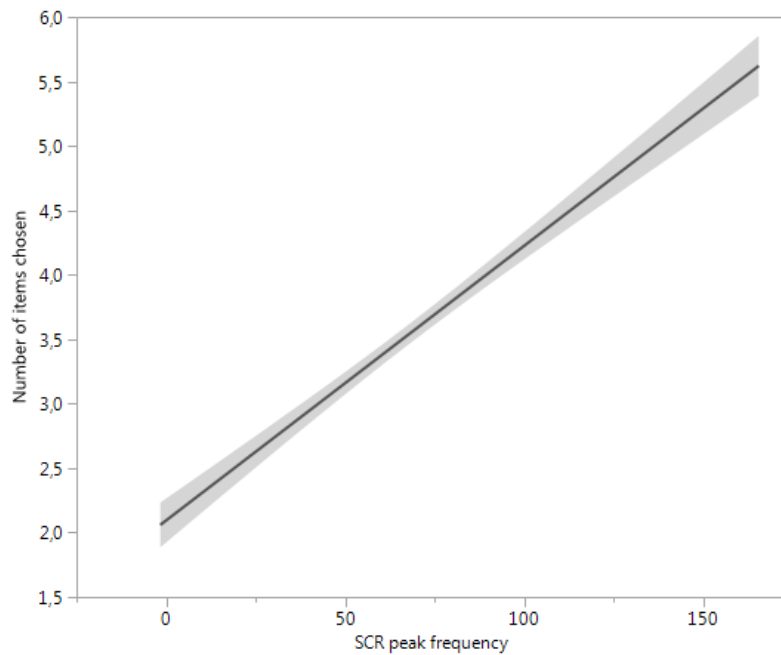
Figure 4-16. The positive relationship between SCR peak frequency during the entire shopping experience and the number of items chosen that was not dependent on the CBT group.

SCR peak frequency and hypothetical spending. To study the relationship between the SCR peak frequency for the entire shopping experience and hypothetical spending including a *"CBT-group"* as a moderating variable, an LMM was estimated. The LMM included the logarithmically transformed hypothetical spending as the dependent variable; SCR frequency, *"CBT-group,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. The data analysis demonstrated no significant effect of *SCR frequency* ($F_{(1, 52.1)} = .46$, $p = .50$) or the interaction between *SCR frequency* and *"CBT-group"* ($F_{(1, 52.2)} = .56$, $p = .46$) on hypothetical spending. However, the effect of *"CBT-group"* ($F_{(1, 27.7)} = 3.17$, $p = .086$) on

hypothetical spending was marginally significant. The table with the model-parameter estimates is provided below (see Table 4-23).

Effect	β	SE	df	t	p
Intercept	7.37	.21	47.1	34.5	<.0001*
SCR frequency	-.002	.003	52.2	-.68	.50
"CBT-group" [Low- CBT]	-.17	.10	27.7	-1.78	.086**
SCR frequency * "CBT-group" [Low- CBT]	-.002	.003	52.2	-.75	.46

Table 4-23. Solutions for fixed effects, *p< .05, **p<.1.

SCR peak amplitude and hypothetical spending. To study the relationship between the SCR peak amplitude for the entire shopping experience and hypothetical spending including a *"CBT-group"* as a moderating variable, an LMM was calibrated. The LMM included the logarithmically transformed hypothetical spending as the dependent variable; the SCR peak amplitude, *"CBT-group,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept. The LMM analysis demonstrated a significant direct effect of SCR peak amplitude (F (1, 34.4) = 7.15, *p* = .011) (see Figure 4-17) on hypothetical spending, and a significant main effect of *"CBT-group"* (F (1, 24.4) = 4.70, *p* =.040) (see Figure 4-18) on hypothetical spending. However, the effect of the interaction between SCR peak amplitude and *"CBT-group"* (F (1, 34.4) = .20, p = .66) on hypothetical spending proved to be non-significant. The table with model-parameter estimates is provided below (see Table 4-24).

Effect	β	SE	df	t	p
Intercept	6.75	.20	31.7	33.2	<.0001*
SCR peak amplitude	5.59	2.09	34.4	2.67	.011*
"CBT-group" [Low- CBT]	-.20	.092	24.4	-2.17	.040*
SCR peak amplitude * "CBT-group" [Low- CBT]	.93	2.09	34.4	.45	.66

Table 4-24. Solutions for fixed effects, *p< .05.
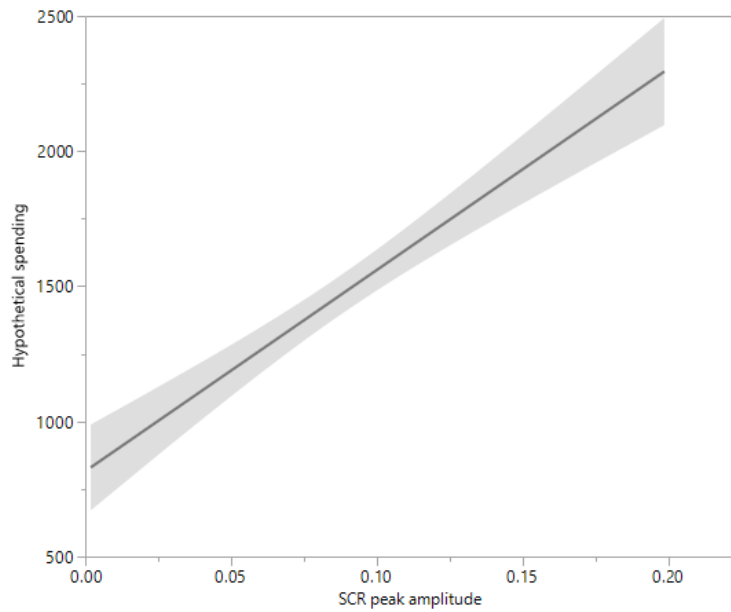
Figure 4-17. A higher mean SCR peak amplitude experienced during the entire shopping time in each fashion store was positively linked to a higher amount of money spent on chosen items, regardless of the CBT group. Hypothetical spending is transformed back to the original scale and depicted in Danish krone.
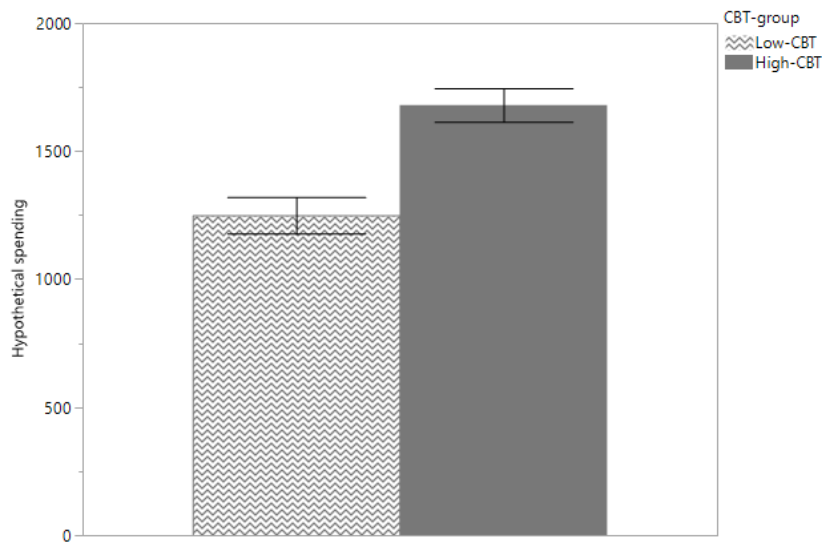
Figure 4-18. Higher hypothetical spending was shown for the High-CBT group than for the Low-CBT group over the entire shopping trip. Hypothetical spending is transformed back to the original scale and depicted in Danish kroner.

To conclude, regardless of the consumers CBT level, the SCR peak frequency and SCR peak duration experienced during the entire shopping experience in each fashion store was positively linked to the time spent on shopping. The SCR peak frequency was also positively linked with the number of chosen items during each shopping experience. However, no significant relationship between the SCR peak amplitude and the above-mentioned behavioral-shopping outcomes were shown. However, a higher emotional intensity experienced during the entire shopping time indicated by higher SCR amplitude was positively related to a higher willingness to hypothetically spend more money for the shopping items.

4.7. Summary of Results

In summary, the developed hypotheses could be partly supported. The results of the study provide evidence that the two CBT groups demonstrated different emotional and behavioral responses that characterized their in-store behavior in the fashion domain. First, contrary to what was expected in hypothesis H1a-c, participants with a high CBT or those with a low CBT did not differ in terms of how much time they spent on shopping or how many items they ultimately chose during their shopping experiences in two fashion stores. However, instead of selecting more items, consumers with a high CBT were more likely to hypothetically spend more money by choosing more-expensive fashion goods in both fashion stores than consumers with a low CBT. Thus, hypothesis H1a-c was partly supported. Secondly, following hypothesis H2a-c, it was expected that, at the beginning of their shopping experience in each fashion store, consumers with a high CBT would show a higher frequency of indicated emotional peaks. Additionally, those responses would be of higher amplitude and shorter duration than those experienced by the low-CBT consumer segment. Furthermore, the differences between the groups would be more expressed in the high-end fashion store as compared to the low-end fashion store. This expectation, however, was only partially supported by the findings. During the first minute of the shopping experience, the two CBT groups experienced the store stimulation differently because the emotional responses experienced by each group of consumers varied depending on the store context (i.e., high-end fashion store versus low-end fashion store). Interestingly, contrary to what was expected, specific responses were present only in a specific group of consumers. In particular, the High-CBT group showed a stronger emotional excitation—measured by an increased number of SCR peaks—and a shorter length of experienced emotional responses—measured by a shorter SCR peak duration—

in the high-end fashion store than in the low-end fashion store. The Low-CBT group, on the other hand, demonstrated differences in the intensity of their emotional responses, such as showing a higher SCR peak amplitude, in the high-end fashion store than in the low-end fashion store.

Two questions were additionally explored to provide a more in-depth understanding of the emotional processes underlying the shopping experience as well as in-store behavior in compulsive buying. The exploratory data analyses provided some interesting results. First, the differences in the emotional reactions of the two groups were studied for the whole shopping period. Significant group differences in their emotional responses proved to be only present at the beginning of their shopping experience, not during the entire shopping experience. However, for the entire shopping experience, the participants demonstrated store dependent differences. Specifically, participants showed a higher-amplitude and shorter duration of emotional responses in the high-end fashion store than in low-end fashion store, regardless of their CBT level. However, no group or store differences were found for the number of SCR peaks caused by the encountered stimulation during the entire shopping time.

Secondly, the relationships between the emotional responses underlying the shopping experience and the behavioral outcomes for the two CBT groups were also explored. Different results were obtained for the two phases of shopping. In addition, different emotional responses were linked to specific behavioral outcomes. Specifically, for the first minute of the shopping experience, both physiological arousal measures (i.e., SCR frequency and SCR peak amplitude) showed a positive relationship with only one behavioral outcome, namely, the hypothetical spending. In addition, these effects were dependent on the CBT group. Although a positive relationship between the SCR peak frequency and hypothetical spending was present in the High-CBT group, the positive relationship between the SCR peak amplitude and hypothetical spending was apparent only in the Low-CBT group. Additionally, independent from the CBT group, the SCR peak duration indicted for the first minute of shopping experience in each fashion store could predict the total time spent on shopping.

For the full duration of the shopping experience, the SCR peak frequency experienced during the shopping experience was positively linked to the time spent on the shopping and the number of chosen items. In addition, the SCR peak amplitude for the entire shopping period was positively related to the hypothetical spending. Finally, the SCR peak duration indicated during the whole

shopping experience was positively linked to the time spent in the store. This effect was only marginally significant. None of these relationships were moderated by the CBT group. Possible explanations of these results are discussed in the following section.

A summary of the developed hypotheses and explorative questions as well as the corresponding study findings are presented in Table 4-25.

Supported (+), partly supported (+/-), not supported (-).

Hypotheses	Outcome	Findings
H1 a-c. CBT groups will show significant differences in their behavioral shopping outcomes. The High-CBT group, when compared to the Low-CBT group, will demonstrate (a) a longer time spent on shopping, (b) a higher number of chosen items, and (c) a higher hypothetical spending during a shopping experience. This effect will differ depending on the fashion-store type: namely, there will be a stronger effect in the high-end fashion store compared to the low-end fashion store.	+/-	There were no significant group differences for a (a) time spent on shopping or (b) number of items chosen during a shopping experience. There was a positive effect of CBT-group on hypothetical spending independent from fashion-store type. In particular, the High-CBT group showed a higher amount of money hypothetically spent for the items chosen during the shopping trip than the Low-CBT group.
H2 a-c. CBT groups will show significant differences in their emotional responses at the beginning of a shopping experience in each fashion store. The High-CBT group, when compared to the Low-CBT group, will demonstrate (a) higher emotional excitation, (b) stronger intensity of emotional reactions, and (c) a shorter duration of emotional responses. This effect will differ depending on the fashion-store type: namely, there will be a stronger effect in the high-end fashion store compared to the low-end fashion store.	+/-	There were significant group differences for (a) emotional excitation, (b) intensity of emotional reaction, and (c) duration of the emotional response experienced at the beginning of a shopping experience in each fashion store. These effects were dependent on the fashion-store type. Specifically, a higher frequency of emotional responses and a shorter duration of emotional responses was present only for the High-CBT group in the high-end fashion store compared to the low-end fashion store. A higher amplitude of responses indicating a stronger emotional response intensity was present in the Low-CBT group in a high-end store in comparison to the low-end fashion store.

Exploratory questions	Findings
Would the two CBT-groups show significant differences in their emotional responses that underlie their shopping experience during the entire shopping period, and would those differences be impacted by the fashion-store type?	There were no significant general or store-dependent differences between the CBT groups for any of the variables representing physiological emotional reactions. There were no differences shown in a) emotional excitation indicated by a frequency of emotional responses, b) intensity of emotional reaction, and c) duration of the emotional reaction during the entire shopping experience.
Would there be any significant relationships between the emotional responses underlying the shopping experience and the behavioral shopping outcomes for the CBT groups: 1) *for the first minute of the shopping experience and*	There was a positive relationship between emotional responses underlying the shopping experience and hypothetical spending moderated by the CBT-group during the first-minute of shopping experience. Specifically, a positive relationship between SCR peak frequency and hypothetical spending was present, but only for the High-CBT group. Moreover, a positive relationship between the SCR peak amplitude and hypothetical spending was present for the Low-CBT group. The SCR duration was positively linked to the time spent on shopping, independent from the CBT-group.
2) *for the entire shopping experience in both fashion stores?*	There was a positive relationship between the emotional responses underlying the entire shopping experience and behavioral outcomes, regardless of the CBT-group. In particular, there was a positive relationship between the SCR peak frequency and the two behavioral outcomes (i.e., time spent on shopping and a total amount of chosen items). Moreover, there was also a positive relationship between the SCR peak amplitude and hypothetical spending. Lastly, there was a marginally significant positive relationship between the SCR duration and time spent on shopping.

Table 4-25. Summary of hypotheses, exploratory questions, and corresponding findings.

4.8. Discussion

This study is the first attempt to examine the underlying processes that occur in compulsive buying during an interaction with a store environment representing a single fashion-apparel brand. The research findings show that consumers with a high CBT, in comparison to consumers with a low CBT, tend to process and respond to the store environment differently. Although not all the hypotheses were supported, the findings demonstrated some substantial differences between two segments of consumers interested in fashion consumption. The results of this study provide a better understanding of in-store information processing underlying behavioral and emotional responses that can characterize the consumer-brand interaction in compulsive buying in the fashion context. This offers relevant contributions to the academic community, marketing practitioners, and consumer and public policy domains concerned about compulsive buying.

4.8.1. Theoretical and Methodological Contributions

Behavioral outcomes. First, this research contributes to the knowledge on in-store consumer behavior in compulsive buying in the fashion context. Consistent with previous findings (e.g., Kukar-Kinney et al., 2012; Lo & Harvey, 2011, 2012; McElroy et al., 1994), there were statistically significant differences between consumers with a low and high CBTs in their hypothetical spending behavior during their shopping experience. Contrary to what was expected, there were no differences between the two segments of consumers in terms of how many items they selected and how much time they spent during their shopping trips. However, instead of choosing more fashion items, consumers with a high CBT instead chose more-expensive products in both fashion stores (i.e., low-end and high-end fashion stores). A few explanations can be provided for these findings. According to Kukar-Kinney et al. (2012), compulsive buyers tend to be more sensitive to prestige and more willing to paying a higher price for fashion items. Instead of relying on price-quality heuristics, they tend to act as "*smart shoppers*" by searching for a higher transaction value and a better deal on the brands of interest, and this provides them with instant gratification (ibid). Additionally, Lejoyeux et al. (2007) has shown that, specifically within the French sample, women tend to report spending more money for items with which they have an emotional or narcissistic relationship. Instead of seeking in-

store sales, they instead preferred shopping in the smaller boutiques that sold designers' brands. Another study conducted by Lo and Harvey (2012) showed that compulsive buyers tend to be less budget-conscious during shopping, indicating a lower concern with their budget and a higher tendency to overspend.

To further clarify this assumption and better understand the underlying motivations that can explain the demonstrated results, the self-reported reflections on the shopping experience provided by each participant were explored. Some women indicated that specific strategies guided their choices. Even though consumers with a high CBT showed higher hypothetical spending than the low-CBT consumers in both shops during the experiment, in their self-reported reflections, the women indicated a slightly more positive attitude towards the high-end fashion store. When asked about their buying decisions in the high-end fashion store, one of the respondents with a high CBT reported that *"High fashion is not for wearing it every day. I have a good feeling to have them on. It represents the brand that everyone can see. I did not need all of them, but this is OK, not that much for the price"*. Another participant reflected *"I can relate to the high quality, it represents the different brand. Even I do not need any of it; I take it... I am open to anything"*, *"… shopping is for making my style – you will never find that item again – you have only one chance. I choose a designer's brand rather than quantity"*. Some women in the high CBT segment also indicated that they were aware of the provided budget limitation and this impacted their choices: *"Generally, I do not like to go shopping. The rule that I follow is that I choose things on sale within my budget... Money is a limitation for me"*. While being asked about their choices in the low-end fashion store, most of the women reported choosing items that they liked or would be of practical value for their everyday life. Some women from the consumer group with a high CBT also mentioned the motives related to the representation of self-identity, such as *"they are my style,"* *"fits my style,"* or *"surprisingly the items spoke to me, they matched my style and favorite color."* These insights suggest that, as it has been previously demonstrated in the literature, a perceived social status linked to the goods and gained self-identity play a vital role in compulsive buying (Lejoyeux et al., 2007; Park & Burns, 2005; Roberts & Jones, 2001; Yurchisin & Johnson, 2004).

Emotional responses for the first minute of shopping experience. The results of this study further contribute to the compulsive buying literature by showing that two potentially different mechanisms enact in two segments of consumers during the first minutes of a shopping

experience in the fashion domain. The findings of this study indicate differences in how the High-CBT group and Low-CBT group perceived the store stimulation. Specifically, differences in particular SCR parameters were shown in each CBT group for two fashion stores. On one hand, consumers with a low CBT demonstrated an equal duration of SCR peak responses and an equal level of emotional excitation (indicated by SCR peak frequency) but higher SCR peak amplitude in the high-end fashion store than in the low-end fashion store. Following the results obtained by Groeppel-Klein (2005), the differences in the SCR peak amplitude and the positive correlation between SCR peak amplitude and hypothetical spending shown in the Low-CBT group in the present study may indicate their differences in experienced pleasure and approach reactions in both fashion stores. On other hand, consumers with high CBTs showed a higher frequency of SCR responses[20] and shorter recovery times of emotional responses in the high-end fashion store than in the low-end fast-fashion store. This can indicate that they were more excited by a greater number of exciting events in the high-end fashion store. Groeppel-Klein (2005) found that the SCR frequency was positively linked to the amount of money spent in the store. In this study, SCR frequency was positively related to the higher hypothetical spending only for consumers with a high CBT, and this effect did not depend on the fashion-store type.

In contrast to the previous findings from cue-reactivity experiments (e.g., Trotzke et al., 2014), no differences in the induced SCR amplitude between the groups or between the stores for the High-CBT group were found. Research on skin conductance demonstrates that the frequency of the SCR response indicates induced attention towards objects in the environment, and SCR recovery time may indicate sustained processing driven by an effortful control system (Boucsein, 2012; Quermonne, Nammathao, Louchahi-Raoul, & Marcy, 1993; Steiger, 1988). Thus, consumers with a high CBT might have experienced more inhibitions of physiological reactions in the low-end fashion store in comparison to the high-end fashion store (Boucsein, 2012). Researchers suggest that, because shopping causes a release of dopamine hormones that are linked to pleasurable activities, similar to substance addictions, repeated consumption may cause the disturbed homeostasis in the brains of compulsively buying consumers (Faber et al., 1987; Ridgway et al., 2008). That is, compulsive buyers may show neuroplasticity to reward-related cues and reward themselves via repeated exposure (Olsen, 2011). In particular, although a hyperactive dopamine system would release more dopamine neurotransmitters, because there

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[20] With a 10% confidence level

are fewer available receptors to which they can connect, compulsively buying consumers may need more stimulation to match their previously experienced emotional intensity levels (Racine et al., 2014). Thus, it is possible that they experience the stimulation as less *"thrilling,"* which would hinder the intensity of the physiological response to the upcoming environmental stimuli. Post-hoc visual video inspection supported the assumption that longer SCR peak durations could be an indicator for prolonged processing in response to the exposed products. Thus, it may be assumed that potentially, in the low-end fashion store, consumers with a high CBT were more judgmental, and they could have responded to the items with more executive processing. However, in the high-end fashion store, consumers with a high CBT would have relied more on the emotional system. These assumptions inspire future investigations.

Emotional responses over the entire shopping experience. This research also contributes to a better understanding of physiological changes experienced in consumers with a high CBT as compared to those with a low CBT over the entire shopping experience in both fashion stores. Exploratory analyses showed that differences in the emotional responses captured for the two segments of consumers discussed above were present only during the first minute of the shopping experience. The existence of differences in the physiological reactions for the group or store-and-group interaction measured over the entire shopping experience in this study was not supported. This result is to some extent consistent with findings that have been obtained in other studies on emotional variability in compulsive buying (e.g., Faber & Christenson, 1996; Kellett & Totterdell, 2008). For instance, a field study introduced by Kellett and Totterdell (2008) offered the important finding that positive changes in the arousal levels in compulsive buyers were experienced at the beginning of shopping experience in the store, namely, during the first 40 minutes out of 1.5 hours allocated to shopping. There are several explanations related to the obtained results.

One reason why the study did not capture any group or store-and-group-interaction differences in the physiological reactions over the entire shopping experience duration could be that, as noted in previous research, emotionally charged events tend to attenuate over some time. According to Falk (1981), learning theories claim that the effects of positive-mood-reinforcing stimuli may be only evident during the early stage of the shopping experience. This can be caused by hedonic adaptation effects or habituation. From the psychophysiological point of view, studies investigating learning mechanisms have shown that phasic measures often meet

the criteria for habituation (for review, see: Rankin et al., 2009; Thompson & Spencer, 1966; Thompson, 2009). Previous studies (e.g., Barry, 2009; Steiner & Barry, 2011) have demonstrated that, with repeated exposure of stimuli, the habituation of SCR - quantified by intensity, frequency, and sequence of the SCRs - is characterized by the decrement of these SCR parameters over the course of the trials. For instance, one way to identify the habituation is through a decrease in the frequency or amplitudes of SCR (Barry, 2004; Sokolov, 1963). According to Rankin et al. (2009), this habituation response may also be impacted by the simultaneous process of sensitization. Sensitization is expressed by an initial increase in the SCR response amplitude or frequency, indicating responsiveness, which is then followed by a decrease of SCR response amplitude, or frequency due to the habituation. Although adaptation, defined as an adjusted emotional state, can be linked to a broad range of stimuli, habituation is related to the specific stimuli that generalize across other interconnected stimulus; but is sensitive to the presentation of novel stimulus (Barry, 2004; Sokolov, 1963).

Similar patterns of reactions indicating the long-term habituation effect have been previously reported by von Dultzig (1997), who ran a field study to explore the changes in SCR amplitudes during exposure to ads. It was demonstrated that, over the course of ad-viewing, the SCR amplitude diminished as more ads were shown to the subject. To explore if women would look at the same products over the course of their shopping experience in each store, in this study, each video recording was visually analyzed to identify shoppers' behavioral patterns. It was noticed that, first, as soon as the women entered the stores, they interacted with a large variety of new options. Then, they would reduce their focus only to some relevant items and compare them with the previously seen items. At the end of their shopping experience in each fashion store, they would end up going back to the previously inspected products and making a review of all chosen items before going to the cashier. Thus, they were indeed exposed to the same items more than once, and this could have caused difficulties in capturing group differences for their changes in arousal level over the entire shopping experience in each fashion store.

Another reason why particular changes were captured at the beginning of the shopping experience but not during the whole experience could be the indirect impact of the anticipatory reaction. Previous findings in neuroscientific literature have proved that, during value-based decision-making, when processing reward-related experiences, the responses biased by the reward-expectation may be stronger than the responses during the actual rewarding experience

(e.g., McClure et al., 2004; Plassmann et al., 2012). Before starting each shopping task in each assigned store, each woman was shown a printed brand logo of the store where she was going to shop. This could have induced their expectations of specific rewards and caused participants to be more reactive at the beginning of the shopping experience rather than during the entire shopping duration. For example, previous findings from cue-reactivity experiments (e.g., Trotzke et al., 2014), have shown that compulsive buyers show craving responses indicated by higher SCR-amplitude responses when exposed to reward-representing shopping cues (i.e., leaving with shopping bags or paying at the cash desk). Potentially, knowing that buying fashion items may provide different contingencies of rewards, such as power, and prestige, this expectation may have induced the amplification of the actual responses, perhaps leading to compulsive buyers being more reactive at the beginning of the shopping experience rather than during the entire shopping time in each fashion store.

Relationship between emotional responses and behavioral shopping outcomes. This work also sheds light on the mechanisms that underlie the consumer interaction with the store environment during a shopping experience in the fashion context. However, due to the small sample size, these results are only tentative, warranting further study with larger samples. As discussed in the previous sections, the findings of the study show that different consumer segments respond and process information differently and those differences may depend on their CBT. The exploratory data analyses in this study also provide insights into how emotional processes that occur in the shopping environment during the entire shopping experience impact in-store behavior, regardless of their CBT. It has been shown that arousal parameters that indicate different physiological processes may be linked to different behavioral outcomes. A positive correlation between the SCR frequency experienced during the entire shopping experience in the store and the time spent on shopping was found. Additionally, a higher SCR frequency also predicted the higher number of items chosen. These findings, to some extent, support the existing notions that emotional arousal has a positive impact on time spent at the store, as consumer choices, and money spent during shopping experience (e.g., Donovan et al., 1994; Gilboa & Rafaeli, 2003; Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). In a field experiment, Groeppel-Klein (2005) studied the relationships between two emotional measures (namely, the sum of experienced SCR amplitudes and the SCR frequency) and three behavioral measures (namely, the intention to buy, the amount actually purchased, and the time spent shopping) and demonstrated that both emotional measures predicted these behavioral outcomes. In one of her

studies, Groppel-Klein (2005) studied the SCR measures for the specific store section (i.e., fruit and vegetable department). In another study (Groppel-Klein, 2005), SCR measures were collected for the entire shopping experience at a department store for sports goods. The SCR measures were recorded until consumers indicated that they did not want to shop anymore or they chose a product. Although the present study was inspired by that investigation (ibid), it used slightly different study design and constructs. For instance, this study was restricted to the fashion context. Additionally, instead of asking about the intention to buy or registering a categorical indication of the purchase decision, the hypothetical spending, that is, the price of the chosen items was registered. Thus, based on the present study results, it may be assumed that a higher number of exciting events in the fashion store environment will increase the motivation to stay longer in the emotionally exciting environment. Additionally, because more of the items are exciting, more items may be chosen during shopping for fashion items. For hypothetical spending, however, there is another SCR parameter that has shown a positive effect. In particular, the arousal intensity induced by the encountered exciting events over the whole shopping period in each store indicated by a higher number of SCR peak frequency was able to positively predict the hypothetical spending for the chosen items. Finally, longer duration of the SCR peak during the shopping experience indicated that the consumers would be likely to spend more time shopping. As previously discussed, a longer SCR duration may be an indication of sustained processing driven by an effortful control system (Boucsein, 2012; Quermonne et al., 1993; Steiger, 1988). Thus, it may be assumed that if a store environment triggers more executive processes, perhaps by providing a large variety of items, the more time consumers will spend in the shop.

4.8.2. Managerial and Societal Implications

Overall, the findings of this study show that consumers with a high CBT are more emotionally responsive to the high-end fashion context and are vulnerable to the higher priced items. In addition, the two groups of consumers show different physiological responses that can characterize their interactions with the two fashion contexts. Based on the obtained results, this research can suggest three managerial and social implications relevant for consumers, marketing practitioners, and consumer and public-policy domains.

First, this information can be used to educate consumers as well as inform retail managers about the effects of the store environment on this vulnerable consumer group. As is shown in this study, the responses of the vulnerable consumer group may depend on the situation or context. Thus, by understanding in which circumstances marketing actions may lead to adverse consequences, retailers and marketing practitioners may be empowered to take not only proactive but reactive roles during consumer interactions with the brand environment. For instance, retailers can use their retail space to demonstrate their social responsibility by having in-store campaigns educating consumers about their compulsive buying habits and the underlying motives that drive their choices (Lee & Workman, 2015). By ensuring more mindful buying behavior, retailers may ensure a lower volume of returns of unused items (Hassay & Smith, 1996) and build a better relationship with the customers resulting in less-frequent brand switching. Additionally, these findings could be integrated into consumer and public-policy attempts used for educational purposes. Furthermore, it can serve as an inspiration for the development of further strategies development for consumers to track and adjust their emotional variability during shopping episodes. For example, the technological and scientific development and the adoption of affordable, wearable technologies (e.g., Apple Watch or Fitbit) have led to the applications in the mobile devices that are designed to track biological, physiological, and cognitive data and provide personalized feedback to reach health goals or improve personal achievements. Biofeedback-based therapy has long been practiced by medical professionals to help people to cope with their dependencies (e.g., control their dependency on drugs) or to improve their emotional-regulation and stress responses by tracking and training arousal responses (e.g., Hilborn, Cederholm, Eriksson, & Lindley, 2013; Peira, Fredrikson, & Pourtois, 2014). User-friendly solutions, such as NeuroSky (www.neurosky.com), Neurocam (www. neurowear.com), or Plato (www.platoscience.com), which integrate different neuroscience knowledge about attention, emotion, and interest, have been used to help people solve their everyday problems. These tools incorporate physiological feedback and help people to learn how to reduce their stress level, to capture a photographic moment dictated by their body responses, or to stimulate creative potential. Following the same line of thought, new behavioral-monitoring solutions can be offered to consumers to monitor their behavior and gain a sense of agency over their behavior in a shopping situation. An extended discussion entailing the implications mentioned above is provided in *Chapters 5.4* and *5.5*.

4.8.3. Limitations and Future Research

This study is only the first attempt in understanding the processes linked to compulsive buying as it occurs in more realistic shopping situations in brand-manifesting environments, in particular, when interacting with a single-brand, apparel store environment in the fashion context. On one hand, this is the first study in the compulsive buying literature that incorporates a variety of arousal parameters employed to measure different aspects of emotional changes in a field experiment. In addition, by running a field experiment in the fashion domain, this study brings the understanding of consumer's processing of store information in compulsive buying a step closer to reality. On the other hand, there is room for improvement because it raises questions that should be further addressed. Thus, the following limitations should be acknowledged.

Sample. The generalizability of the study results can be limited only to the tested sample. In this study, only subjects with the following characteristics were tests: women; a medium, high, or very high interest in fashion; age between 20 and 35 years old; and Danes or foreigners living in Denmark for at least two years. The sample tested in the study is relatively small, which could have impacted the results. In particular, the ability to capture all of the hypothesized effects and explored relationships could have been affected. To increase the power of the present study, a larger-scale experiment is highly encouraged. More in-depth discussion concerning the sample limitations is presented in *Chapter 5.6.*

Study design. The choices and in-store behavior of the participants could have been to some extent affected by the provided study instruction and study set-up. In this study, participants were told that four of the 42 participants might win their choices realized for 1000 DKK (approximately $143). In addition, participants were informed that they should shop for as long as they wanted, up to twenty minutes in each shop. These money and time constraints could have activated their goal-oriented behavior, thereby impacting the way they made their choices. These limitations should be further addressed in future studies by testing a few different field-experiment set-ups both including and excluding the time and money constraints. Furthermore, due to the time limits, this study was restricted to only two fashion-store cases. In future research, different shopping contexts could be tested and a more extensive variety of stores representing different product categories, brands, and store designs could be included.

A few studies in the compulsive buying literature have reported that, although there are differences in the positive changes experienced during buying episodes and the *"euphoric"* reactions during shopping experiences in the positively stimulating environments, these differences are more strongly expressed in contexts inducing negative emotions (Billieux et al., 2008; Miltenberger et al., 2003). Therefore, it may be possible that differences between the groups would be more apparent if *"actual"* consumers were approached. For example, following the approach introduced by Lejoyeux et al. (2007), the mall shopper could have been stopped on their way to the stores of interest. However, this type of participant-recruitment strategy would not have allowed the store comparison, and it would have reduced the possibility of encountering the compulsive buyers.

Methodological choices. From a methodological point of view, little research has been done on the emotional variability in compulsive buying measured during actual shopping experiences. Prior studies in the compulsive buying literature provided only a limited understanding because they relied on retrospective measures for capturing the affective aspect of shopping experience. This is the first study that approached these research questions with tools measuring physiological reactions. In this regard, this study contributes to the theoretical and methodological insights that could be further employed in compulsive buying studies as well as consumer-research studies in a broader context.

In this study, the differences in experienced emotional arousal were studied with EDA phasic measures, and the EDA phasic responses were decomposed into three parameters representing arousal. Even though EDA can provide a precise indication of the slightest variations of physiological changes during actual shopping experiences (Bagozzi et al., 1999; Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001), the process of data collection, data pre-processing, and interpretation of the field experiments is still complicated. For example, although EDA measures indicate emotional arousal changes and serve as a proxy for a specific psychological state, the cognitively interpreted perceived emotion is not indicated by any of the parameters (Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001). To gain a better understanding of subjectively interpreted arousal, future studies should also include verbal scales studying the cognitive interpretation of experienced emotional states. In addition, different consumer neuroscience methods or their combination with the qualitative methods could be further employed to provide a better view of the mechanisms of the overall information processing. For

example, emotional responses at a particular time of the shopping experience could represent different decision-making stages. For example, Gidlöf et al. (2013) showed in a study that decision-making processes in the natural environment may be tracked by two gaze types: orienting gaze and evaluating gaze. According to their findings, the evaluation stage of decision-making is characterized by a higher number of re-fixation and re-dwells on products. This is noteworthy because it seems that re-dwells are at the core of the decision process. However, during the initial orienting process, there is a smaller number of re-dwells on the products of interest. Thus, it is encouraged to design the study in a manner so that different stages that may underlie shopping experience could be explored in terms of the variation of the physiological responses. Several questions can be further researched; for instance, at what point during the shopping experience in the store or over the entire shopping trip do compulsive buying consumers show the highest arousal levels and for how long those levels are maintained, or in which stage of the shopping experience do those physiological differences impact their choices.

Previous studies that employed physiological and neurological measurement tools (e.g., Lawrence et al., 2014a; Raab et al. 2011; Trotzke et al., 2014; Trotzke, Starcke, et al., 2015) and that established significant arousal differences between the groups employed simulated shopping tasks or used cue-reactivity paradigms to test emotional responses to shopping cues. Laboratory and field experiment settings tend to differ since during a simulated shopping task the items exposed to the participants are actually not available. On the other hand, during a field experiment, consumers are directly interacting with products and in-store environment. Thus, it can be argued that different aspects of emotional processes, such as a craving response or emotional motivation, can be captured with two different types of experiments and with diverse research methods. Although a retail setting offers increased ecological validity because the store context can relatively better represent the actual decision-making situation, studying behavior in a more natural environment does not come without limitations. Running field experiments with consumer neuroscience methods provides a few technical challenges that should be addressed. An extended discussion on ecological validity is presented in *Chapter 5.3.2.*

5. General Discussion

This thesis presents and discusses topics related to compulsive buying, information processing, and brand touchpoints. It provides a thorough literature review and two experimental studies that explored the cognitive, emotional, and behavioral responses underlying a consumer's interaction with brand advertising, and with the in-store environment in compulsive buying. Both brand advertising and retail environment are essential, strategic brand touchpoints for companies seeking a competitive advantage, but they can have a devastating effect on vulnerable consumers, i.e., compulsive buyers. However, there is still a scarcity of empirical research on the external influences (e.g., brand information) and processes that explain a consumer's behavior in brand-manifesting situations in compulsive buying. Previous research primarily focused on the internal factors related to compulsive buying, including personality traits and comorbid conditions (e.g., Black, 2007; Black et al., 2010; Grant et al., 2005; Lawrence et al. 2014 a, 2014 b); self-esteem, materialistic values, and personal goals (e.g., Dittmar, 2005; Scherhorn et al., 1990); or more general mechanisms of compulsive buying (e.g., Trotzke et al., 2014). Only a handful of studies acknowledged the influence of environmental factors (e.g., Dittmar et al., 1996; Kwak et al., 2002; Lee et al., 2000) or explored the consumer's relationship with products and brands (e.g., Lo & Harvey, 2012; Lejoyeux et al., 2007). Most of the existing research relied on the analysis of the consumer's opinion about their buying spurs their interaction with products rather than an analysis of their behavior in the context-dependent situations (Dittmar, 2004; Johnson & Attmann, 2009). Thus, researchers argue that there is a need for increased reliability and validity in the compulsive buying research, as highlighted by the following statements:

- Experimental research should examine a consumer's vulnerability and susceptibility to marketing influences (Gupta, 2013),
- The responses of compulsively buying consumers should be studied within the context(s) of their behavior manifestation (Kellett & Totterdell, 2008),
- More direct methods that go beyond surveys should be employed to better understand compulsive buying (Horváth et al., 2015; Dittmar, 2005).

Because there has been a rise over the past few decades in the number of at-risk consumers due to increased commercial stimulation, related research fields should acknowledge the importance of understanding the characteristics that underlie their behavior in market-related situations.

5.1. Summary of Results

This section briefly reviews the results from the experimental studies. As introduced in *Chapter 1.2.1*, the central research goal of this thesis was formulated as follows:

> ***RG:*** *The investigation of the cognitive, emotional, and behavioral responses that characterize consumer-brand interaction at relevant brand touchpoints in compulsive buying.*

To achieve the research goal, a review of the existing compulsive buying literature was first presented to shed light on the nature of the compulsive buying phenomenon and to develop a conceptual framework for the subsequent empirical studies. In the literature review, the existing conceptual approaches for compulsive buying were first overviewed to introduce some clarity on the compulsive buying construct and to highlight the roles of the context and external, environmental influences in compulsive buying. Secondly, different assessment methods were discussed to provide a better understanding of the methods used to identify and evaluate compulsive buying. Thirdly, the existing findings on consumer characteristics that have been linked to compulsive buying—and could therefore impact compulsively buying consumer responses in studied contexts—were further reviewed. Finally, the existing literature on compulsive buying and brand touchpoints was studied. Two pre-purchase and purchase situations crucial to brand consideration (Baxendale et al., 2015) were chosen as experimental settings to provide empirical evidence on the deducted theoretical insights. In this manner, the central research goal was decomposed into two research questions, each of which entailed an experimental study:

> ***RQ1 (Study I):*** *What are the cognitive responses that characterize consumer information processing of advertisements in compulsive buying?*

> ***RQ2 (Study II):*** *What are the emotional and behavioral responses that characterize consumer information processing of the store environment during a shopping experience in compulsive buying?*

To the existing knowledge, Study I is the first study that explores the underlying processes related to information processing of advertisements in compulsive buying. To this end, neurophysiological indexes for attention allocated for adverting processing and physiological visual reactions were recorded during TV-ads viewing task. Additionally, memory performance measures were collected after the ad-viewing was completed. Study II is, to author's knowledge, the first investigation of the underlying processes that occur during shopping experience in compulsive buying. Moreover, it is the first study to investigate these processes in a more externally valid shopping situation, namely, when interacting with the store environment representing two fashion brands. During the study, participants were asked to complete in-store shopping tasks in two single-brand fashion-apparel retail stores (i.e., low-end and high-end). During that time the physiological measures of arousal and shopping behavior were collected with a mobile monocular eye-tracker synchronized with a mobile EDA biosensor.

The literature review and two empirical studies provided in this thesis reemphasize the importance of researchers acknowledging brand-related contexts as well as interactions with marketing channels that provide brand information in compulsive buying domain. Moreover, the thesis highlights the necessity of understanding the dynamic consumer responses that can characterize their behavior when exposed to commercial information in contexts relevant to their consumption journey. Given the scant literature on these topics, this doctoral thesis contributes to the field by 1) shedding light on the compulsive buying construct, its conceptualization, identification, and evaluation and 2) highlighting the role of different brand touchpoints and revealing underlying responses that reflect information processing in compulsive buying. The findings of the studies indicate similarities and differences between consumers with a high or low CBT. First, based on the results obtained from Study I, there were a few differences between the two groups when exposed to advertising information during commercial viewing, but only for few attention and memory variables. For example, the high-CBT consumers took longer than the low-CBT consumers to decode and examine visual brand elements presented in the video commercials. Interestingly, this effect was only demonstrated for the brands presented in the ads promoting social causes. Moreover, there was a significant negative relationship between the experienced cognitive workload during exposure to ads and the probability of recognizing the brands, though this was only present for the High-CBT group. In other words, the mental effort allocated to active advertising processing was linked to a lower probability of recognizing the brands. In Study II, further differences were shown between the

two groups during shopping tasks in the fashion domain. The study results confirmed that consumers with a high CBT as compared to consumers with a low CBT tend to choose more-expensive items and demonstrated a higher potential to spend more money during their shopping experiences when shopping for fashion items. In addition, the two consumer segments showed different emotional-arousal responses, moderated by fashion-store type, during a shopping experience. However, these differences were only present for the first minute of shopping. Specifically, consumers with a high CBT showed more excitability, indicated by a higher frequency rate of emotional responses, and a shorter duration of those emotional responses in the high-end fashion store than in the low-end fashion store. Consumers with a low CBT, on the other hand, demonstrated more intense emotional responses, indicated by a higher amplitude of emotional responses, in the high-end fashion store than in the low-end fashion store. In the High-CBT group, a higher likelihood to spend more money for the chosen items was predicted by the frequency of their responsiveness to the emotional events; in the Low-CBT group, however, this likelihood was predicted by their experienced emotional intensity.

Taken together, the findings of this thesis provide theoretical, methodological, managerial, and societal implications for academics, practitioners, and consumer and public-policy domains. The results of the thesis also offer some limitations that set the stage for future research. These contributions, limitations, and future research directions are discussed in the chapter below from the meta-perspective.

5.2. Theoretical Contributions

This thesis offers several theoretical contributions to both the marketing literature and compulsive buying literature on information processing and consumer interaction with brand touchpoints, as discussed in the following section.

5.2.1. Contribution to Compulsive Buying Literature

A primary contribution to the compulsive buying literature is a further development of the understanding of the nature of the compulsive buying construct. First, this thesis provides an in-depth, systematic review that integrates different approaches from both the clinical and

consumer research fields on the labeling, conceptualization, and operationalization of the compulsive buying construct. By delineating the assumptions made about compulsive buying in different research streams and by reviewing existing debates on the definitions of compulsive buying and its operationalization and assessment methods, this thesis highlights the complexity and multidimensionality of the compulsive buying phenomenon. The review demonstrates that viewing compulsive buying as a dichotomous entity and defining it as a *"mental disorder"* restricts its understanding to only clinical samples. Adopting the medical perspective primarily implies identifying individual factors of the consumer as the main cause for their buying problem that can be addressed by medical treatment. There is no doubt that compulsive buying can take a pathological form; however, to generalize this and then medicalize all the consumers prone to compulsive buying can negatively impact the control of any deviant buying cases in the general population. For instance, labeling compulsive buying as a buying *"addiction"* without any neurobiological or psychophysiological evidence of the classification of compulsive buying could result in the overpathologization of the buying behavior, which is performed to excess. It has been shown that compulsive buying can also occur without any comorbid psychiatric indications, and it can also depend on contextual factors rather than intrinsic consumer characteristics alone. By disentangling the conceptual views, this thesis highlights the need for a more comprehensive understanding of compulsive buying, thereby addressing the problematic compulsive buying behavior studied in consumerism-driven contexts.

Secondly, this thesis also contributes to the existing literature by introducing theoretical insights and empirical evidence on information processing of brand information at two relevant consumer touchpoints representing brand manifesting situations. In particular, this work sheds light on the consumer characteristics related to compulsive buying, considering both personal variables (e.g., personality traits or neurobiological factors) and characteristics related to consumer interaction with products, brands, and different buying contexts (e.g., fashion consumption, brand consciousness, etc.). The literature review reveals that, even though brands and the brand-related environment are essential for brand consideration and are a natural part of the decision-making process while choosing products, the influence of branding and marketing has not been widely acknowledged in the compulsive buying literature. This thesis also extends the existing literature on compulsive buying by incorporating theoretical insights on information processing models for both advertising and store information as well as a theoretical foundation of brand touchpoints.

Thirdly, this thesis studied and validated the cognitive, emotional, and behavioral characteristics of information processing in two environments that represented brand manifestation. By doing that, this work adds to the better understanding of the dynamic processes that may better represent the actual behavior in the relevant situations. Instead of viewing brand touchpoints from a strategic point of view, the touchpoints were considered to be settings for two crucial stages relevant to brand consideration (namely, pre-purchase and purchase). The findings of the studies show that consumers with high CBTs were more emotionally reactive to the specific brand-related contexts and to encountered information, for example, in high-end fashion store compared to low-end fashion store. However, when exposed to TV ads, high-CBT consumers and low-CBT consumers demonstrated a relatively similar attentiveness to advertising information, nor did they show any differences in their ad or brand memory. These findings contribute to the previous knowledge established in highly controlled environments that investigated the emotional reactivity of compulsive buyers when exposed to buying items during standardized and validated cue reactivity paradigms and decision-making tasks (e.g., Lawrence et al., 2014a; Raab et al., 2011; Trotzke, Starcke, et al., 2015). This research also adds to the existing understanding regarding emotional variability that is related to excessive shopping binges in actual shopping contexts (e.g., Faber & Christenson, 1996; Kellett & Totterdell, 2008). In addition, the findings also contribute to our understanding regarding a compulsive buyer's behavior in the fashion context, which was previously primarily studied in an online setting (e.g., Kukar-Kinney et al., 2012) or with luxury fashion (e.g., Kukar-Kinney et al., 2012; Lejoyeux et al., 2007). Furthermore, the presented findings extend the present understanding of the influence of advertising as well as add to the contradicting findings in the literature, which are based on collected consumer attitudes and opinions about their susceptibility to advertising information (e.g., Kwak et al., 2002; Lee et al., 2000; Mikołajczak-Degrauwe & Brengman, 2014).

Fourthly, this thesis approaches the compulsive buying topic with assumptions introduced by the novel disciplines of consumer neuroscience and behavioral economics. By doing so, this research project challenges the previously employed approaches that are driven by consumer rationality highlighting assumptions, and that use self-report methods to study compulsive buying behavior. According to Raab et al. (2011), the utilization of novel consumer neuroscience methods in compulsive buying research may provide a more realistic picture of

actual consumer behavior. Thus, this research introduces new insights into the mechanisms and non-conscious processes that underlie cognition and in-store decisions.

Finally, by establishing empirical evidence on these reactions and deducting the similarities and differences between consumers with a high and a low CBT, this thesis extends the understanding of what can characterize different consumer segments. This thesis addresses the consumers within the general population, thereby providing insights into more at-risk consumers rather than pathological compulsive buying cases. These findings demonstrate that more research should be conducted to address different consumer segments, study the consumers in different situations that could impact their behavior, to delineate their similarities and differences that can help resolve existing debates regarding the nature of the compulsive buying phenomenon.

5.2.2. Contribution to Literature on Information Processing and Brand Touchpoints

The predominant information processing frameworks and theoretical insights in the marketing literature rely on the assumption of rational consumer behavior. Conventional models—such as the ELM (Petty & Cacioppo, 1986; Petty et al., 1983), employed to study advertising communication, or the MRM (Mehrabian & Russell, 1974), used to investigate consumer interaction with the store environment—highlight the causal relationship between stimulus and stimulus-induced responses. By incorporating neurophysiological models and the cognitive neuroscience literature into the analysis, this thesis sheds light on the implicit dynamic interplay between a variety of processes that occur at different levels of conscious awareness and underlie consumer-ad or -store interactions. Additionally, the literature on the information processing of marketing information primarily focuses on individual differences instead of acknowledging the differences in the consumer segments. Based on these thesis findings, and those obtained in Study II in particular, it can be assumed that different processes occur in different consumer segments, which can explain consumer interactions with the provided commercial information. In addition, theories related to brand touchpoints may be extended based on the specific consumer characteristics that can define their responses in a brand-manifestation context.

5.3. Methodological Contributions

From a methodological point of view, this thesis offers several contributions for researchers as well as business practitioners, consumer advocates, and public-policy advocates. The two experimental studies are examples of a method that can be employed to study consumer interactions with brand information at different brand touchpoints in other settings. The selected experimental designs, simulating a TV-ads viewing experience and replicating a real-world shopping trip, were both designed to closer recreate a natural environment. Moreover, instead of measuring the cognitive interpretation of the impact of the exposed information, this thesis studied the consumer responses that were measured when interacting with the commercial information. From the managerial perspective, the methods used in this thesis can serve as a methodological example for the techniques that can be incorporated in a marketing toolbox and the utility of these methods (i.e., the benefits and drawbacks of their application) in the commercial world.

5.3.1. Method Triangulation

By incorporating consumer neuroscience methods and triangulating them with self-reflection-based research instruments, this thesis contributes to the existing methodological debates on the selection of the most optimal research methods for studying consumer behavior in the marketing field. The findings show that using just one method to investigate compulsive buying case might be insufficient. On one hand, it is well established that the behaviors of compulsively buying consumers are often impacted and reinforced by organizations aimed at making a profit. On the other hand, compulsively buying consumers are often depicted by society and in the media as *"self-involved, materialistic, and empty individuals,"* which leads to *"an even greater source of guilt and shame than alcoholism or drug abuse"* experienced by the compulsively buying consumers (Benson, 2008, p.5). Thus, not only do excessive shoppers end up hiding their purchasing behaviors (Ridgway et al., 2008), they are also condemned to secrecy to avoid being judged as *"superficial, narcissistic, and weak-willed"* (Benson, 2008, p.5). By studying consumer interactions with brand information at relevant brand touchpoints while applying the conventional self-reflection-based methods, the resulting findings may be impacted by different cognitive biases that prevent the disclosure of actual behavior patterns. This problem is well

illustrated by the contradicting results obtained in Study II. When asked about the money spent during their shopping trips, the consumer group with a high CBT indicated that they spent as much as non-compulsive buyers. However, during the shopping tasks, the high-CBT consumers ended up choosing more-expensive items than their counterparts, regardless of the fashion-store context.

Besides the benefits discussed above, employing only neurophysiological and physiological methods to study consumer behavior in compulsive buying also results in some challenges. For example, quantitative methods such as eye-tracking and EEG do not account for the introspection of the participants, e.g., individual interpretation. In addition, the process of measurement may potentially yield an imposed sense of precision and accuracy (Bryman, 2015). For instance, the results of this thesis show that employing physiological methods to study physiological differences in consumer behavior over the whole course of information processing may be complicated. As seen in both experiments, there were no observed differences when the entire duration of the ad- viewing task or shopping task was considered. In Study II, on the other hand, significant differences were obtained during the first minute of the shopping experience. The integration of the tools to measure physiological responses may be more suitable to study specific reactions when exposed to specific information or to study responses in the particular time intervals, such as to explore consumer response to particular brand information during exposure to ads.

Moreover, the integration of nontraditional methods can be more expensive, and the methods are often less accessible (Venkatraman et al., 2015). The application of consumer neuroscience tools to the study of consumer behavior can be a complicated and time-consuming process (Yoon et al., 2012). Due to the resources needed for the data collection and data analysis, small samples are often tested. Furthermore, there is a lack of standardized procedures for recording and interpreting the data (Yoon et al., 2012). The collection of neurophysiological and physiological data necessitates expertise so that errors in the data caused by noise or artifacts are successfully controlled for. For example, to account for the internally and externally generated artifacts that can impact the EDA data in Study II, a careful procedure for device preparation, data collection, and data pre-processing was followed. First, the participants were asked to use their dominant hand, which did not have the sensors measuring the EDA, to interact with clothing. Secondly, different pre-processing procedures—including device calibration, device synchronization, noise

cancellation and correction for individual variability—were incorporated to extract the measures. For instance, drift in the EDA sensor and individual variability induced by physiological states and thermal conditions were accounted for by correcting the phasic data for tonic changes.

Taken together, the experiments, and the discussion regarding the employed methods provided in this thesis seek to increase the recognition in the compulsive buying literature that both biological as well as socially constructed biases should be addressed in future studies.

5.3.2. Field Experiment

Study II is the first experiment in the compulsive buying literature that employs physiological measurement tools in the field study. As seen in the study, the entire mechanisms tested in the less controlled environment can be challenging to be fully understood. Although highly controlled experiments conducted in artificial laboratory environments enable researchers to control for extraneous variables that may impact the research findings, these type of study settings also often results in limited external validity. On the other hand, although field experiments create a higher level of realism, their internal validity may be compromised (Gravetter & Forzano, 2012). Despite technological and methodological advances, very few studies have attempted to go beyond the lab setting in the academic domain. The synergy between wearable technologies that are less intrusive and easy to carry with methodologies to reduce measurement noise have allowed the investigation of consumer choices in settings that are more realistic than a laboratory (Duchowski, 2007; Holmqvist et al., 2011; Lohse, 1997; Stopczynski et al., 2014). However, employing neurophysiological and physiological data collection methods in the mobile settings can also be demanding. For example, an experiment utilizing such methods must be designed to control for artifacts and must feature randomization to avoid response fluctuations due to noise. Data acquisition and handling should follow a reliable data synchronization procedure, and data noise filters must be employed to ensure the successful removal of artifacts from all physiological data sets. In short, the limitations of time and data complexity should be acknowledged.

In the real world, however, consumers are influenced by various factors that affect their responses. For example, in the store environment, a variety of cues impact consumer urges and their motivation to purchase at the point-of-purchase (Ballantine et al., 2010; Donovan et al., 1994; Groeppel-Klein & Baun, 2001; Spies et al., 1997). Hence, contradicting results may be obtained depending on the chosen experimental settings (i.e., laboratory or field setting) because by nature compulsively buying consumers are more affected by the process of buying and different influences in the context of buying (d'Astous, 1990; Faber et al., 1987; Lejoyeux & Weinstein, 2010; O'Guinn & Faber, 1989). By incorporating a variety of arousal parameters to measure emotional changes following recently established novel methodologies (e.g., Groeppel-Klein, 2005; Groeppel-Klein & Baun, 2001) in Study II, this thesis sets the stage for future field studies that can focus on the issues identified in the present research. As the first study of its kind in the compulsive buying literature, this thesis demonstrates that designing experiments that would better represent actual consumer situations are in the high need in the scientific realm.

5.4. Managerial Implications

The present research has also implications for marketing practitioners. In particular, it offers further implications for different brand-communication tactics that may be appropriate for different consumer segments. It also provides a better understanding of how compulsively buying consumers respond to different brand-related environments. Moreover, it reveals the potential consequences of marketplace actions that should be taken into the considerations for companies seeking more socially responsible marketing practices.

5.4.1. Segmenting Consumers

The findings of this study demonstrate that, at both brand touchpoints, the high- and low-CBT participants showed differences in how they interacted with brand advertising and how they responded to the store environment. In particular, consumers with a high CBT were more emotionally responsive to the high-end fashion environment compared to the low-end fashion environment. In both stores, the high-CBT participants tended to choose more-expensive fashion items than the low-CBT participants. In contrast, in the ad-viewing task, the consumers from the

two segments showed no significant differences in their attention processes measured during exposure to ads or in their reported memory. However, exploratory data analysis also demonstrated that higher cognitive workload experienced by consumers with a high-CBT during ad-viewing task had a negative impact on the probability to recognize the advertised brands. This proves that specific characteristics of consumers should be taken into account when designing and implementing brand-communication strategies. Additionally, most of the studies in the marketing literature take a holistic approach to brand touchpoints to improve brand-communication strategies. However, it is also important to understand what the underlying processes of this interaction are at each chosen brand touchpoint.

5.4.2. Socially Responsible Marketing Practice

The findings in this thesis are also of interest to marketing practitioners for several reasons. First, it is assumed that the increased rates of higher CBTs in the general population are impacted by the changes in the economic and cultural landscape, namely, the market-based economy and consumption-driven society (Neuner et al., 2005; Unger & Raab, 2015). According to Faber & O'Guinn (1988, p.), "*media in all forms encourage compulsive buying,*" and Black (2001, 2007) claims that advertising educates people to solve their problems by consuming products. Thus, there is a call for ethical, socially responsible perspectives in marketing practices that are built on empirical knowledge of the effects of marketing efforts on compulsive buying (Gupta, 2013; Workman & Paper, 2010).

The results from Study I raise the important question of whether all media in all forms negatively impact compulsively buying consumers. Interestingly, while the negative impact of advertising has been highlighted in the literature, there is still a lack of empirical evidence to explain how, when, and in what form advertising information influences compulsively buying consumers. In the first study, no differences between the two consumer segments during advertising information processing were found in terms of their engagement, cognitive workload, or memory-performance measures when exposed to TV commercials. According to Friestad and Wright (1994), the influence of advertising is a socially constructed phenomenon that consumers learn during their life. As the amount of exposure to advertising increases, to as much as 2000 brands per day (Solomon, 2015), research indicates an increased effort by

consumers to resist the influence of advertising through more persuasion knowledge. Persuasion influence is often affected by persuasion knowledge, because viewers who have a higher persuasion knowledge tend to be more judgmental to any presented advertising arguments (Brinol, Rucker, & Petty, 2007). In other words, consumers tend to develop different coping strategies that give them a stronger resistance to attempts by advertisers and salespeople to influence them (Friestad & Wright, 1994). Therefore, understanding in which contexts and through which type of media channels commercial information impacts vulnerable consumers can help marketing practitioners take a more proactive role in consumer protection. By understanding the specific behavioral and physiological patterns that occur during consumer interaction with market-related information in the specific brand-related situations, it is easier for market practitioners to identify aberrant consumer groups. Thus, instead of targeting the entire range of consumers, retailers can design their marketing strategies more efficiently by using communication at brand touchpoints that is more consumer-friendly and may have a positive impact on at-risk consumers. For example, based on the findings of this study, high-CBT consumers are particularly vulnerable to high-end fashion products. Thus, less-aggressive marketing strategies could be potentially employed at the point-of-purchase in the fashion market.

5.5. Societal Implications

This thesis also offers several contributions from a social point of view. First, by incorporating different market-related situations and studying compulsive buying at different brand touchpoints, this work seeks to raise awareness and educate the public about the problem of compulsive buying. Even though shopping is generally socially acceptable (Elliott, 1994; Woodruffe-Burton et al., 2002), out-of-control buying behavior often leads to adverse consequences that impact not only personal but also collective wellbeing. According to Rose (2007, p.), *"compulsive buying seems poised to become a major 'addiction' problem in the 21st century"*. Due to the prominent tradition of medicalization in the clinical domain, compulsive buying is often portrayed as a psychiatric condition and is therefore often approached from an individual perspective that disregards the broader context (Lee & Mysyk, 2004). In the media, compulsive buying consumers are often shamed and stigmatized (Benson, 2008) instead of being empowered. By introducing an extended discussion of the established literature on

compulsive buying definitions and traditions within different fields, this thesis aims at increasing the publicity for and supporting consumers with compulsive buying issues. Because this thesis studied consumers in the general population rather than extreme compulsive buying cases, the results may be used for an educative purpose. For example, the acquired knowledge can be used to enlighten the general population about the compulsive buying phenomenon. For instance, Benson, Dittmar, and Wolfsohn (2010) claim that educational programs on the effects of marketing efforts on aberrant consumer buying patterns should be introduced at schools or colleges. Additionally, establishing the responses that characterize the information processing of commercial information encountered at relevant brand touchpoints in compulsive buying enhances consumer mindfulness and can help consumers make better-informed decisions during purchase situations. The raised awareness may lead to more funding opportunities that can help investigate the understudied topic of compulsive buying further (Raab et al., 2011).

Secondly, from a consumer and public-policy point of view, a better understanding of compulsive buying in specific market-related situations can help develop new public-policy strategies (Ridgway et al., 2008). For example, understanding the characteristics of compulsive buyers in specific situations may help consumer-policy advocates develop guidelines for marketing professionals who seek to promote more responsible marketing practices in the industry (Edwards, 1993; Workman & Paper, 2010). In addition, the presented understanding can help inform the consumer and public-policy advocates about the role of brand advertising and store environment information in compulsive buying. By integrating the new knowledge on consumer behavior in store settings, new preventative strategies for compulsive buying can be designed in the future. For example, past practices from the studies in academic and applied sciences on the behavioral changes have shown that behavior change is reached while addressing the underlying mechanism of repetitive adverse behavior (Neal, Wood, Labrecque, & Lally, 2012). Hence, consumer neuroscience approaches highlighting the awareness of the role of implicit emotions in decision making can benefit consumer research to better understand the decision-making process. In addition, by being incorporated into the consumer and public-policy practice, the consumer neuroscience approaches can provide better insights into a large variety of questions about problematic consumption cases (Hubert & Kenning, 2008; Kenning & Linzmajer, 2011; Raab et al., 2011). As elaborated in *Chapter 4.8.2.*, by combining the gained knowledge with modern technological solutions, in the long run, real-time biofeedback-based devices could be designed that would enable consumers to monitor their own behavior. For

instance, different applications can be designed that could be used to provide a feedback on the physiological changes of problematic compulsive buyers in the buying or brand-related situations, and by doing that to increase the awareness of their situational reactions and help them make necessary adjustments in those situations.

5.6. Limitations

The thesis findings are only the first step towards a better understanding of the compulsive buying phenomenon at two relevant brand touchpoints (i.e., when interacting with brand advertising and when interacting with the store environment). Thus, there are a few limitations that open the potential for future research.

First, the thesis results are limited to the selected sample. Only women with ages from 20 to 35 years were chosen to participate in the study. These gender and age restrictions were introduced to better represent the compulsively buying consumer segment. Furthermore, to increase the external validity for the sample's representation of the general consumer population, both studies involved both university students and *"actual"* consumers. Only fashion consumers who indicated a medium, high, or very high interest in fashion were tested in Study II in order to better understand the specific buying context. The samples explored in this thesis were primarily limited to the Danish population. Other nationalities were also included, provided that they had lived in Denmark for at least two years and were familiar with Danish brands. Thus, transferring of results to target groups other than investigated in these studies should be done with caution. In addition, the chosen sample size in each experiment was relatively small. The number of tested samples in the previous experiments on neurological and physiological correlates in compulsive buying (e.g., Lawrence et al., 2014a; Raab et al., 2011; Trotzke et al., 2014) does not exceed the sample sizes selected for the studies in this thesis. However, previously employed sample screening and classification methods have relied on a more extreme position to group the consumers as they used the stricter compulsive buying identification norms (e.g., provided by the Clinical Screener [Faber & O'Guinn, 1992]), or clinical measures. One explanation for this is that stronger effects can be observed with smaller samples when testing consumers with an extremely high CBT or with clinical samples as compared to non-compulsive buyers. Because it has been shown that clinically diagnosed compulsive buyers are often

comorbid with different psychiatric conditions (Christenson et al., 1994; Mueller, Claes, et al., 2011), those tested subjects may have different information processing patterns in brand-related contexts. More research is encouraged to address these limitations.

Secondly, both studies are also limited to the methods chosen to evaluate the compulsive buying tendency and to classify the tested participants into the high- and the low-CBT segments. As discussed in *Chapter 2.3.*, different instruments can be used to evaluate the CBT in the compulsive buying research field, and this may have an impact on the research findings. For instance, certain scales may measure different constructs linked to compulsive buying, such as impulsivity or compulsivity, whereas others may focus on assessing the process of buying or the buying consequences (Ridgway et al., 2008).

Thirdly, several restrictions concerning the experimental designs, such as the experimental stimuli, should also be acknowledged. Both studies were restricted to the particular product categories, chosen brands, and specific contexts that represented the tested brand touchpoints. In Study I, commercials that promoted four different product categories were tested, including food, fashion, social cause, and fast-moving consumer goods. The advertised chosen brands were ostensibly unknown to the European population. In Study II, two brands were chosen for testing that represented the low-end, fast-fashion segment and a high-end fashion segment in terms of their store communication and positioning strategy. Participants evaluated both brands by subjectively indicating their familiarity, likability and personal opinion about the brand's positioning strategy to validate the experimenter's choices.

Furthermore, both studies are limited to the measurements and experimental settings chosen to capture the constructs of interest. In Study I, the study design sought to simulate the context of TV-ads viewing, and it was conducted in the laboratory setting. In Study II, the experiment design was limited to the fashion context, and the field experiment was conducted in two fashion stores. Thus, although the findings of Study I may have a potentially higher external validity, while generalizing the results across different product categories and studies, the transfer of the results from Study II to contexts other than fashion or to other store designs is limited.

Specific limitations have been already discussed in-depth in *Chapter 3.8.3* and *Chapter 4.8.3* as well as in the discussion section on the methodological contributions in *section 5.3*. Future research addressing the discussed restrictions is described in the following section.

5.7. Future Research

Several suggestions are proposed that would address the findings and limitations of the conducted studies.

5.7.1. Interaction with Brand Touchpoints

The presented findings on compulsive buying information processing at different brand touchpoints can serve as an inspiration for further research attempts to address related questions. In this study, only two types of relevant touchpoints, which represented two consumer-brand interaction situations (i.e., interaction with brand advertising and interaction with in-store context), were selected. In addition, the exposure to brand advertising was restricted to the video commercial viewing simulating context, whereas the store-interaction situation was limited to the fashion context. The two situations were chosen to represent the pre-purchase and purchase stages of the consumer decision journey. Future research should incorporate a wider variety of brand touchpoints. Additionally, different product categories, different media types, different brands (e.g., luxury brands or favorite brands), a more extensive variety of advertising messages (e.g., responses to print ads) and store designs (e.g., themed-store atmospheric) could also be further explored. For example, a study introduced by Lee and Workman (2015) showed that, for fashion products, compulsively buying consumers may show a stronger brand loyalty for their favorite brand. It may be possible that if none of the brands were of particular interest to the compulsively buying consumers, it could have caused more difficulties to capture the differences in their emotional reactions towards exposed products and store stimulation. Thus, more research is necessary to determine whether only the brands that create a special relationship with compulsively buying consumers impact their responses in the store environment.

According to Baxendale et al. (2015), three groups of brand touchpoints can be influential when choosing brands, including brand-owner touchpoints, retail touchpoints, and third-party touchpoints. Those groups consist of six specific brand touchpoints: brand advertising, retailer advertising, in-store communications, word-of-mouth, peer observation (i.e., seeing other customers), and traditional earned media such as editorials. Based on the classification proposed by Davis and Dunn (2002), apart from advertising, pre-purchase, brand-experience touchpoints include websites, word-of-mouth, direct mail, partnerships, and public relations. Purchase touchpoints include direct-field sales, physical stores, the point-of-purchase displays, product assortment, and contact with customer representatives. Furthermore, post-purchase touchpoints –which were not addressed in this thesis—include loyalty programs, newsletters, customer service, and product quality. Brand touchpoints may be examined in isolation, as it was done in this thesis. Additionally, a holistic approach on the consumer's decision journey across all brand touchpoints could be taken into consideration (Wiesel, Pauwels, & Arts, 2010) to better understand the impact of brands on vulnerable consumer groups. Moreover, following the methodology introduced by Baxendale et al. (2015) that investigated the most important touchpoints for consumer-brand interactions, the influence of different touchpoints for brand consideration across different categories for compulsively buying consumers could be further explored. Alternatively, the short-term and long-term impact of the information during information processing could be considered. Finally, following the definition of Court et al., (2009), a brand touchpoint refers to a direct or indirect consumer interaction with the brand, and this includes both consumer-initiated as well as commercially designed brand-information encounters. Thus, instead of only focusing on commercially initiated touchpoints, indirect consumer interactions with touchpoints could also be further studied.

5.7.2. Heterogeneity in Compulsive Buyers Segments

To address the limitations discussed in *Chapter 5.6*, the heterogeneity in the compulsively buying consumer segments should be acknowledged in future studies. For instance, the heterogeneity of compulsive buyers can be addressed by looking at the structural differences in their behavior. Unique categories of the behavioral patterns could be identified by clustering the groups based on their preference for the products, the extent of the expressed compulsive buying tendency, or by psychological factors linked to the motives reinforcing the behavior (Desarbo &

Edwards, 1996; Kardefelt-Winther, 2015). For example, according to Desarbo and Edwards (1996), compulsively buying consumers can be segmented into internally motivated consumers or externally motivated compulsive buyers. In addition, according to Johnson and Attmann (2009), compulsively buying consumers may show different preferences for a variety of products such as accessories, clothing, shoes, and beauty products. According to Ureta, (2007), some compulsively buying consumers may show a tendency to collect the purchased items and store them in their closets so they can later enjoy them by creating a sacred place to worship their purchases. Alternatively, others instead focus on the buying process and tend to give the products away.

Gender differences in compulsive buying could also be explored. Although researchers generally agree that compulsive buying is more prevalent in the female population (e.g., Black, 2007; Faber & O'Guinn, 1992; Harvanko et al., 2013), some socio-demographic studies report equal gender distributions for compulsive buying (e.g., Koran et al., 2006; Mueller, Mitchell, et al., 2010). From a sociological perspective, it is assumed that shopping and buying activities over time have become something that is framed closer to a woman's rather than a man's identity (Dittmar, 2005; Elliott, 1994). Scherhorn (1990, p.374) claims that, for a long time, a "*dependent*" role was imposed on women both in society as well as in their relationships. However, some researchers argue that differences between genders are artificial. According to Koran et al. (2006), the actual number of men may be underreported. Because women are more eager to seek help, a higher number of women suffering from compulsive buying can be registered in the clinical journals. In addition, because women are chosen as the primary target for the advertising industry in the media landscape, they are more exposed to messages about compulsive buying (O'Guinn & Faber, 1989). According to Mueller, Mitchell, et al. (2011), men may be more inclined to buy different products related to functionality or independence. Thus, they focus on the technical aspects of goods. Women, in contrast, are more driven by hedonic properties of items, such as aesthetics, and beauty. To date, no literature has been established regarding gender-dependent segments in compulsive buying with regards to differences in the processes that underlie an interaction with a product or brand-related information. In addition, due to the changes in the gender-based societal roles over the past decade, the findings regarding the gender artifact in compulsive buying could be outdated. More research is needed to address these concerns.

Finally, the previous results in the compulsive buying literature rely predominantly on the data collected by studying extreme or clinical cases of compulsive buying. Because, clinical samples often comorbid with different psychiatric conditions (e.g., Black, 2007; Black et al., 2010; Davenport et al., 2012), it can be assumed that specific behavioral processes in that setting may be more strongly expressed than in consumers with CBT within the general population. Studying the extreme clinical cases can help develop better treatment possibilities, because an improved understanding may provide the necessary scientific justification addressing the concerns for potential over-pathologizing of excessive behavior and incentive-driven habits (Billieux et al., 2015; Brevers & Noel, 2015).

5.7.3. Larger-Scale and Cross-Cultural Studies

The samples tested in this research are relatively small. Hence, larger-scale studies are also encouraged. Furthermore, a broader demographic pool and extensive geographic areas should be tested, since these experiments were limited to a specific area (i.e., Denmark). According to Neuner et al. (2005), the compulsive buying phenomenon has been shown to be tied to Western culture. However, these findings stem from empirical evidence collected more than a decade ago. Thus, cultural differences should be acknowledged by conducting cross-cultural studies including both Western countries as well as other regions of the world.

5.7.4. Mechanisms Underlying the Information Processing

Even though it was hypothesized in Study I that the attention-processing measures would correlate with the memory-performance measures, only a few significant findings were established. More research should be done to study the underlying mechanisms of information processing in compulsive buying domain to establish the causal evidence for the effects. To address the limitations of Study II, more research should be done to explore specific characteristics over the course of the shopping experience and of the decision-making. For instance, to study at which point in the decision-making situation (e.g., during product presentation, during decision-making, or during the evaluation stage) arousal impacts the behavior. In addition, different shopping strategies (e.g., *"browsing," "exploring"* or *"choosing"*) could be explored and further tested with psychophysiological measurement tools.

Furthermore, the established research pinpoints different socio-cultural and psychological factors as the catalytic function in compulsive buying. Hence, an understanding of whether certain structural aspects of the psychological, physiological, and neural mechanisms occurring during commercial-information processing could map onto the factors mentioned above could provide a more holistic understanding of the nature of compulsive buying.

5.7.5. Integrating Consumer-Neuroscience Tools

Despite the variety of challenges with the use of consumer neuroscience tools, their utilization may lead to a deeper understanding of consumer behavior and to a better design of potential interventions. Multimodal methods applied to the study of consumer interaction with brand touchpoints can help shape future theories and models. Additionally, by considering neural, behavioral, and physiological factors, they can provide in-depth understanding, better empirical testing, and better deduction and tracking of the problem's causes to specific smaller phenomenon, allowing the development of novel hypotheses (Yoon et al., 2012). For instance, recent mobile eye-tracking experiments have shown that, during different decision-making stages (orientation and evaluation), there are different visual behaviors such as more re-dwells during the evaluation phase than in a comparable search task (Gidlöf et al., 2013). This could serve as an identifier for the exploration of different information processing patterns enacted during the shopping experience. Other methods, such as the index of prefrontal asymmetry in the gamma frequency range (see Ohme et al., 2010; Ravaja et al., 2013) can be incorporated into the research toolbox. Furthermore, more studies with mixed methods are highly encouraged. For example, different qualitative methods could be used to provide a better understanding of particular problems, such as different strategies or stages that occur during a shopping experience in the compulsively buying consumer segment. Then, those differences could be quantitatively tested by using the neurophysiological and physiological measurements in the experimental settings.

5.7.6. Introducing More Ecological Validity in Future Research

The results of Study I, which indicated only a very few significant findings, establish a call for more research efforts. First, even though Study I aimed to recreate a more natural environment, it was still an experiment that was conducted in a controlled laboratory environment. More research is needed to create a better ecological validity, perhaps by expanding the research efforts into an actual environment. For instance, responses to ads could be tracked before an actual shopping task. Thus, the experiment would activate the compulsively buying consumer's motivation to processes the information. Furthermore, the short-term and long-term impact of the exposed advertising information should be addressed. Additionally, the shopping experience in compulsive buying could be studied by approaching actual shoppers during their purchase journey or by addressing constraints on money and shopping time.

6. General Conclusion

This research is one of the first attempts to explore compulsive buying and brand touchpoints. By studying the dynamic responses of consumers prone to compulsive buying in two situations representing the different phases of consumer journey, this thesis provides a deeper level of understanding about information processing in compulsive buying in the marketing context. By integrating multimodal approaches and experimental settings that closer represent actual environments, the presented research offers valuable theoretical, methodological, managerial, and social contributions. This research will hopefully inspire researchers to study compulsive buying in context-dependent situations and to further investigate the underlying processes occurring during encounters with advertising information or during in-store shopping experiences via new interdisciplinary research efforts.

7. References

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8. Appendices

8.1. Appendix 1. Compulsive Buying Literature Review

8.1.1. Empirical Studies on Compulsive Buying in Clinical Research

RESEARCH ARTICLE	SAMPLE	CB EVALUATION METHOD	STUDIED CONSTRUCTS AND VARIABLES	RESEARCH PROCEDURES
Attiq & Rauf-i-Azam, 2015	General population	ECBS (Edwards, 1993)	Individuals attention to social comparison information Purchase decision involvement Compulsive buying behavior	Self-reports based questionnaire
Billieux, Rochat, Rebetez, & Van der Linden, 2008	Students within general population	Impulsive Behavior Scale (Van der Linden et al., 2006); and QABB scale (Lejoyeux et al., 1997);	Impulsivity: lack of perseverance, sensation seeking, urgency, lack of premeditation,	Self-reports based questionnaire
Black, Shaw, McCormick, Bayless, & Allen, 2012	General population	Diagnostic criteria for pathological buying (McElroy et al., 1994; clinical screener (Faber & O'Guinn, 1992); and indication for having CB for 1 or more years.	Neuropsychological functioning Impulsivity Novelty seeking Psychiatric comorbidity Symptoms for ADHD	Experimental neuropsychological assessment tasks and self-reports based questionnaire.
Claes, Bijttebier, Eynde, Mitchell, Faber, Zwaan, & Mueller, 2010	General population	Clinical screener (Faber & O'Guinn, 1992)	Reactive temperament Regulative temperament Materialism Depression	Self-reports based questionnaire
Davenport, Houston, & Griffiths, 2011	Students within general population	Clinical screener (Faber & O'Guinn, 1992)	Reward sensitivity Impulsivity Cognitive and somatic anxiety Self-esteem Social desirability Excessive eating	Self-reports based questionnaire
García Ureta, 2007	Self-identified compulsive buyer	Self-identification	Characteristics of addiction to buying Causes of behavior Materialistic values Personal values	Qualitative case study Observatory diary recording

Harvanko, Lust, Odlaug, Schreiber, Derbyshire, Christenson &Grant, 2013	Students within general population	MIDI (Christenson et al., 1994; Grant et al., 2005); diagnostic criteria for pathological buying (Black, Monahan, & Gabel, 1997; McElroy et al., 1994)	Prevalence Characteristics Stress and mood states Psychiatric comorbidity Affective disorders Anxiety disorders Psychosocial functioning Sociodemographic variables	Self-reports based questionnaire
Kellett & Totterdell, 2009	Sample from the health center	Clinical screener (Faber & O'Guinn, 1992); CAS (Frost et al., 1998); Yale–Brown Obsessive–Compulsive Scale – Shopping version (Goodman et al., 1989)	Mood variability Shopping experience Self-perception of shopping episodes	A field experiment using self-reports based questionnaire.
Koran, Faber, Aboujaoude, Large, & Serpe, 2006	General population	Clinical screener (Faber & O'Guinn, 1992)	Buying attitudes and behavior Buying consequences Financial Demographic variables Prevalence	Self-reports based questionnaire
Kyrios, Frost, & Steketee, 2004	General population	Clinical screener (Faber & O'Guinn, 1992)	Cognitive beliefs Cognitive styles: perfectionism Processing: decision – making	Self-reports based questionnaire
Kyrios, McQueen, & Moulding, 2013	General population	Clinical screener (Faber & O'Guinn, 1992), and additional clinical diagnostic questions	Mood effects Episodic memory Emotional and functional constructs and consumption items	Two experimental information-processing paradigms with mood manipulation condition. Measured elf-reports - based accounts.
Lawrence, Ciorciari, & Kyrios, 2014	General population	Compulsive Buying Rating Scale built on diagnostic criteria (McElroy et al.,1994)	Sensitivity to reward Obsessive-compulsive phenomenon Depressive phenomenon Hoarding	Self-reports based questionnaire
Lawrence, Ciorciari, & Kyrios, 2014	General population	Clinical screener (Faber & O'Guinn, 1992); CAS (Frost et al., 1998); and Buying Cognitions Inventory (Kyrios et al., 2004)	Neurophysiological cognitive processes Executive processing Cue-reactivity Neural connectivity Episodic memory	Experiment with shopping items manipulation condition. Responses collected with electroencephalograph and self-reports based questionnaire.

Lejoyeux, Mathieu, Embouazza, Huet, & Lequen, 2007	Shopping sample within general population	Mc Elroy et al. (1994)	Prevalence Buying style: buying during sales or periods of sales campaigns, planning of purchases, affective involvement in purchases, preference of specific brands, tendency to consider purchases as exceptional, the use of shopping Web sites The use of the Internet Time speaking on cellular phone	Self-reports based questionnaire in the shopping context
Lejoyeux, Richoux-Benhaim, Betizeau, Lequen, & Lohnhardt, 2011	Students within general population	Mc Elroy et al. (1994) criteria for CB; and QABB scale (Lejoyeux et al., 1997)	Prevalence Sociodemographic variables Alcohol and smoking behavior Money attitude Buying style Self-esteem	Self-reports based questionnaire
Lo & Harvey, 2011	Students within general population	Clinical screener (Faber & O'Guinn, 1992)	Decision processes: search behavior, choice characteristics, spending, budget consciousness, credit card availability effects, emotional responses to overspending	Two simulated web-based shopping experiments with collected behavior and self-reports based measures.
McElroy, Keck, Pope, Smith, & Strakowski, 1994	Psychiatric patients	Diagnostic criteria (McElroy et al., 1994)	Conceptualization Characterization Psychiatric comorbidity Affective disorders Anxiety disorders Impulsive control disorders Family history	Self-reports based questionnaire
McQueen, Moulding, & Kyrios, 2014	General population	Clinical screener (Faber & O'Guinn, 1992); and additional clinical diagnostic questions	Compulsive buying beliefs Urge to buy	Experiment with cognitive beliefs manipulation. Measured self-reported indications of behavior and self-reports based questionnaire.
Mikołajczak-Degrauwe & Brengman, 2014	General population	CBI (Ridgway et al., 2008)	Advertising attitudes Skepticism towards Advertising avoidance Persuasion knowledge	Self-reports based questionnaire
Miltenberger, Redlin, Crosby, Stickney, Mitchell, Wonderlich, Faber & Smyth, 2003	General population	Clinical screener (Faber & O'Guinn, 1992)	Emotional factors: sadness/depression, tension/anxiety, anger/irritation, self-criticism, boredom, and euphoria/excitement before and after shopping	Semi-structured interviews and self-monitoring assessment methods

Mueller, Mitchell, Peterson, Faber, Steffen, Crosby & Claes, 2011	General population	Clinical screener (Faber & O'Guinn, 1992)	Depression Materialism Excessive Internet use	Self-reports based questionnaire
Mueller, Mitchell, Crosby, Gefeller, Faber, Martin, Bleich, Glaesmer, Exner & de Zwaan, 2010	Treatment moreover, potential treatment undergoing compulsive buyers	Clinical screener (Faber & O'Guinn, 1992); SCID-ICD , and diagnostic criteria (McElroy et al., 1994)	Psychiatric comorbidity Obsessive–compulsive symptoms Affective disorders Anxiety disorders Eating disorders Impulse control disorders Latent profile	Self-reports based questionnaire
Otero-López & Villardefrancos, 2015	General population	The Spanish translated version of GABS (Raab et al., 2005)	Extrinsic life aspirations: financial success, image, popularity, and conformity Intrinsic life aspirations: self-acceptance, affiliation, community feeling, physical health, and safety Hedonism Spirituality	Self-reports based questionnaire
Rose, 2007	General population	Clinical screener (Faber & O'Guinn, 1992)	Impulse control Narcissism Materialism Mediation	Self-reports based questionnaire
Schlosser, Black, Repertinger, & Freet, 1994	Self-identified compulsive buyers	Clinical screener (Faber & O'Guinn, 1992) adopted Valence et al. (1988) scale	Life-style Problems that compulsive buying causes	Self-reports based questionnaire
Sohn & Choi, 2012	General population	Clinical screener (Faber & O'Guinn, 1992) validated by diagnostic criteria (McElroy et al., 1994)	Beliefs related to shopping Self-regulation Stimulation Deprivation Response Compulsive spending	Qualitative in-depth interview
Spinella, Lester, & Yang, 2015	General population	Clinical screener (Faber & O'Guinn, 1992)	Attitudes toward money Financial management behavior Materialistic values	Self-reports based questionnaire
Trotzke, Starcke, Müller, & Brand, 2015	Students within general population	GABS (Raab et al., 2005)	Internet use expectations for online shopping Shopping excitability Arousal Subjective craving Behavior in online context	Cue-reactivity experiment with shopping and control cues manipulation conditioned. Measured skin and self-reports based responses.

Trotzke, Starcke, Pedersen, & Brand, 2014	Compulsive buyers from the self-help group and non-clinical controls	Diagnostic criteria (McElroy et al., 1994)	Underlying mechanisms of pathogenesis Cue-reactivity Subjective craving Subjective arousal Subjective urge Physiological arousal	Cue-reactivity experiment with shopping and control cues manipulation conditioned. Measured skin and self-reports based responses.
Trotzke, Starcke, Pedersen, Müller, & Brand, 2015	Compulsive buyers from the self-help group and non-clinical controls	Diagnostic criteria (McElroy et al., 1994), SCID-ICD (Glasofer, Brown, & Riegel, 2015; Kessler et al., 2008; Wittchen, Fydrich, Zaudig, & Fydrich, 1997); clinical screener (Faber & O'Guinn, 1992); and GABS (Raab et al., 2005)	Decision under ambiguity Decision under risk Emotional processing Physiological and behavioral performance Executive functioning	Experiment with scientifically validated decision-making tasks. Measured performance behavioral measures, skin conductance, and self-reports based responses.
Vogt, Hunger, Pietrowsky, & Gerlach, 2015	General population	Clinical screener (Faber & O'Guinn, 1992), GABS (Raab et al., 2005); and assessment on (hypo) mania subsection of the Structured Clinical Interview for DSM-IV (Wittchen, Fydrich, Zaudig, & Fydrich, 1997)	Impulsivity with hoarding Impulsivity without hoarding	Experiment with scientifically validated decision-making tasks. Measured performance behavioral measures, and self-reports based responses.
Voth, Claes, Georgiadou, Selle, Trotzke, Brand, de Zwaan & Müller, 2014	Treatment undergoing compulsive buyers and non-clinical controls	SCID-ICD (First, Spitzer, Gibbon, & Williams, 2002) and GABS (Raab et al., 2005)	Reactive temperament Regulative temperament	Measured performance behavioral measures, and self-reports based responses.
Wang & Yang, 2008	Students within general population	Clinical screener (Faber & O'Guinn, 1992)	Personality traits Harmonious passion Obsessive passion Compulsive buying behavior Online shopping dependency	Self-reports based questionnaire
Williams & Grisham, 2012	General population	Clinical screener (Faber & O'Guinn, 1992) and CBI (Ridgway et al., 2008)	Emotional regulation Attentional mindfulness Impulsivity	Self-reports based questionnaire

Abbreviations: GABS (German Addictive Buying Scale) (Raab, Neuner, Reisch, & Scherhorn, 2005), CBS (Compulsive Buying Scale) (Valence, Astous, & Fortier, 1988), Clinical screener (Faber & O'Guinn, 1992), CBI (Compulsive Buying Index) (Ridgway, et al., 2008), ECBS (Edwards Compulsive Buying Scale) (Edwards, 1993), QABB (Questionnaire about buying behavior Questionnaire about Buying Behaviour (Lejoyeux et al., 1997); SCID-ICD (Structured Clinical Interview for DSM-IV) (Glasofer, Brown, & Riegel, 2015; Kessler et al., 2008; Wittchen, Fydrich, Zaudig, & Fydrich, 1997)), MIDI (Minnesota Impulse Disorders Interview) (Christenson et al., 1994; Grant et al., 2005); CAS (Compulsive Acquisition Scale) (Frost et al., 1998).

Table 8-1. An overview of empirical studies on compulsive buying in clinical research.

8.1.2. Empirical Studies on Compulsive Buying in Consumer Research

AUTHORS	SAMPLE	CB EVALUATION METHOD	STUDIED CONSTRUCTS AND VARIABLES	RESEARCH PROCEDURES
Achtziger, Hubert, Kenning, Raab, & Reisch, 2015	General population	GABS (Raab et al., 2005)	Financial consequences: real debts Self-control Sociodemographic profiles	Self-reports based questionnaire and actual behavioral data
Cole & Sherrell, 1995	Students within general population	Clinical screener (Faber & O'Guinn, 1992); and CBS (Valence et al., 1988)	Differences between compulsive buying evaluation scales Validity and reliability of CB measures	Self-reports based questionnaire
d'Astous, 1990	General population	CBS (Valence et al., 1988)	Nature of behavior Self-esteem Irrational credit card usage Gender differences Susceptibility to social influence Early consumption experiences	Self-reports based questionnaire
d'Astous, Maltais, & Roberge, 1990	Adolescents within general population	CBS (Valence et al., 1988)	Consumption habits Social and family influences Self-esteem Introversion Rational consumer behavior	Study 1: qualitative semi-structured interview Study 2: self-reports based questionnaire
Desarbo & Edwards, 1996	Sample 1: self-identified treatment seeking individuals Sample 2: general population	ECBS (Edwards, 1993); and self-identification	Nature of compulsive buyers' heterogeneity based on psychological processes: anxiety, perfectionism, self-esteem, fantasy, impulsiveness, excitement seeking, approval seeking, the locus of control, dependence, depression, avoidance coping, denial, isolation, materialism	Self-reports based questionnaire
Dittmar & Drury, 2000	General population	CBS (Valence et al., 1988)	Conceptualization of impulsive and compulsive buying Shopping experience Self-identity Cultural and social influences	Qualitative in-depth face-to-face interview
Dittmar, 2005	Compulsive buyers from the self-help group and non-clinical controls	CBS (Valence et al., 1988)	Gender Age Endorsement of materialistic values	Self-reports based questionnaire

Dittmar, Long, & Bond, 2007	General population	CBS (Valence et al., 1988)	Materialistic values Buying motives: self-identity, and emotional and mood related Compulsive buying tendency online	Self-reports based questionnaire
Edwards, 1993	Sample 1: compulsive buyers from the self-help group Study 2: general population	Self-identification	Compulsive buying evaluation scale development Conceptualization of behavior: the compulsion to spend, shopping related feelings, spending tendency, dysfunctional spending, post-purchase guilt	Self-reports based questionnaire
Elliott, 1994	General population	CBS (Valence et al., 1988)	Function of compulsive buying Heterogeneity Postmodernity effects	Qualitative in-depth face-to-face interview, and self-reports based questionnaire
Faber & Christenson, 1996	Self-identified compulsive buyers and controls	Clinical screener (Faber & O'Guinn, 1992) for validation	Experienced mood states prior and during shopping	Self-reports based questionnaire
Faber & O'Guinn, 1988	Self-identified compulsive buyers who contacted self-help group and general population for control purposes	Self-identification	Materialism: possessiveness, non-generosity, envy Obsessive-compulsive syndrome Feelings regarding shopping and the products purchased	Self-reports based questionnaire
Faber & O'Guinn, 1989	Sample 1: general population Sample 2: self-identified compulsive buyers	Clinical screener (Faber & O'Guinn, 1992)	Compulsive buying evaluation scale development and validation Prevalence	Self-reports based questionnaire
Faber & O'Guinn, 1992	Sample 1: general population Sample 2: self-identified compulsive buyers	Clinical screener (Faber & O'Guinn, 1992); self-identification; and clinical identification	Compulsive buying evaluation scale development Behavior: motivations and feelings associated with buying Financial consequence	Self-reports based questionnaire
Faber, Christenson, de Zwaan, & Mitchell, 1995	Study 1: women screened for binge eating and control group of non-binge eaters Study 2: self-identified compulsive buyers	Clinical screener (Faber & O'Guinn, 1992) for validation purpose	Comorbidity with eating disorders	Self-reports based questionnaire

Flight, Rountree, & Beatty, 2012	Students within general population	CBI (Ridgway et al., 2008)	Affect and urge to buy Behavior: impulsive and compulsive buying differences	Self-reports based questionnaire and online shopping diary
Hassay & Smith, 1996	General population	Clinical screener (Faber & O'Guinn, 1992)	Motives Post-shopping behavior: concern for store return policy, product return frequency, return volumes Shopping channels	Self-reports based questionnaire
Horváth & Birgelen, 2015	General population	Clinical screener (Faber & O'Guinn, 1992)	Brand perception Purchase decisions Functional benefits of branded products Emotional benefits of branded products	Self-reports based questionnaire
Horváth, Büttner, Belei, & Adıgüzel, 2015	General population	Study 1: CBS (Valence et al., 1988); and CBI (Ridgway et al., 2008) Study 2: GABS (Raab et al., 2005)	Self-control attempts Self-control strategies in a shopping situation	Study 1: qualitative in-depth face-to-face interview Study 2: Self-reports based questionnaire
Johnson & Attmann, 2009	General population	Modified ECBS scale (Edwards, 1993)	Product specific context behavior Neuroticism Materialism Fashion interest Compulsive clothing buying	Self-reports based questionnaire
Kukar-Kinney, Ridgway, & Monroe, 2009	Internet clothing retailer sample from the general population	CBI (Ridgway et al., 2008)	Motivations to buy and to shop on the Internet as opposed to the brick-and-motor retail stores: seeking product, information variety, the ability to buy unobserved, avoiding social interactions, and experiencing positive feelings during shopping and buying Shopping behavior	Self-reports based questionnaire and actual behavioral data
Kukar-Kinney, Ridgway, & Monroe, 2012	Internet clothing retailer sample from the general population	CBI (Ridgway et al., 2008)	Price knowledge/consciousness Price promotions effects Brand consciousness Prestige sensitivity	Self-reports based questionnaire
Kukar-Kinney, Scheinbaum, & Schaefers, 2016	General population	CBI (Ridgway et al., 2008)	Online buyer behavior for daily deal promotions Motivations: hedonic, utilitarian, social normative, social comparison Psychological responses to contextual information: discount size, quantity restriction, time restriction, offer distinctiveness, the number of coupons sold	Self-reports based questionnaire

Kwak, Zinkhan, & DeLorme, 2002	Students within general population	Clinical screener (Faber & O'Guinn, 1992)	CB effects on advertising attitudes Exposure to television commercials and television shows effects Cultural differences	Self-reports based questionnaire
Kwak, Zinkhan, Delorme, & Larsen, 2006	Study 1: shopping sample within general population Study 2: students within general population	Clinical screener (Faber & O'Guinn, 1992)	Normative influences Compulsive buying tendency Compulsive buying behavior Impulsive buying behavior Impulsive buying tendency	Two studies Self-reports based questionnaire
Lee & Workman, 2015	General population	Clinical screener (Faber & O'Guinn, 1992)	Brand variables: brand awareness brand loyalty brand attachment brand quality perception	Self-reports based questionnaire
Lee, Lennon, & Rudd, 2000	Television shoppers within general population	Clinical screener (Faber & O'Guinn, 1992)	Comorbidity with binge eating Exposure to television shopping channel	Self-reports based questionnaire
Lo & Harvey, 2012	General population	Clinical screener (Faber & O'Guinn, 1992)	Credit card availability effects Cultural differences Spending behavior Price effects Budget consciousness Shopping feelings Post-purchase feelings	Two web-based experiments collected behavioral and self-reports based responses
Manolis & Roberts, 2011	Adolescents within general population	Clinical screener (Faber & O'Guinn, 1992)	Subjective well-being Time affluence Materialism	Self-reports based questionnaire
Mowen & Spears, 1999	Students within general population	Clinical screener (Faber & O'Guinn, 1992)	Cardinal personality traits: Five-Factor Model of personality Central personality traits: materialism and need for arousal	Self-reports based questionnaire
Neuner, Raab, & Reisch, 2005	General population	GABS (Raab et al., 2008)	Prevalence Postmodern society Acculturation process effects Cultural influences Sociodemographic variables	Self-reports based questionnaire
O'Guinn & Faber, 1989	Self-identified compulsive buyers who contacted self-help group	Clinical screener (Faber & O'Guinn, 1992)	Phenomenological conceptualization: compulsivity as a personality trait, self-esteem, fantasizing personality, the motivation of behavior, consequences of behavior	Study 1: qualitative in-depth face-to-face interview Study 2: self-reports based questionnaire

Park & Davis Burns, 2005	General population	Clinical screener (Faber & O'Guinn, 1992)	Fashion orientation: fashion interest, fashion leadership, the importance of being well dressed, anti-fashion consumption Credit card usage	Self-reports based questionnaire
Pham, Yap, & Dowling, 2012	General population	Clinical screener (Faber & O'Guinn, 1992)	Financial attitudes Financial management practices Materialism	Self-reports based questionnaire
Prete, Guido, & Pichierri, 2013	General population	CBS and Clinical screener (Faber & O'Guinn, 1992)	Consumer Hypnotic-Like Suggestibility consciousness state Consumer susceptibility to interpersonal influence Consumer susceptibility to consumer atmospherics	Self-reports based questionnaire
Raab, Elger, Neuner, & Weber, 2011	Sample 1: compulsive buyers – undergoing psychotherapeutic treatment Sample 2: non-compulsive buying group from general population	GABS (Raab et al., 2008)	Decision-making Impulse control Neural correlates Reward processing	fMRI experiment with simulated purchasing task measuring brain responses. Behavioral responses indicated on self-reports based accounts.
Reeves, Baker, & Truluck, 2012	Students within general population	Clinical screener (Faber & O'Guinn, 1992)	Celebrity worship Materialism Self-concept Well-being: boredom proneness, self-esteem, and life satisfaction.	Self-reports based questionnaire
Ridgway, Kukar-Kinney, & Monroe, 2008	Study 1: Students within general population Study 2: general population	CBI (Ridgway et al., 2008)	Compulsive buying tendency evaluation scale Conceptualization Validation of the compulsive buying tendency evaluation scale	Self-reports based questionnaire and actual behavioral data
Roberts & Pirog, 2004	Students within general population	Clinical screener (Faber & O'Guinn, 1992)	Extrinsic goals: financial success, attractiveness to others Intrinsic goals: self-acceptance, community feelings	Self-reports based questionnaire
Roberts & Roberts, 2012	Adolescents within general population	Established for experiment	Academic stress Gender	An experiment with academic stress manipulation condition. Self-reports based accounts collected behavior responses.

Roberts, Manolis, & Pullig, 2014	General population	Clinical screener (Faber & O'Guinn, 1992)	Contingent self-esteem Self-presentation concerns: Fear of negative evaluation, importance of social identity	Study 1: self-reports based questionnaire for exploratory purpose Study 2, Study3: experiments, self-reports based responses
Scherhorn, Reisch, & Raab, 1990	Self-identified compulsive buyers and control group	GABS (Raab et al., 2008)	Conceptualization: addiction related characteristics Distorted autonomy	Self-reports based questionnaire
Shoham, Gavish, & Segev, 2015	General population	Clinical screener (Faber & O'Guinn, 1992)	Envy Self-esteem Fantasizing Effects of cultural orientations and cultural values	Self-reports based questionnaire
Unger & Raab, 2015	Students within general population	GABS (Raab et al., 2008)	Compulsive and compensatory buying prevalence Cultural differences Sociodemographic variables	Self-reports based questionnaire
Valence, Astous, & Fortier, 1988	General population	CBS (Valence et al., 1988)	Conceptualization: personality situation interaction effects, socio-cultural effects, anxiety, self-esteem, family environment, financial constraints Compulsive buying tendency evaluation scale Sociodemographic variables	Self-reports based questionnaire
Yurchisin & Johnson, 2004	Students within general population	ECBS (Edwards, 1993)	Perceived social status associated with buying Materialism Self-esteem Apparel product involvement	Self-reports based questionnaire

Abbreviations: GABS (German Addictive Buying Scale) (Raab et al., 2005),CBS (Compulsive Buying Scale) (Valence et al., 1988), Clinical screener (Faber & O'Guinn, 1992), CBI (Compulsive Buying Index) (Ridgway et al., 2008), ECBS (Edwards Compulsive Buying Scale) (Edwards, 1993)

Table 8-2. An overview of empirical studies on compulsive buying in consumer research.

8.2. Appendix 2. Material for Study I: Neurocognitive Tasks

The set of neurocognitive assessment tasks lasted in total 15 minutes. This set consisted of three tasks: 1) a 3-choice active vigilance task (3CVT), 2) an auditory passive vigilance task (APVT), 3) and a visual passive vigilance task (VPVT). To minimize the practice effects, each participant went through the training before they started the tasks.

During the 3CVT task, subjects were asked to discriminate one primary target from two secondary non-target geometric shapes that were randomly presented during 5 minutes period (70% - target-occurrence, 30 % - non-target occurrence). The inter-stimulus interval was kept inconsistent to maintain high engagement levels. Thus it varied from 1.5 to 3 seconds. Study participants were asked to respond as quickly as possible to each stimulus by pressing the arrows, more specifically, by choosing the left arrow for target stimuli and pressing the right arrow for non-target stimuli. The other two vigilance tasks were passive tasks that also lasted for approximately five minutes each. During the visual psycho-vigilance task (VPVT) participants were instructed to repeatedly press the space key each time a ten-centimeter circular target image was presented for 200 milliseconds. The target image was introduced every two seconds. The APVT test was similar to the VPTV test. Except that in APVT test, instead of visual stimulus, the auditory stimulus was presented. Participants were asked to complete the task with their eyes closed. Instead of visual stimuli, the audible tone was played every 2 seconds.

8.3. Appendix 3. Material for Study I: EEG Metrics Extraction

The individualized B-Alert *EEG-based engagement* model identified and classified the level of an individual's state into different levels of alertness ranging from inattentive/fatigue to highly engaged (i.e., vigilant and alert) (Johnson et al., 2011). The engagement DFA model used a total of twenty-two model-selected variables obtained from electrodes combinations FzPOz and CzPOz (see Figure 8-1 and Table 8-3) over 1 to 40 Hz bins. The model utilized a total of seven model-selected variables from channel FzPOz and fifteen model-selected variables from channel CzPOz. From channel FzPOz, the model included one variable in the 14 –24 Hz and 6 in the 25– 40 Hz bins (absolute and relative power density spectra). From channel CzPOz, the model included one variable in the 1 –4 Hz, two in the 5-7 Hz, 5 in 8-13 Hz, two in 14-24 Hz, and 6 in the 25– 40 Hz bins (absolute and relative power density spectra).

The B-Alert *EEG based workload* model (Berka et al., 2007) used the absolute and relative power density spectra from the differential combinations of EEG derivations into a two-class linear discriminant function analysis classifier ranging from the low to high cognitive workload probability (i.e., 0.1- 1). The model employed a total of thirty-one model-selected variables from electrodes combinations FzPOz, CzPOz, C3C4, FzC3, F3Cz, and F3Cz FzPOz and CzPOz (see Figure 8-1 and Table 8-3) over 1 to 40 Hz bins. For example, the workload DFA model used a total of seven model-selected variables from channel FzPOz, including one in the 1 –4 Hz, one in the 8– 13 Hz bins, one in the 14-24 Hz, and two in the 25-40 Hz bins (absolute and relative power density spectra). The table with all EEG variables used for computation of engagement and workload indexes is presented in Table 8-3.

The *EEG based workload model* was designed and trained on the EEG data collected from the large population who completed different combinations of tasks and levels of these tasks, for example, Forward Digit Span and Backward Digit Span tests (for a detailed description see Berka et al., 2007).

Figure 8-1. Visual representation of electrodes used for neurophysiological metrics calculation.

	Model-selected variables for computation of Engagement index				
	1-4Hz	*5-7 Hz*	*8-13 Hz*	*14-24 Hz*	*25-40Hz*
FzPOz	0	0	0	1	6
CzPOz	1	2	5	2	6
	Model-selected variables for computation of Workload index				
C3C4	1	0	2	2	2
CzPOz	0	0	0	2	5
F3Cz	0	3	1	0	1
F3C4	1	0	1	1	0
FzC3	1	0	0	1	1
F3POz	1	0	1	1	2

Table 8-3. EEG variables used for computation of engagement and cognitive workload indexes.

The model is adapted from Berka et al., 2007, p.4.

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8.4. Appendix 4. Material for Study I: Advertising Stimuli

Ad category/ Storyline	Ad message
Social cause (SC)	
Ad 1. While the child is playing in the living room with bricks, his mother comes in, looks at the child and says: "You look just like my father."	**Ad 1**. "Every year more than 400 girls are sexually abused by their father".
Ad 2. A black frame. Somebody's hands are making a gun from the balloon.	**Ad 2.** "It is easy to convince children that killing is a game."
Ad 3. Brother and sister are hanging out at home. Suddenly the phone rings and the sister answers. Both siblings are shocked.	**Ad 3.** "A sick child affects everyone."
Ad 4. Continuous fast-changing frames of different people walking from doors to doors interacting with one another. In the background, the number "40" is constantly repeated.	**Ad 4.** "Keep helping hungry children."
Fashion (FSH)	
Ad 1. A group of girls is hanging out in nature close to the caravan. While enjoying a beautiful sunny day, they are playing with the camera, taking pictures of each other, laughing and demonstrating their outfits.	**Ad 1**. "Pollux clothing company. Main Street grand junction & Montrose, CO."
Ad 2. Fashionable models/youth dressed in high-fashion clothing running around the building. Fast "James Bond" like music is played in the background.	**Ad 2.** "New collection out. Fall/Winter '13. Joe's".
Ad 3. A frame of the man running away after one -night stand with the girl. Suddenly he understands that he needs to come back since the girl is wearing his T-shirt. When comes back he finds a protective cat and leaves his T-shirt for the girl.	**Ad 3.** "It is about time you had a favorite T-shirt."
Ad 4. The casually dressed family is enjoying everyday activities, such as driving their car, playing badminton, talking a walk together.	**Ad 4**. "Brooks Brothers."

continues on the next page

Fast-moving consumer goods (FMCG)

Ad 1. A couple who just had some fun on the grass pretends that nothing happens. However, girl's white pants with green stains from the lawn uncover their secret.

Ad 2. Women walk in the office, even though her dress is stuck in her underpants, nobody notices anything except her beautiful and shiny hair.

Ad 3. Two men are imitating training. One is the commander. The bear chases Another in the hamster.

Ad 4. The good-looking woman is presenting baking soda.

Ad 1. "For life's bleachable moments."

Ad 2. "The miracle of beautiful hair."

Ad 3. "New sustainable degree with motions sense."

Ad 4. "It is up to three shades whiter or your money back."

Food (F)

Ad 1. A man is walking with the source in the barbecue. He continuously says "that is what she said" joke.

Ad 2. A sexy woman is messily eating salad.

Ad 3. Beautiful family dinner at the restaurant. Grandmother, daughter and a mother are having their perfect time.

Ad 4. Food is used as bricks to build the house, which is pulled down by the avocado.

Ad 1. "For almost everything. Almost".

Ad 2. "Eat as you mean it."

Ad 3. "When you are here, you are family."

Ad 4. "Homewrecker burrito. Come build yours today with 20 plus fresh ingredients".

Table 8-4. Overview of ad stimuli by category. The storyline, the content of the ad, and ad message.

8.5. Appendix 5. Material for Study I: Additional Analyses

To address the recent debates in the literature regarding the discretization of the continuous variables (e.g., Rucker, McShane, & Preacher, 2015), conducted data analyses for Study I were supplemented by additional data analyses presented in the following section. Attention and memory measures and their relationships, including moderating effect of advertising category, were studied for the whole range of consumers evaluated on their compulsive buying tendency with Compulsive Buying Scale (Valence et al., 1988). The mixed-effects regression models estimated fixed and random effects accounting for the repeated design and within-participant variation (West et al., 2006; for its application, see Landwehr et al., 2013). Linear mixed models (LMM) were calibrated using the statistical software JMP 13.0 (SAS Inc.). Generalized linear mixed models (GLMM), which allow the assessment of a binomial dependent variable, were estimated using the statistical software SPSS 24 (SAS Inc.). The top-down model-structuring approach introduced by Verbeke and Molenberghs (2000) was followed to create the final model. The analyses began with the testing of the most complex model, including dependent variables, fixed effects, and two random factors (namely, *"Subject ID" and "Stimulus Name"*). Then, each model with deducted factors was tested to see whether the model was improved. The best-fitting model was assessed by evaluating the model fit information criteria and selecting the structure with the smallest Akaike's Information Criteria and Bayesian Information Criterion. The models were fitted and compared using restricted maximum likelihood methods. Only the best-fitting models are further reported in each data analyses section. The normalization for non-normally distributed interval variables of interest was achieved by log-transforming the EEG data, visual attention data, and self-reported memory-performance data. *P* values of .05 were taken to indicate significance. Additionally, a confidence level of .1 was also considered.

8.5.1. Adjusted Hypothesis H1 a-b: Attention during Advertising Processing

To begin with, LMMs including fixed and random factors to account for intra-subject variability were performed to test the relationships between attention allocated to brand-advertising processing (namely, engagement, cognitive workload) and CBT level (*"CBT-score"*). Specifically, the data analyses aimed to understand whether a higher CBT score (*"CBT-score CBS"*) would be positively related to the attention allocated to the advertising processing indicated by an a) increase in engagement, and an b) increase in cognitive workload

experienced during ad-viewing task. The effect of the ad category on studied relationships was also explored, including *"ad category"* as an interacting variable in the estimated models.

Engagement. First, an LMM was estimated with engagement included as the dependent variable; *"CBT-score", "ad category"* (fashion, FMCG, food, social cause), and the interaction between *"CBT-score"* and *"ad category"* modeled as fixed effects; and *"StimuliName"* added as a random factor. Data analysis demonstrated that all effects on engagement were statistically non-significant (*"CBT-score CBS":* $F_{(1, 46)} = 1.21$, $p = .28$, *"ad category":*$F_{(3,714)} = .93$, $p = .43$),*"CBT-score CBS"*"ad category":*$F_{(3, 714)} = .27$, $p = .85$). The table with parameter estimates for the model is provided below (see Table 8-5).

Effect	β	SE	df	t	p
Intercept	.34	.091	46	3.80	.0004*
CBT-score CBS	.003	.003	46	1.10	.28
Ad category[Fashion]	-.002	.006	714	-.30	.77
Ad category [FMCG]	-.008	.006	714	-1.44	.15
Ad category [FOOD]	.004	.006	714	.74	.46
CBT-score CBS *Ad category[Fashion]	-.0002	.0006	714	-.34	.73
CBT-score CBS *Ad category[FMCG]	-.0001	.0006	714	-.22	.82
CBT-score CBS *Ad category[FOOD]	.0006	.0006	714	.90	.37

Table 8-5. Solutions for fixed effects, *p< .05.

Workload. Secondly, an LMM with cognitive workload modeled as the dependent variable; *"CBT-score CBS," "ad category"* (fashion, FMCG, food, social cause), and their interaction included as fixed factors; and *"Subject ID" and "Stimuli Name"* modeled as random factors was estimated. The effects of *"CBT-score CBS"* ($F_{(1, 46)} = 1.57$, $p = .22$), *"ad category"* ($F_{(3, 12)} = 1.86$, $p=.19$) and their respective interaction ($F_{(3, 696)} = .19$, $p = .90$) on cognitive workload were all non-significant. The table with parameter estimates for the model is provided below (see: Table 8-6).

Effect	β	SE	df	t	P
Intercept	**.50**	**.042**	**47**	**11.66**	**< .0001***
CBT-score CBS	.002	.0012	45.9	1.25	.22
Ad category [Fashion]	-.009	.008	12	-1.08	.30
Ad category [FMCG]	.012	.008	12	1.44	.18
Ad category [FOOD]	-.013	.008	12	-1.62	.14
CBT-score CBS *Ad category[Fashion]	.0002	.0003	696	.76	.45
CBT-score CBS*Ad category[FMCG]	-.009	.0003	696	-.28	.78
CBT-score CBS*Ad category[FOOD]	-.068	.0003	696	-.22	.83

*Table 8-6. Solutions for fixed effects, *p< .05.*

In summary, even though CBT level showed a positive relationship with both attention indexes (i.e., a) *engagement: β* = .003; b) *cognitive workload*: *β* = .002), these relationships proved to be statistically non-significant. In addition, advertising category had no significant impact on the tested relationships.

8.5.2. Adjusted Hypothesis H2 a-b: Visual Attention to Brand Elements

Next, the relationships between the visual attention measures (i.e., TTFF, TS on AOI of visual brand elements) and CBT level were tested by estimating LMMs using the statistical software JMP 13.0 (SAS Inc.). The following analyses sought to determine whether CBT score would be positively linked to an increase in visual attention allocated to visual brand elements indicated by (a) a reduction in decoding and (b) an increase in examination time of visual brand elements presented during ad-viewing task. The "*ad category*" variable was also included in each model to explore the potential moderation effects.

TTFF on AOI of visual brand elements. First, TTFF on AOI of visual brand elements was studied. TTFF was modeled as the dependent variable with *"CBT-score CBS," "ad category"* (fashion, FMCG, food, social cause), and the interaction between*"CBT-score CBS"* and *"ad category"* modeled as fixed factors. *"Stimulus Name"* was included as a random factor. Data analysis revealed that the effects of *"CBT-score CBS"* (F (1, 748) = 1.82, *p* = .18), and *"ad*

category" (F (3, 12) = 2.32, *p* = .13) on TTFF on AOI of visual brand elements were both non-significant. However, the effect of interaction between *"CBT-score CBS"* and *"ad category"* on TTFF to visual brand elements proved to be marginally significant (F (3, 748) = 2.59, *p* = .052**)[21]. The table with parameter estimates is provided below (see Table 8-7).

Effect	β	SE	df	t	P
Intercept	**15827**	**2526**	**18.9**	**6.27**	**<.0001***
CBT-score CBS	47.3	35.1	748	1.35	.18
Ad category [Fashion]	1881	3905	12	.48	.64
Ad category [FMCG]	-2536	3905	12	-.65	.53
Ad category [FOOD]	**-7775**	**3905**	**12**	**-1.99**	**.070****
CBT-score CBS *Ad category[Fashion]	-23.9	60.7	748	-.39	.69
CBT-score CBS *Ad category[FMCG]	-76.0	60.7	748	-1.25	.21
CBT-score CBS *Ad category[FOOD]	-65.7	60.7	748	-1.08	.28

*Table 8-7. Solutions for fixed effects, *p < .05, **p<.1.*

To examine the significant interaction, additional analyses were performed (Jaccard & Turrisi, 2003). Separate regression models were generated to explore the effects of "*CBT-score CBS*" on TTFF on AOI of visual brand elements at each level of moderating factor that is for each advertising category (i.e., fashion, food, FMCG, social cause). The regression models showed that *"CBT-score CBS"* had a significant and positive influence on TTFF to visual brand elements presented during ad-viewing task, but this effect was statistically significant only for the social cause ad category (β = 213, t (187) = 2.16, *p* = .032). The effects of *"CBT-score CBS"* on TTFF to the visual brand elements within other ad categories proved to be statistically non-significant (fashion: β = 23.3, t (187) = .42, *p* = .68; FMCG: β = -28.8, t (187) = -.60, *p* = .55); food: β = -18.5, t (187) = -.28, *p* = .78, (see Figure 8-2).

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[21] * p < .05, ** p < .1.
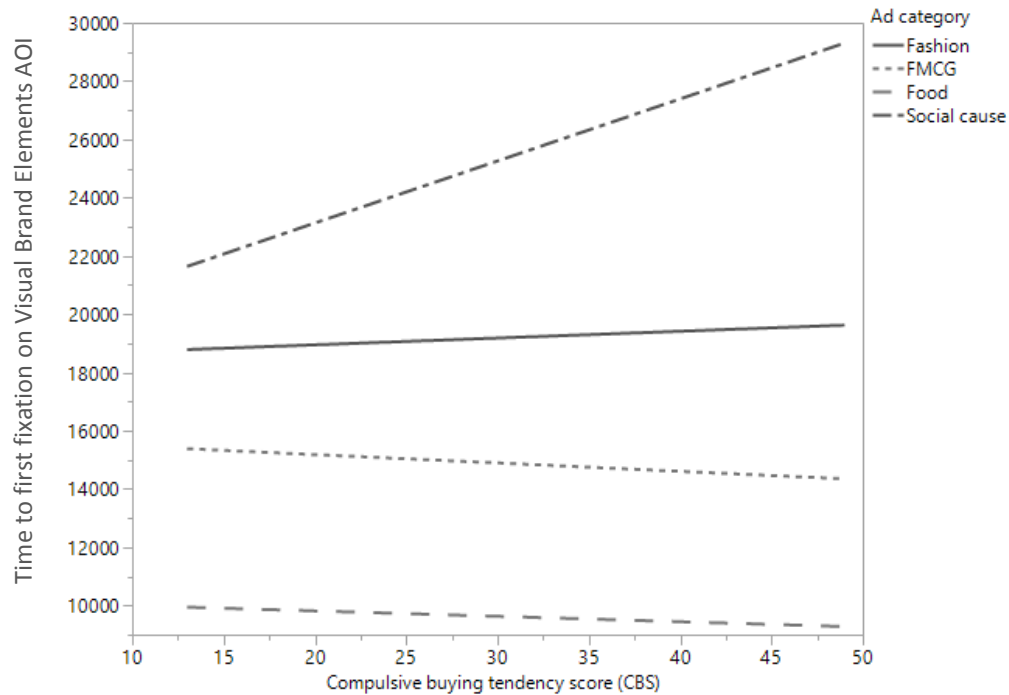
Figure 8-2. The relationship between the mean time to first fixation to visual brand elements and compulsive buying tendency score for each ad category. Time to first fixation is presented in milliseconds. The compulsive buying tendency score was positively linked to the time to first fixation to visual brand elements exposed during ad-viewing task, but only for social cause ad category.

TS on AOI of visual brand elements. Secondly, an LMM including the logarithmically transformed TS on AOI of visual brand elements as a dependent variable with *"CBT-score," "ad category"* (fashion, FMCG, food, social cause), and their interaction modeled as fixed factors was estimated. *"Subject ID"* and *"Stimulus Name"* were also included as random factors. Data analysis revealed that there was a significant effect of interaction between *"CBT-score"* and *"ad category"* on TS on AOI ($F_{(3, 702)} = 2.77$, $p = .041$), while the direct effects of *"CBT-score"* and *"ad category"* on TS on AOI proved to be both non-significant (*"CBT-score CBS"*: $F_{(1, 46)} = .11$, $p = .74$; *"ad category"*: $F_{(3, 12)} = 2.27$, $p = .13$). The table with parameter estimates is provided below (see Table 8-8).

Effect	β	SE	df	t	P
Intercept	**5.90**	**.44**	**34.8**	**13.4**	**<.0001***
CBT-scoreCBS	.003	.009	46	.33	.74
Ad category[Fashion]	**1.22**	**.56**	**12**	**2.18**	**.051****
Ad category [FMCG]	-.88	.56	12	-1.58	.14
Ad category [FOOD]	.34	.56	12	.61	.55
CBT-scoreCBS*Ad category[Fashion]	-.003	.011	702	-.31	.76
CBT-scoreCBS*Ad category[FMCG]	-.013	.011	702	-1.16	.25
CBT-scoreCBS*Ad category[FOOD]	-.015	.011	702	-1.33	.18

Table 8-8. Solutions for fixed effects, *p< .05, **p<.1.

To further explore the interaction effect in each ad category, additional regression analyses were performed (Jaccard & Turrisi, 2003). Regression models were generated for four ad categories: fashion, food, FMCG, and social cause. Data analyses showed that *"CBT-score CBS"* had a significant and positive influence on TS on AOI of visual brand elements, but this effect was only present for the social cause ad category (β = .034, t (46) = 2.11, *p* = .040) (see Figure 8-3). The relationship between *"CBT-score CBS"* and TS on AOI within other ad categories proved to be non-significant (fashion: β = -.0004, t (46) = -.04, *p* = .97; FMCG: β = -.010, t (46) = -.57, *p* = .57; food: β = -.011, t (46) = -.87, *p* = .39).
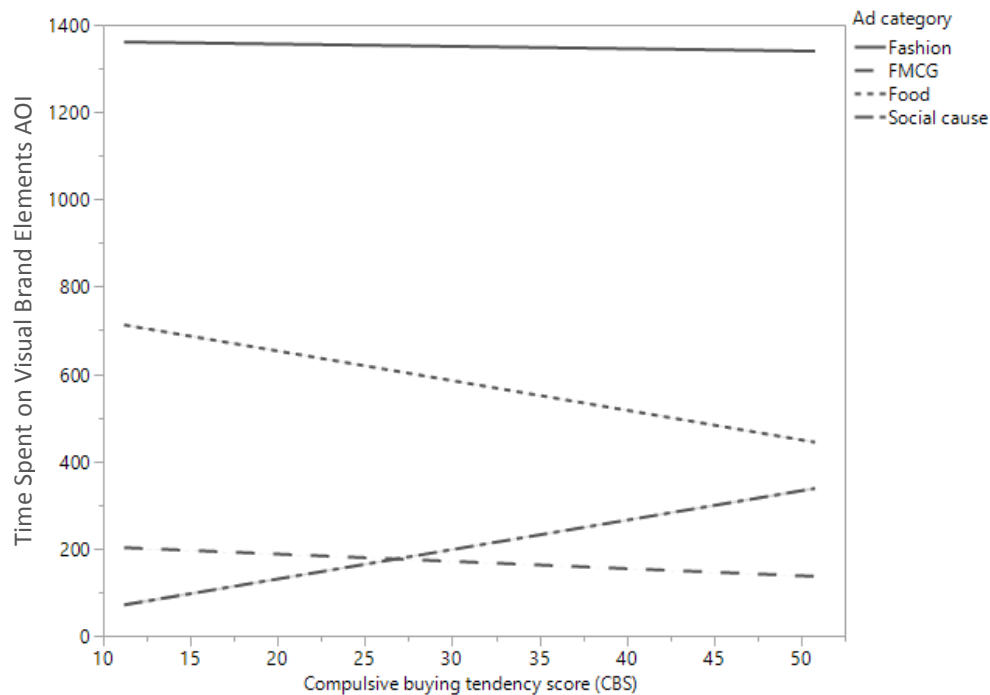
Figure 8-3. The relationship between mean time spent fixating on visual brand elements and compulsive buying tendency score for each ad category. Time spent fixating on visual brand elements is transformed back to the original values and is presented in milliseconds. The compulsive buying tendency score was positively linked to the time spent fixating on visual brand elements, but only during social cause ad exposure times.

In summary, a higher CBT level was directly linked to a) a longer decoding time of visual brand elements, and it was also positively linked to b) a longer time spent looking to visual brand elements exposed during ad-viewing task. These effects were only present during social cause video commercials viewing.

8.5.3. Adjusted Hypothesis H3 a-b: Memory Performance

To further explore the relationships between memory performance measures and CBT level and to study the impact of shown ad category on memory performance, reported association density and brand recognition measures were studied. The data analyses aimed to determine whether compulsive buying score would be directly positively linked to the better memory performance,

as indicated by a) an increase in association density score and b) an increase in brand recognition probability. For that purpose, LMMs were performed using the statistical software JMP 13.0 (SAS Inc.) and GLMM were estimated using the statistical software IBM SPSS Statistics Version 24 (SAS Inc.).

Association density. First, an LMM including logarithmically transformed association-density score as the dependent variable; *"CBT-score CBS," ad category"* (fashion, FMCG, food, social cause), and their interaction as fixed factors; and*"Subject ID"* and *"Stimulus Name"* as random factors was estimated. Results demonstrated that all effects on association-density score were statistically non-significant (*CBT-score CBS"*: F (1, 46) = .060, *p* = .81; *"ad category"*: F (3, 12) = 1.14, *p* = .37; *"CBT-score CBS" *"ad category"*: F (3,702) = 1.18, *p* = .32). The table with parameter estimates is provided in Table 8-9.

Effect	β	SE	df	t	P
Intercept	**1.03**	**.15**	**48**	**6.94**	**<.0001***
CBT-score CBS	.001	.0044	46	.24	.81
Ad category[Fashion]	.058	.043	12	1.34	.20
Ad category [FMCG]	-.064	.043	12	-1.49	.16
Ad category [FOOD]	.025	.043	12	.59	.57
CBT-score CBS*Ad category[Fashion]	.001	.002	702	.57	.57
CBT-score CBS*Ad category[FMCG]	**-.004**	**.002**	**702**	**-1.79**	**.074****
CBT-score CBS*Ad category[FOOD]	.0003	.002	702	.13	.90

*Table 8-9. Solutions for fixed effects, *p< .05, **p<.1.*

Brand recognition. Next, brand recognition measure that served as the second index for memory performance was investigated with a GLMM. Brand recognition with binomial distribution was modeled as the dependent variable with *"CBT-score CBS," "ad category"* (fashion, FMCG, food, social cause)*,* and the interaction between *"CBT-score CBS"* and *"ad category"* included as fixed factors. *"Subject ID"* was also added to the model as a random factor. Data analysis demonstrated that there was no significant effect of *"CBT-score CBS"* (F (1, 760) = .30, *p* = .59) on brand-recognition probability. However, data analysis also revealed that the effect of *"ad category"* (F (3, 760) = 3.07, *p* = .027) on brand recognition was statistically significant. Additionally, the effect of interaction between *"CBT-score CBS"* and

"ad category" on brand-recognition probability was marginally significant (F (3,760) = 2.21, *p* = .086**)[22]. The table with parameter estimates is provided below (see Table 8-10).

Effect	β	SE	t	P
Intercept	.075	.63	.12	.91
CBT-score CBS	.015	.019	.81	.42
Ad category[Fashion]	-.15	.83	-.18	.86
Ad category [FMCG]	.43	.83	.52	.61
Ad category [FOOD]	**2.60**	**.96**	**2.70**	**.007***
CBT-score CBS*Ad category[Fashion]	.020	.025	.81	.42
CBT-score CBS*Ad category[FMCG]	-.002	.025	-.076	.94
CBT-score CBS*Ad category[FOOD]	**-.053**	**.028**	**-1.89**	**.059****

Table 8-10. Solutions for fixed effects, *p< .05, **p<.1.

Post-hoc Bonferroni adjusted tests showed that brand-recognition probability was higher for FMCG product category ads as compared to the food commercials (*p* = .033). Pairwise comparison tests as well demonstrated that brand-recognition probability was higher for the food ad category than for the social cause ad category (*p* = .000). Finally, brand recognition probability was also higher for social cause ads as compared to the fashion ads (*p* = .022). All other effects between ad categories were non-significant (all *ps* > .099) (see Figure 8-4).

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[22] * p < .05, ** p < .1.
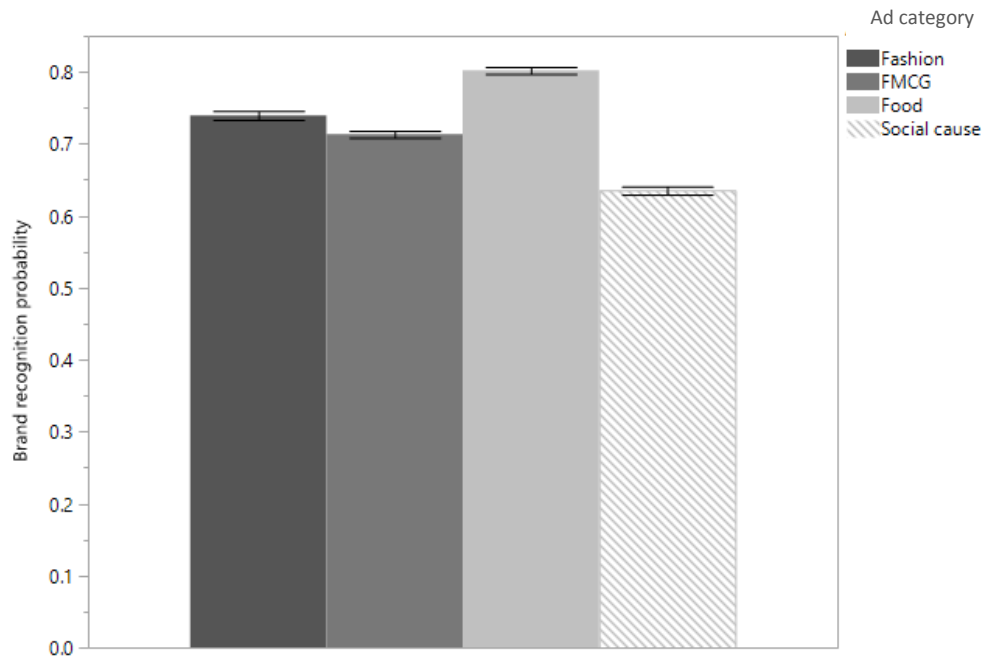
Figure 8-4. Mean brand-recognition probability for each ad category. Whiskers indicate standard error. Brand-recognition probability for FMCG ad category was higher than brand recognition for food commercials. Additionally, brand-recognition probability for food ad category was higher than brand recognition probability for social cause ad category. Finally, brand recognition probability for social cause ads was higher than brand recognition probability for fashion ads.

To further explore the interaction effect in each ad category, additional regression analyses were performed (Jaccard & Turrisi, 2003). GLMMs were generated for four ad categories: fashion, food, FMCG, and social cause including *"CBT-score CBS"* as independent variable and *"Stimuli ID"* as a random intercept. Data analyses showed that the relationship between *"CBT-score CBS"* and brand- recognition probability within all ad categories proved to be non-significant (fashion: $\beta = .035$, $p = .091$; food: $\beta = -.036$, $p = .13$; FMCG: $\beta = .013$, $p = .46$; social cause: $\beta = .015$, $p = .90$) (see Figure 8-5).
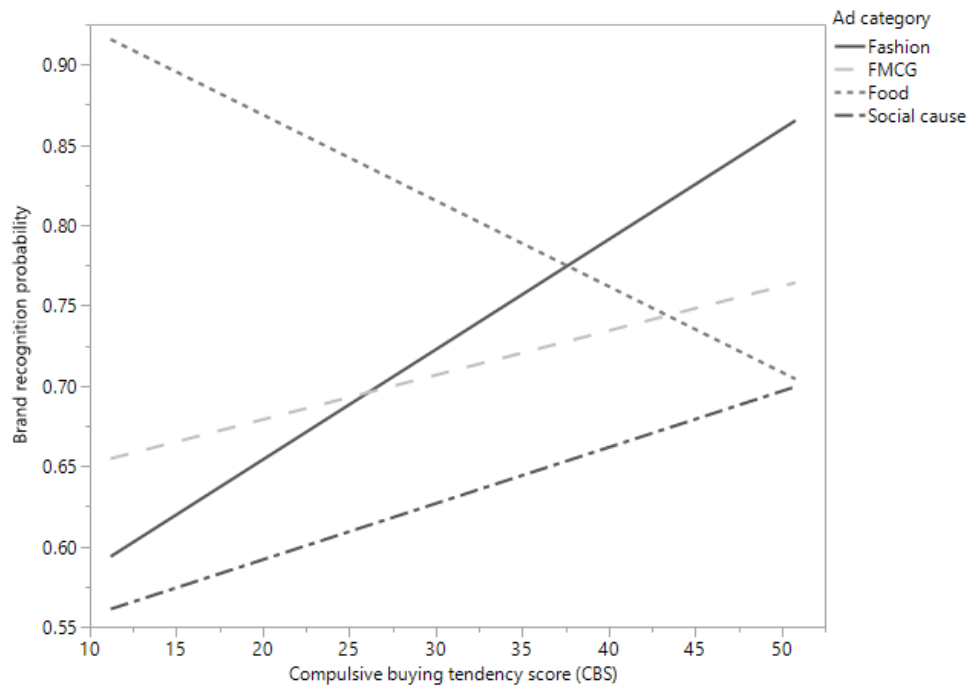
Figure 8-5. The relationship between brand-recognition probability and compulsive buying tendency per ad category.

In summary, there were no significant relationships between CBT score and any of the memory performance measures (i.e., a) association-density score and b) brand recognition). In addition, there were no changes in the results depending on the advertising category.

8.5.4. Exploration of Relationships between Attention Indexes and Memory Performance

Additionally, relationships between attention indexes for ad-processing and memory performance measures were also studied including the "*CBT-score*" as a moderating factor.

Engagement and association density. First, an LMM including a logarithmically transformed association-density score as a dependent variable; engagement, *"CBT-score CBS",* and their interaction as fixed effects; and *"Subject ID"* and *"Stimuli Name"* as random effects was estimated. Data analysis showed that all effects on association density were statistically non-significant (*engagement*: $F_{(1, 526)} = .23$, $p = .63$; *"CBT-score CBS"*: $F_{(1, 45.8)} = .11$, $p = .74$;

engagement *"CBT-score CBS": F $(1, 672) = .43$, *p* $= .51$). The table with model parameter estimates is provided below (see Table 8-11).

Effect	β	SE	df	t	P
Intercept	**1.04**	**.15**	**53.1**	**6.76**	**<.0001***
CBT- score CBS	.0015	.004	45.8	.34	.74
Engagement	-.053	.11	526	-.48	.63
Engagement* CBT- score CBS	.008	.013	672	.66	.51

Table 8-11. Solutions for fixed effects, *p< .05.

Workload and association density. Next, the relationship between cognitive workload and reported association-density score with a moderating factor of *"CBT-score CBS"* was explored. The LMM with logarithmically transformed association-density score included as a dependent variable; cognitive workload, *"CBT-score CBS,"* and the interaction between cognitive workload and *"CBT-score CBS"* modeled as fixed effects; and *"Subject ID"* and *"Stimuli Name"* included as random effects was estimated. Data analysis revealed that all effects were non-significant (*cognitive workload:* F $(1, 581) = 1.08$, *p* $=.30$, *"CBT-score CBS"*: F $(1, 45.2) = .050$, *p* $=.82$, *"CBT-score CBS" * cognitive workload*: F $(1,625) = .65$, *p* $=.42$). The table with model parameter estimates is provided below (see Table 8-12).

Effect	β	SE	df	t	P
Intercept	**1.17**	**.19**	**90.5**	**6.09**	**<.0001***
CBT- score CBS	.001	.0045	45.2	.22	.82
Engagement	-.24	.23	581	-1.04	.30
Engagement* CBT- score CBS	-.019	.024	625	-.80	.42

Table 8-12. Solutions for fixed effects, *p< .05.

The relationship between attention indexes measured during advertising processing and reported brand- recognition probability were also studied including the *"CBT-score CBS"* as a moderating factor.

Engagement and brand recognition. A GLMM with brand recognition variable modeled as the dependent variable and cognitive engagement, *"CBT-score CBS,"* and their interaction modeled as fixed factors was estimated. Additionally, *"Subject ID"* was included as a random factor. Data analysis showed that all effects on brand recognition were statistically non-significant (*engagement*: F (1, 764) = 3.21, *p* = .57), *"CBT-score CBS"*: F (1, 764) = .067, *p* = .80; *engagement* "CBT-group":* F (1, 764) = .37 *p* = .55). The table with model parameter estimates is provided below (see Table 8-13).

Effect	β	SE	t	P
Intercept	1.20	1.00	1.19	.23
CBT- score CBS	-.008	.031	-.26	.80
Engagement	-1.29	2.28	-.57	.57
Engagement* CBT- score CBS	.042	.069	.61	.55

Table 8-13. Solutions for fixed effects, *p< .05.

Workload and brand recognition. Finally, the effects of cognitive workload on brand recognition moderated by *"CBT-score CBS"* were studied by running a GLMM. Brand recognition was modeled as the dependent variable; cognitive workload, *"CBT-score CBS,"* and their interaction included as fixed factors; and *"Subject ID"* modeled as a random factor. Data analysis showed that all effects on brand recognition were statistically significant: *"CBT-score CBS"* (F (1, 758) = 7.44, *p* = .007); *cognitive workload* (F (1, 758) = 5.45, *p* =.020); *cognitive workload*"CBT-score CBS"* (F (1,758) = 6.78, *p* = .009). The table with model parameter estimates is provided below (see Table 8-14).

Effect	β	SE	t	P
Intercept	**-4.13**	**2.07**	**-2.00**	**.047***
CBT- score CBS	**.17**	**.063**	**2.72**	**.007***
Cognitive workload	**9.20**	**3.94**	**2.33**	**.020***
Cognitive workload * CBT- score CBS	**-.31**	**.12**	**-2.60**	**.009***

Table 8-14. Solutions for fixed effects, *p< .05.

To specify the interaction, spotlight analyses (Krishna, 2016; for application see Landwehr et al., 2013) were conducted with the *"CBT-score CBS"* variable mean shifted by dummy coding. To explore the effect of cognitive workload on a brand-recognition probability at the high level of CBT, a new dummy variable was created. *"CBT-score CBS"* variable was replaced with '*"CBT-score CBS-High"*=*"CBT-score CBS"*- *M* – *SD'* variable. A GLMM model including workload, *"CBT-score CBS-High"* and their interaction as predictors, brand-recognition with binomial logit distribution as the dependent variable, and *Subject ID"* as a random intercept was estimated. Next, to explore the effect of cognitive workload on a brand-recognition probability at the low level of CBT, a new dummy variable was created, where *"CBT-score CBS"* variable was replaced with '*"CBT-score CBS-Low"*= *"CBT-score CBS"*- *M* +*SD'* variable. Another GLMM was run where *"CBT-score CBS-High"* variable was replaced by *"CBT-score CBS-Low"* variable.

Data analyses revealed that the effect of cognitive workload on brand recognition probability differed depending on the CBT level (see Figure 8-6). That is, at the high level of CBT, the cognitive workload was negatively linked to the brand-recognition probability (β= -3.58, SE = 1.54, t = -2.33, p =.020). At the low level of CBT, on the other hand, the cognitive workload was positively linked to the brand recognition probability (β= 1.94, SE = 1.46, t = 1.32, p =.19). However, the relationship between cognitive workload and brand-recognition probability was only significant at the high level of CBT. Specifically, higher experienced workload during ads viewing could predict a worse probability of recognizing seen brands.
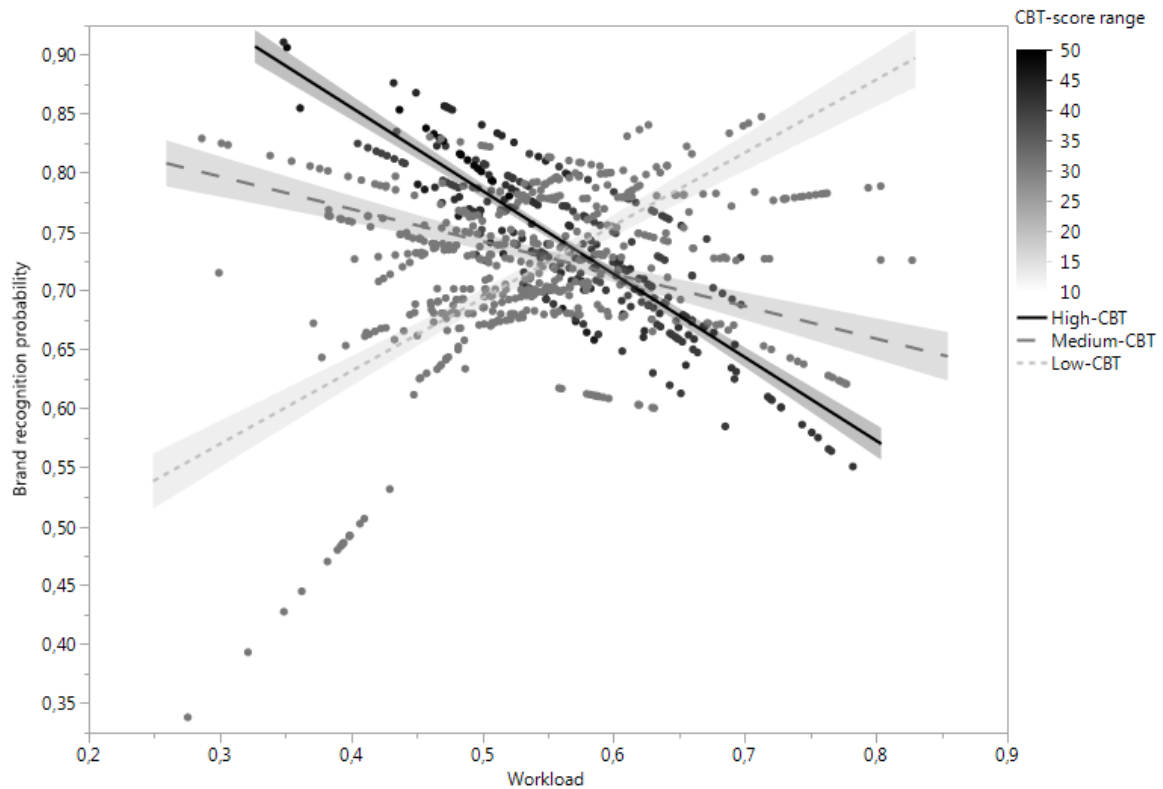
Figure 8-6. The relationship between workload and brand-recognition probability moderated by compulsive buying tendency level.

While data analyses showed no significant relationships between attention indexes and association density measure, the cognitive workload was found to predict the brand-recognition probability, but only at the high level of CBT. In particular, for consumers with a high CBT higher cognitive workload experienced during ad–viewing task resulted in worse performance on the brand recognition test conducted after ads exposure.

8.5.5. Exploration of Relationships between Visual Attention to Visual Brand Elements and Brand Recognition

Finally, the relationship between visual attention to visual brand elements (i.e., TTFF, TS on AOI of visual brand elements) and brand-recognition probability including the *"CBT-score"* as a moderating factor was studied performing GLMMs analyses.

TTFF on AOI of visual brand elements and brand recognition. First, a GLMM including brand recognition variable with binomial distribution as the dependent variable; TTFF on visual brand elements, *"CBT-score,"* and their interaction as fixed factors; and *Subject ID"* as a random factor was estimated. Data analysis showed that all effects on brand recognition were statistically non-significant (*TTFF*: F (1, 764) = 2.57, p = .11; *"CBT-score"*: F (1, 764) = .37, p = .54; *TTFF* "CBT-score":* F (1, 764) = 2.57 p = .11). The table with model parameter estimates is provided below (see Table 8-15).

Effect	β	SE	t	P
Intercept	**1.34**	**.58**	**2.31**	**.021***
TFFF	.00004	.00002	-1.60	.11
CBT- score	-.010	.017	-.61	.54
TTFF* CBT- score	.000001	.000007	1.60	.11

Table 8-15. Solutions for fixed effects, *p< .05.

TS on AOI of visual brand elements and brand recognition. Next, a GLMM including brand recognition with binomial distribution as a dependent variable; TS on AOI, *"CBT-score,"* and their interaction as fixed factors; and *"Subject ID"* as a random factor was estimated. Data analysis showed that all effects on brand recognition were statistically non-significant (*TS:* F (1, 764) = .22, p = .64; *"CBT-score"*: F (1, 764) = .00, p = .99; TS**"CBT-score"*: F (1,764) = .92, p = .34). The table with model parameter estimates is provided below (see Table 8-16).

Effect	β	SE	t	P
Intercept	.47	.53	.89	.37
TS	.000	.0004	.46	.64
CBT- score	.000	.016	.010	.99
TS* CBT- score	.00001	.00001	.96	.34

*Table 8-16. Solutions for fixed effects, *p< .05.*

In summary, exploratory analyses demonstrated that none of the visual attention measures showed any significant relationship with brand recognition probability.

Summary of Results

In summary, data analyses revealed that there were no significant relationships between CBT level and attention indexes, and between CBT level and memory performance measures. In addition, the ad category had no significant impact on studied relationships. However, there was a significant direct positive relationship between the CBT level and the TTFF to visual brand elements and a significant direct negative relationship between the CBT level and the TS fixating on visual brand elements. The ad category moderated both relationships, that is significant effects were demonstrated only for social cause ads. In addition, there were no significant relationships between attention indexes underlying ad-processing and association-density score depending on the CBT level. Furthermore, there was also no significant relationship between engagement and brand-recognition probability and visual attention measures and brand-recognition probability. However, there was a significant relationship between cognitive workload and brand-recognition probability, which depended on the CBT level. Spotlight analyses demonstrated that the relationship between cognitive workload and brand-recognition probability was negative and only significant at the high CBT level. In addition, the ad category effect was only significant for brand-recognition probability and was independent of the CBT level.

8.6. Appendix 6. Material for Study I: Exploratory Analyses

Engagement and association density. The effects of engagement on the reported number of associations moderated by *"CBT-group"* was studied by estimating an LMM. The logarithmically transformed association-density score was included as dependent variable; engagement, *"CBT-group,"* and their interaction were modeled as fixed effects; and *"Subject ID"* and *"Stimulus Name"* were added as random factors. Data analysis showed that all effects on association-density score were statistically non-significant (*engagement*: $F(1, 373) = .61$, $p = .43$; *"CBT-group"*: $F(1, 29.3) = 1.14$, $p = .29$; *engagement*"CBT-group"*: $F(1, 375) = .78$ $p = .38$). The table with model parameter estimates is provided below (see Table 8-17).

Effect	β	SE	df	t	p
Intercept	**1.13**	**.081**	**116**	**13.9**	**<.0001***
Engagement	-.11	.14	373	-.78	.43
CBT- group[High-CBT]	.051	.048	29.3	1.07	.29
Engagement*CBT group[High-CBT]	.13	.14	374.8	.89	.38

Table 8-17. Solutions for fixed effects, *p < .05.

Workload and association density. The effects of cognitive workload on the reported number of associations moderated by *"CBT-group"* was studied by estimating an LMM. The logarithmically transformed association-density score was included as the dependent variable with cognitive workload, *"CBT-group,"* and their interaction added as fixed factors. *"Subject ID"* and *"Stimulus Name"* were also included as random factors. Data analyses revealed that all effects on association-density score were statistically non-significant (*cognitive workload:* $F(1, 371.7) = .002$, $p = .97$; *"CBT-group"*: $F(1, 30.2) = .94$, $p = .34$; *cognitive workload*"CBT-group"*: $F(1, 418.9) = 2.43$, $p = .12$). The table with model parameter estimates is provided below (see Table 8-18).

Effect	β	SE	df	t	p
Intercept	**1.09**	**.17**	**284.9**	**6.30**	**<.0001***
Cognitive workload	.013	.30	371.7	.04	.97
CBT- group[High-CBT]	.047	.048	30.2	.97	.34
Cognitive workload*CBT group[High-CBT]	-.43	.27	418.9	-1.56	.12

Table 8-18. Solutions for fixed effects, *p < .05.

Engagement and brand recognition. The effects of engagement on brand recognition moderated by *"CBT-group"* was studied by estimating a GLMM. Brand recognition with Binomial logit distribution was modeled as the dependent variable; engagement, *"CBT-group,"* and their interaction included as fixed factors; and *"Subject ID"* added as a random factor. Data analysis showed that all effects on brand recognition were statistically non-significant (*engagement*: F (1, 508) = .015, *p = .90, "CBT-group"*: F (1, 508) = .23, *p = .63; engagement* "CBT-group": F (1, 508) = .65, p = .42*). The table with model parameter estimates is provided below (see Table 8-19).

Effect	β	SE	t	P
Intercept	**1.21**	**.41**	**2.92**	**.004***
Engagement	-.65	.95	-.68	.50
CBT- group[High-CBT]	-.31	.65	-.48	.63
Engagement*CBT group[High-CBT]	1.13	1.40	.81	.42

Table 8-19. Solutions for fixed effects, *p < .05. Solutions provided in the log odds ratio scale.

TTFF on AOI of visual brand elements and brand recognition. The effects of TTFF on visual brand elements on brand recognition moderated by *"CBT-group"* was studied by estimating a GLMM. Brand recognition with Binomial logit distribution was modeled as the dependent variable; TTFF on AOI of visual brand elements, *"CBT-group,"* and their interaction included as fixed factors; and *"Subject ID"* added as a random intercept. Data analysis showed that all

effects on brand recognition proved to be statistically non-significant (*TTFF:* (1, 508) = .95, *p* = .33; *"CBT-group"*: F (1, 508) = .45, *p* = .50; *TTFF* "CBT-group":* F (1, 508) = 2.33, *p* = .13).

The table with model parameter estimates is provided below (see Table 8-20).

Effect	β	SE	t	P
Intercept	**1.03**	**.26**	**4.00**	**.000***
TTFF	-.000004	.00001	-.39	.70
CBT- group[High-CBT]	-.24	.36	-.67	.50
TTFF*CBT-group[High-CBT]	.00002	.00002	1.53	.13

Table 8-20. Solutions for fixed effects, *p < .05. Solutions provided in the log odds ratio scale.

8.7. Appendix 7. Material for Study II: Exploratory Analyses

Emotional Responses during the First Minute of Shopping Experience and Time Spent on Shopping

SCR peak frequency and time spent on shopping. An LMM with a logarithmically transformed time spent on shopping modeled as the dependent variable; SCR peak frequency, *"CBT-group,"* and their respective interaction included as fixed factors; and *"Subject ID"* modeled as a random intercept was run. Data analysis demonstrated that all effects were non- significant (*SCR peak frequency:* F (1, 55.4) = .091, *p* = .76; *"CBT-group":* F (1, 27) = .60, *p* =.44; *SCR peak frequency *"CBT-group:* F (1, 55.4) = 1.66, p = .20). The table with model parameter estimates is provided below (see Table 8-21).

Effect	β	SE	df	t	p
Intercept	**6.04**	**.15**	**54.6**	**40**	**<.0001***
SCR frequency	-.004	.014	55.4	-.30	.76
"CBT-group" [Low- CBT]	-.054	.070	27.0	-.78	.44
SCR frequency * "CBT-group" [Low- CBT]	.017	.014	55.4	1.29	.20

Table 8-21. Solutions for fixed effects, *p< .05.

SCR peak amplitude and time spent on shopping. An LMM including a logarithmically transformed time spent on shopping as a dependent variable; SCR peak amplitude, *"CBT-group,"* and their interaction as fixed factors; and *"Subject ID"* as a random intercept was estimated. Analysis revealed that all effects were non-significant (*SCR peak amplitude*: F (1, 48.8) = 1.38, *p* = .24; *"CBT-group"*: F (1, 27.2) = .34, *p* =.57; *SCR peak amplitude*"CBT-group":* F (1, 48.8) = .021, p = .88). The table with model parameter estimates is provided below (see Table 8-22).

Effect	β	SE	df	t	p
Intercept	**6.14**	**.14**	**42.9**	**45.0**	**<.0001***
SCR amplitude	-1.62	1.37	48.8	-1.17	.25
"CBT-group" [Low- CBT]	-.042	.072	27.2	-.58	.57
SCR amplitude* "CBT-group" [Low- CBT]	.20	1.38	48.8	.15	.88

Table 8-22. Solutions for fixed effects, *p< .05.

Emotional Responses during the First Minute of Shopping Experience and Number of Items Chosen

SCR peak frequency and a number of chosen items. An LMM including a number of items chosen as a dependent variable; SCR peak frequency, *"CBT-group,"* and their respective interaction as fixed factors; and *"Subject ID"* as a random intercept was estimated. Data analysis showed that all effects were non-significant (*SCR peak frequency:* $F_{(1, 52.1)} = .042$, $p = .84$, *"CBT-group":* $F_{(1, 26.0)} = 1.38$, $p = .25$; *SCR peak frequency *"CBT-group":* $F_{(1, 52.1)} = .012$, $p = .91$). The table with model parameter estimates is provided below (see Table 8-23).

Effect	β	SE	df	t	p
Intercept	**3.68**	**.77**	**47.8**	**4.78**	**<.0001***
SCR frequency	-.015	.071	52.1	-.20	.84
"CBT-group" [Low- CBT]	-.36	.31	26.0	-1.17	.25
SCR frequency * "CBT-group" [Low- CBT]	.008	.071	52.1	.11	.91

*Table 8-23. Solutions for fixed effects, *p< .05.*

SCR peak amplitude and a number of items chosen. An LMM including number of items chosen as a dependent variable; SCR peak amplitude, *"CBT-group,"* and their respective interaction as fixed factors; and *"Subject ID"* as a random intercept was estimated. Analysis demonstrated that all studied effects were non-significant (*SCR peak amplitude:* $F_{(1, 48.8)} = 1.38$, $p = .24$, *"CBT-group":* $F_{(1, 27.2)} = .34$, $p = .57$; *SCR peak amplitude*"CBT-group":* $F_{(1, 48.8)} = .021$, $p = .88$). The table with model parameter estimates is provided below (see Table 8-24).

Effect	β	SE	df	T	p
Intercept	**3.22**	**.59**	**31.8**	**5.48**	**<.0001***
SCR peak amplitude	2.77	6.09	33.8	.46	.65
"CBT-group" [Low- CBT]	-.39	.29	24.8	-1.37	.18
SCR peak amplitude* "CBT-group" [Low-CBT]	7.81	6.09	33.8	1.28	.21

*Table 8-24. Solutions for fixed effects, *p< .05.*

SCR peak duration and a number of items chosen. An LMM including a number of items chosen as a dependent variable; SCR peak duration, *"CBT-group,"* and their respective interaction as fixed factors; and *"Subject ID"* as a random intercept was estimated. Analysis demonstrated that all effects were non-significant (*SCR peak duration:* F (1, 39.2) = 1.41, *p* = .24, *"CBT-group":* F (1, 25.8) = .70, *p* =.41; *SCR peak duration*"CBT-group":* F (1, 39.2) = 2.40, p = .13). The table with model parameter estimates is provided below (see Table 8-25).

Effect	β	SE	df	t	p
Intercept	**2.87**	**.54**	**35**	**5.28**	**<.0001***
SCR duration	.002	.001	39.2	1.19	.24
"CBT-group" [Low- CBT]	-.27	.32	25.8	-.84	.41
SCR duration* "CBT-group" [Low- CBT]	-.002	.001	39.2	-1.55	.13

Table 8-25. Solutions for fixed effects, *p< .05.

Emotional Responses during the First Minute of Shopping Experience and Hypothetical Spending

SCR peak duration and hypothetical spending. An LMM including logarithmically transformed hypothetical spending as a dependent variable; SCR peak duration, *"CBT-group,"* and their respective interaction as fixed factors; and *"Subject ID"* as a random intercept was estimated. Analysis demonstrated that all effects were non-significant (*SCR peak duration:* F (1, 35.9) = .043, *p* = .84, *"CBT-group":* F (1, 21.5) = 2.69, *p* =.12; *SCR peak duration*"CBT-group":* F (1, 35.9) = .057, p = .81). The table with model parameter estimates is provided below (see Table 8-26).

Effect	β	SE	df	t	p
Intercept	**7.28**	**.17**	**31.2**	**42.9**	**<.0001***
SCR peak duration	-.00009	.0004	35.9	-.21	.84
"CBT-group" [Low- CBT]	-.16	.10	21.5	-1.64	.12
SCR peak duration * "CBT-group" [Low- CBT]	.0001	.0004	35.9	.24	.81

Table 8-26. Solutions for fixed effects, *p< .05.

Emotional Responses during the Entire Shopping Period and Time Spent on Shopping

SCR peak amplitude and time spent on shopping. An LMM with a logarithmically transformed time spent on shopping modeled as the dependent variable; SCR peak amplitude, *CBT-group,"* and their respective interaction included as fixed factors; and *"Subject ID"* modeled as a random intercept was run. Analysis demonstrated that all effects were non-significant (*SCR peak amplitude*: $F_{(1, 43.9)} = 2.86$, $p = .098$; *"CBT-group":* $F_{(1, 25.8)} = .25$, $p = .62$; *SCR peak amplitude * "CBT-group"*: $F_{(1, 43.9)} = .0007$, $p = .98$). The table with model parameter estimates is provided below (see Table 8-27).

Effect	β	SE	df	t	p
Intercept	6.23	.16	38.7	40	<.0001*
SCR peak amplitude	-2.67	1.58	43.9	-1.69	.098**
"CBT-group" [Low- CBT]	-.037	.074	25.8	-.50	.62
SCR peak amplitude* "CBT-group" [Low- CBT]	-.043	1.58	43.9	-.03	.98

*Table 8-27. Solutions for fixed effects, *p< .05, **p <.1.*

Emotional Responses during the Entire Shopping Period and Number of Items Chosen

SCR peak amplitude and a number of items chosen. An LMM with a number of items chosen as the dependent variable; SCR peak amplitude,*"CBT-group,"* and their interaction included as fixed factors; and *"Subject ID"* modeled as a random intercept was estimated. Analyses revealed that all effects were non-significant (*SCR peak amplitude*: $F_{(1, 31.4)} = .80$, $p = .38$; *"CBT-group"*: $F_{(1, 24.8)} = 1.95$, $p = .18$); *SCR peak amplitude *" CBT-group:* ($F_{(1, 31.4)} = 1.19$, $p = .28$). The table with model parameter estimates is provided below (see Table 8-28).

Effect	β	SE	df	t	p
Intercept	2.95	.66	29.8	4.45	<. 0001*
SCR peak amplitude	6.15	6.86	31.4	.90	.38
"CBT-group" [Low- CBT]	-.41	.29	24.8	-1.40	.18
SCR peak amplitude* "CBT-group" [Low- CBT]	7.46	6.86	31.4	1.09	.28

*Table 8-28. Solutions for fixed effects, *p< .05.*

SCR peak duration and a number of items chosen. An LMM with a number of items chosen as the dependent variable; SCR peak duration, *"CBT-group,"* and their respective interaction included as fixed factors; and *"Subject ID"* modeled as a random intercept was estimated. Analysis demonstrated that all effects were non-significant (*SCR peak duration:* $F_{(1, 27.9)} = .25$, $p = .62$, *"CBT-group":* $F_{(1, 26.1)} = 1.17$, $p = .29$; *SCR peak duration*"CBT-group":* $F_{(1, 27.9)} = .78$, $p = .38$). The table with model parameter estimates is provided below (see Table 8-29).

Effect	β	SE	df	t	p
Intercept	**3.25**	**.55**	**27.5**	**5.96**	**<.0001***
SCR duration	.0007	.001	27.9	.50	.62
"CBT-group" [Low- CBT]	-.34	.31	26.1	-1.08	.29
SCR duration* "CBT-group" [Low- CBT]	-.001	.001	27.9	-.88	.38

Table 8-29. Solutions for fixed effects, *p< .05.

Emotional Responses during the Entire Shopping Period and Hypothetical Spending

SCR peak duration and hypothetical spending. An LMM with a logarithmically transformed hypothetical spending as the dependent variable; SCR peak duration, *"CBT-group,"* and their respective interaction included as fixed factors; and *"Subject ID"* modeled as a random intercept was run. Analysis demonstrated that all effects were non-significant (*SCR peak duration:* $F_{(1, 27.5)} = .57$, $p = .46$, *"CBT-group":* $F_{(1, 25.5)} = 2.45$, $p = .13$; *SCR peak duration*"CBT-group":* $F_{(1, 27.5)} = .43$, $p = .52$). The table with model parameter estimates is provided below (see Table 8-30).

Effect	β	SE	df	t	p
Intercept	**7.13**	**.16**	**27**	**43.9**	**<.0001***
SCR peak duration	.0003	.0004	27.5	.76	.46
"CBT-group" [Low- CBT]	-.15	.093	25.5	-1.57	.13
SCR peak duration * "CBT-group" [Low- CBT]	-.0003	.0004	27.5	-.65	.52

Table 8-30. Solutions for fixed effects, *p< .05.

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