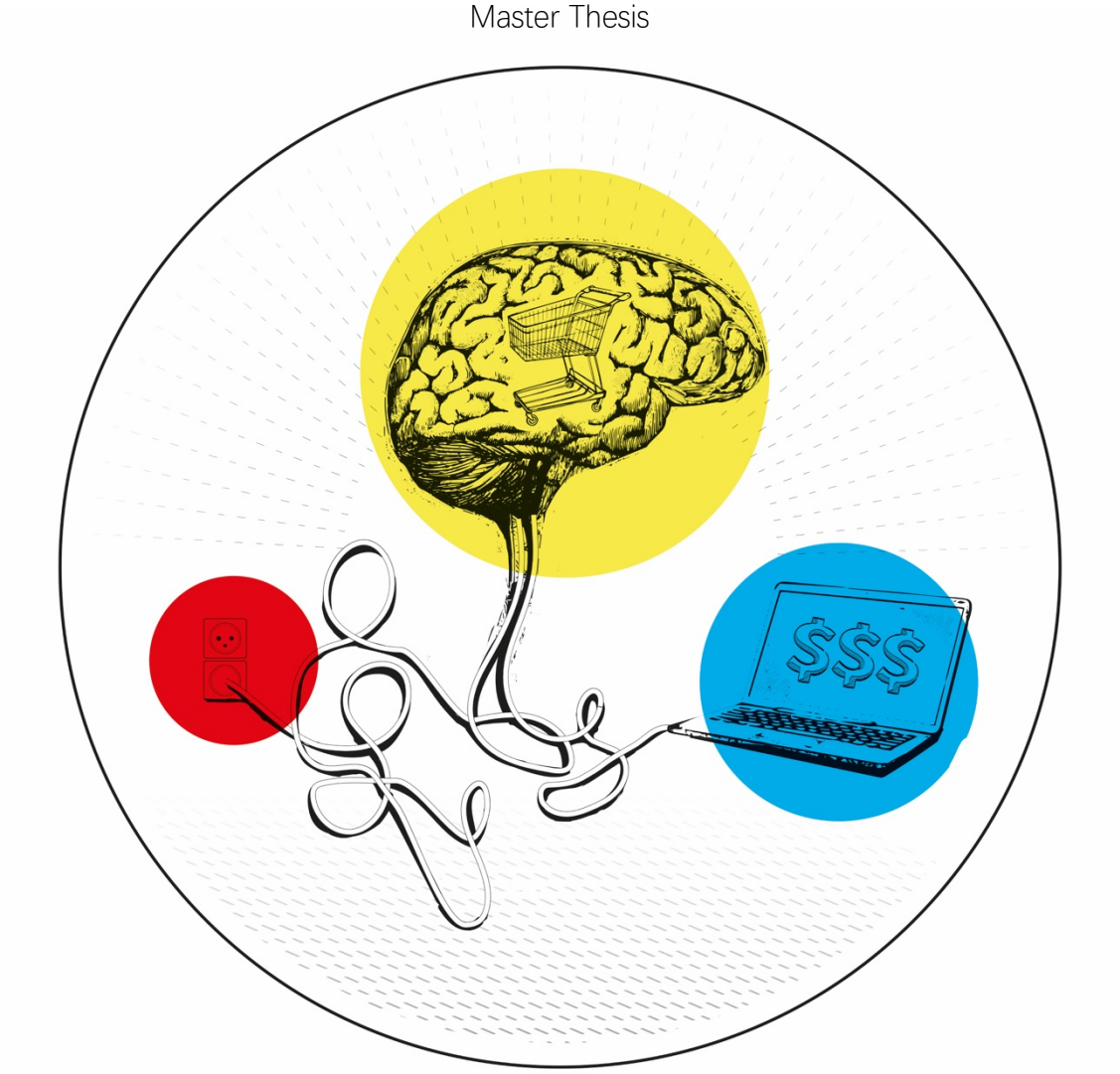
Stimulating Impulsive Purchases Online

A Consumer Neuroscience Study of the Effect of Visually Salient Stimuli on Online Impulsive Purchasing Behavior

Master Thesis



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ABSTRACT

Purpose -- The aim of this research paper was to investigate the impact of certain visually salient stimuli, red color background and product zoom element, vs. a neutral stimulus (white background) on impulsive shopping behavior. This was to be examined through the research question: How do visually salient stimuli affect emotional impulsive responses in an online shopping environment?

Research design -- This study tests the effectiveness of two visually salient stimuli vs. a neutral stimulus using biometric measures (eye-tracking and GSR) and several self-report surveys. The experiment tested 41 European women (ages 18-35). The majority of the experiment consisted of an on-screen test showing the participants product images manipulated to contain the chosen visually salient stimuli. The participants' purchase intention, arousal and valence levels, and previous purchase intention of chosen products was used in combination with total fixation duration (TFD), time to first fixation (TTFF), and reaction data to evaluate the general effectiveness of the visually salient stimuli in terms of influencing online impulsive purchases.

Findings -- Both visually salient stimuli are similarly effective in creating positive valence but were not correlated with arousal. The red color was most effective in increasing general purchase intention, followed by product zoom element (and lastly neutral stimulus). Product zoom element was associated with the longest TFD; however, the implications of this are unclear and will require further research. Both visually salient stimuli perform positively, however more research is required to optimize product zoom element's possible use in online retail and effect on consumers. On the other hand, based on findings, red color background performed more effectively on several of the components of impulsive purchasing, and is more readily applicable. Lastly, this study found that an impulsive purchase is increasingly difficult to define and can benefit from future research using more advanced neurometric techniques to pinpoint a concrete and universal definition.

Practical implications -- Emotion is an essential component of impulsive purchases, and emotional connection to a product results in greater product satisfaction, lower risk of regret, and potentially increased consumer retention. Secondly, the red color background's effectiveness on several of the measures indicate that retailers could potentially benefit from implementing red background color.

Contribution -- This study contributes to research in the emotional aspect of impulsive purchases and the triggers that influence emotion, as well as the effect of visually salient stimuli on impulsive purchasing behavior.

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Figures and tables in bold were created by Ida Ling Yun Zhang Illum and Nathalie Maria Madsen, 2019

List of Acronyms

Acronyms	Term
Neuromarketing terminology	
TTFF	Time to first fixation
TFD	Total fixation duration
AOI	Area of interest
ER-SCR	Event-related skin conductance response
GSR	Galvanic skin response
Data gathering methods	
SR	Self-report
SAM	Self-assessment manikin
BIS	Barratt impulsiveness scale
Components of impulsive purchase	
ITB	Intent-to-buy
PPI	Previous purchase intention
Stimuli	
PZE	Product zoom element

1. Introduction

> *"Every characteristic absence of spirituality, every piece of common vulgarity, is due to an inability to resist a stimulus - you have to react, you follow every impulse."*
> — Friedrich Nietzsche

Online shopping and the behavior within, sees constantly developing trends that online retailers attempt to keep up with. However, some concepts have taken longer than others to translate from common buying behavior in physical stores to the understanding of implications and the practical implementation of these same concepts in an online setting. Impulsive buying in an online setting is an example of one of these concepts. Triggers of impulsive shopping have been researched extensively for physical stores (Clover, 1950; Krishna, 2012; Gupta, 2011; Peck and Childers, 2006) and hence, it is known how physical stores can attempt to increase the number of impulse purchases. Although, the same triggers successful in encouraging impulsive purchases in physical stores are not all directly applicable in webshops, i.e. using triggers that appeal to the senses, such as smell, taste and touch. The measures devised to intentionally encourage impulsive purchases online have, to date, mostly been triggers which can be 'logically' justified by the consumer, e.g. free shipping, sales items, scarcity etc. (Chan et al., 2017).

When searching for the definition of impulsive purchase, an emotional aspect is commonly considered to be relevant (Frijda et al., 2014; Stern, 1962; Chan, Cheung and Lee, 2017; Chen & Wang, 2015) and therefore, research in the emotional contribution to impulsive purchases and the triggers that influence emotion are a gap that should be reduced. This is especially relevant considering that the number of online purchases that are a result of an impulse varies in previous literature; however, the impulse purchase percentage (depending on product type) settles in a range between 40-80% of purchases (Shen and Khalifa, 2012; Aragoncillo & Orús, 2018). While a range of stimuli have been investigated in studies measuring emotional impact, or impact on subsequent behavior following exposure, such as the effect of social proof (Gwee & Chang, 2014) or various colors (Cheng et al., 2009; Lee et al., 2005), not many studies have attempted to understand visually salient stimuli's impact on impulsive behavior, i.e. the effect visually salient stimuli has on all the individual components impulsive behavior is comprised of. Given this lack of existing literature on the effect of visually salient stimuli on impulsive shopping behavior, this paper aims to test two

visually salient stimuli, (1) showing products on a red background and (2) showing products with a product zoom element, against a neutral stimulus, showing products on a plain, white background.

The research gap within the effect of visually salient stimuli on impulsive purchasing behavior (and components of which impulsive shopping behavior) online has consequently led us to this area of research. This study intends to contribute to the existing knowledge on the topic by combining aspects from all relevant literature. With this, a holistic study of all elements which are a part of online impulsive purchasing that, currently, are solely examined individually or as combinations of a couple of the components. The research question that has been determined to best contribute to the topic of online impulse is as follows:

*Research question: How do **visually salient stimuli** affect **emotional impulsive responses** in an **online shopping** environment?*

This is broken down into two sub-research questions with the aim of examining all possible aspects and providing a detailed answer to the research question. These are the following:

1) How do visually salient stimuli (red color background and product zoom element) and neutral stimuli compare in their effectiveness of resulting in high arousal and positive valence (i.e. elicit strong and positive emotional reaction)?

2) How do visually salient stimuli (red color background and product zoom element) and neutral stimuli compare in their effectiveness of resulting in positive preference formation and consequently a high intent-to-buy?

2. Research Design

The following section will focus on the research philosophy and approach taken for the research of this paper. The following chapter will outline the direction of the paper using the research onion depicted in Saunders et. al (2009) (see figure 1).

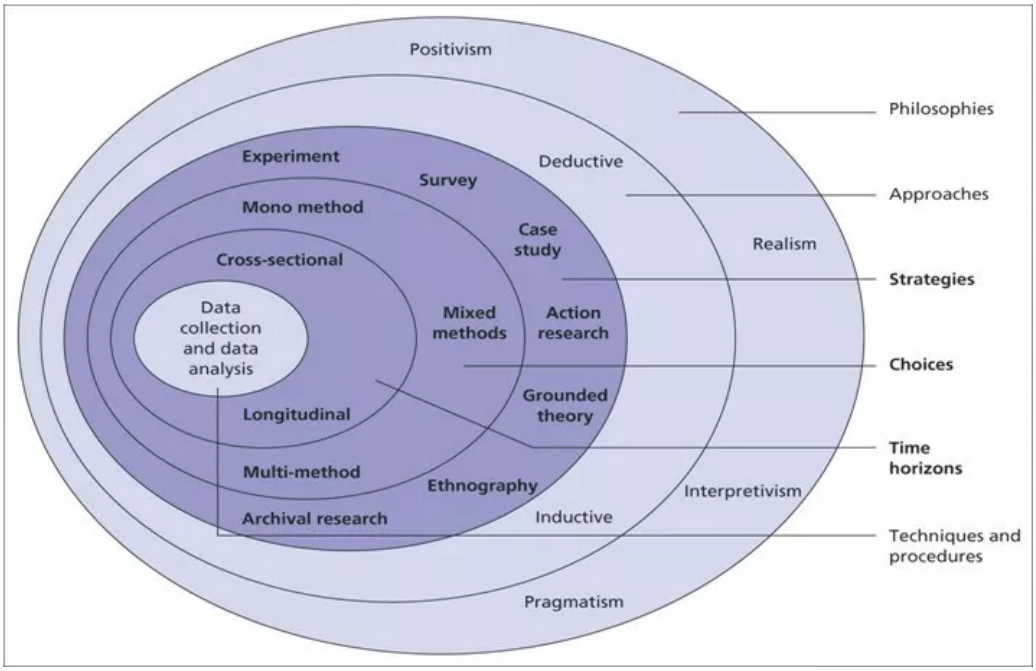


Figure 1: Research Onion

2.1 Research Philosophy

In the first layer, we must decide upon a research philosophy, namely the assumptions about and way in which we view the world and the topic of research. For this particular topic, we have chosen positivism as our school of thinking. By using this philosophy, we will be "*working with an observable social reality and that the end product of such research can be law-like generalisations similar to those produced by the physical and natural scientists*" (Remenyi et al., 1998 in Saunders et al., 2009, p. 113). We will begin by gathering existing knowledge via a critical literature review. Here, we will aim to use mostly peer-reviewed articles but since we want the most recent data we will sometimes have to resort to other types of information sources (e.g. iMotions pamphlet on eye-tracking and galvanic skin response (GSR)). From the information gained in the literature review, we will develop multiple hypotheses for what findings we expect our experiment will have. Via our experiment, we wish to obtain scientific data that can be observed, analyzed and discussed that will either partly or wholly confirm or reject our hypotheses (ibid.). Another philosophy that was considered was realism; however, the axiology of realism cannot be applied to this paper, as research here is value-laden and impacted by the researchers' culture and upbringing (ibid., p. 119), whereas we will remain objective parties throughout the data gathering and analysis.

2.2 Research Approach

With the chosen research philosophy of positivism, it often follows that a deductive research approach is best suited for the topic at hand. With this approach, we are conducting a more scientific method that follows five stages of progress, as put forth by Robson (2002) (in Saunders et al., 2009, p. 124): (1) deducing hypothesis from the theory, (2) determining the operational aspects of which and how variables are tested to prove or disprove the hypothesis, (3) testing the hypothesis, (4) examining the results in order to confirm or reject the hypothesis, and lastly (5) modifying the theory with new knowledge gained. Furthermore, we are attempting to distinguish a causal relationship or at the very least correlation between our chosen visually salient stimuli and the concept of impulsive purchasing. Another facet of our experiment that leads us to choosing deduction is the testing of visually salient stimuli along with a neutral stimulus in order to ensure that the visually salient stimuli are specifically having an effect and not other unintended variables of the experiment. Lastly, deductive approach is chosen due to the fact that the experiment will garner both quantitative data and qualitative data, and that the knowledge gained from this data should be able to be generalized to a larger group that match the same characteristics as the sample population.

The purpose of this study is both descripto-explanatory and exploratory, as the amount of literature available for each facet of online impulsive shopping behavior is expected to be inconsistent. The paper begins with descriptive research on the topic, but this is used as a precursor to conducting a study that attempts to establish a causal relationship or correlation between variables.

2.3 Research Design

Research Strategy

This study will use multiple research strategies in order to gain a holistic view of the topic. This is common within both exploratory and descriptive research and also increases the ease of comparison among the participants. Furthermore, it allows for qualitative knowledge to be combined with the quantitative findings, and therefore can be "*used to suggest possible reasons for particular relationships between variables*" (Saunders et al., 2009, p. 144). Self-reports (SR) will be used in parts one, two and three of the study. The data gathering process will use a self-report indicating the participants' demographics and shopping habits (part one), their SR valence and arousal levels at certain times during the experiment (part two), and lastly their personal impulsiveness level (part

three). Part two will consist of an experiment that will be used to gather quantitative data and test the relationship between the chosen variables. This will not be a classic experiment set-up, as there will not be a differentiation between an experimental group and control group, but rather testing control via neutral product images on which a visually salient stimulus has not been applied (to be explained in chapter *6.5 Stimuli*). In terms of simple vs. complex experiments, the experiment for this study will lean towards simple, as we are merely testing whether a change in the independent variables (the visually salient stimuli) will cause a change in a dependent variable (impulse purchasing behavior), in other words, whether there is a relationship between visually salient stimuli and impulsive purchasing.

Research Choice

This study uses a multiple methods research choice in that more than one data collection and analysis technique is being utilized to answer the research and sub-research questions. This research choice has also become more popular within business research, due to the fact that a study can hereby combine quantitative, qualitative, primary and secondary data (Saunder et al., 2009, p. 151). Within the realm of multiple methods, we choose to use the mixed-model research method, in which the study either simultaneously or sequentially uses both quantitative and qualitative data collection techniques, and during analysis can either quantitize qualitative data or qualitize quantitative data. The mixed-model method allows inferences to be made given what the research findings reveal.

Time Horizon

The last consideration in research design is the time horizon of the study. As we are studying a certain phenomenon at a particular time and place rather than studying a change or development, we will use a cross-sectional study, which simply acts as a snapshot with the intent of describing an incidence of a phenomenon and our chosen topic (Saunder et al., 2009, p. 155).

2.4 Credibility of Research Findings

In order to increase the likelihood of obtaining usable and consistent data, we must also consider the reliability and validity of our methodology.

2.4.1 Reliability

Reliability concerns to what extent the data collection method and analysis conducted from the study will result in dependable and consistent findings. To do this, we must answer three questions posed by Easterby-Smith et al. (2008) (in Saunders et al., 2009, p. 156):

(1) Will the measures yield the same results on other occasions?
(2) Will similar observations be reached by other observers?
(3) Is there transparency in how sense was made from the raw data?

These questions will be answered in the discussion, chapter *8.3.4.2 Reliability*.

Aside from these three questions, there are also four threats to reliability: (1) participant error, (2) participant bias, (3) observer error, and (4) observer bias. In order to combat these, we attempt to create the most controlled environment possible e.g. conducting the study at a similar time during the day, ensuring anonymity of responses, creating a defined structure of each of the four parts of the study - from the introductory self-report to the final personal impulsiveness test - to ensure consistency in how the participants understand the information given, and lastly creating a defined structure of how to interpret the results from each of the three parts of the study to ensure consistency in how the participants' responses are analyzed.

2.4.2 Validity

Validity concerns the extent to which the results obtained from the study are what they appear to be about (Saunders et al., 2009, p. 157). The data we obtain may be able to show us that there is a relationship, but not the type of relationship e.g. causation vs. correlation. Therefore, we must consider both the internal validity (the degree to which the dependent variable is caused by our selected independent variables) and the external validity (whether your results can be generalizable to the real world). To ensure validity, our study will to the best of our abilities occur in a controlled lab setting, so although the scenario is not completely applicable to real life (in that the lab room poses an artificial setting), it is not too foreign of a scenario for testing online shopping tendencies as the experiment is going to be computer-screen based and the participant will be sitting at a desk. Furthermore, a baseline test will be conducted prior to the experiment in order to test the participants' skin conductance baseline in the form of a highly stimulating video. The personal impulsiveness test

in part three of the study is used to gain information about their impulsiveness baseline. This is to examine the assumption that people who are more impulsive by nature will be more likely to impulse purchase and that the chosen visually salient stimuli will therefore more greatly affect the participants who are more impulsive by nature.

As with reliability, there are several threats to validity that we will consider:

(1) History: could any events have a misleading effect on the findings? Or participants' perception of elements of our study?
For this threat, we will keep informed on any changes in societal impressions of impulsive purchasing, but other than impulsive purchase specific events, this threat does not directly apply to this study. We will also attempt to gather data within two weeks (a short period of time), so as to keep conditions similar across all participants.

(2) Testing: possible conflict of interests might influence testing results
Both participants and researchers do not have a conflict of interest, as we have no sponsors to report to and the participants are answering based on personal opinion and are representing only themselves, i.e. not as employees of a certain company.

(3) Instrumentation: large variations in measurements may signify compromised data with decreased usefulness
Should any large variations in data occur, we will attempt to find explanations for them and examine whether there have been oversights during data collection before we consider disposing of the compromised data.

(4) Mortality: participants might drop out of the study or data might be invalid
This threat may occur; however, the study and data gathering does not begin until the participants are in the lab - investment in participants is low and they are therefore somewhat quickly replaceable by a new participant who fits the characteristics.

(5) Maturation: difference in situation
Maturation is unlikely to occur, as each participant will not be activated for more than 20 minutes.

(6) Ambiguity about causal direction: does A influence B or vice versa?

When analyzing the data, we will apply software (JMP statistical software) which is designed to find not only the correlation between two variables, but also the extent to which variable A is (significantly) influencing variable B. Furthermore, the personal impulsiveness test in part three is also included in order to test the potential influencing factor of a participant's personal impulsiveness level on their impulsive purchasing behavior (dependent variable). Therefore, the structure of the study will, again, attempt to avoid this threat.

2.5 Delimitations

One of the biggest delimitations included is in regard to the sample population. For this experiment, we exclusively test females in the age range 18-35, and therefore we forego testing participants not fulfilling these criteria. The age range is in place to minimize any differences age may pose for impulsive shopping behavior (which is outlined in more detail in the literature review, chapter *3.2.5.1 Who is the target segment?*). We will also exclude any participants who have never shopped online (which will be information gathered through the introductory self-report assessment). A final criterion used to define the sample population is nationality. We will primarily use participants from European countries in order to minimize any cultural differences (Michaelidou et al., 2013) that may have an effect on shopping behavior or ultimately impulse shopping behavior.

Another delimitation that is evident is in the chosen visually salient stimuli. While there are many visually salient stimuli that could have been tested (and might have been interesting to test), the scope of the project (time and equipment constraints) allowed for two visually salient stimuli to be fully tested alongside a neutral stimulus. Therefore, by testing the chosen two visually salient stimuli, we forego testing any other visually salient stimuli that may also have an effect on consumers' online impulsive purchasing behavior.

Lastly, there is a delimitation within our research question. While we have chosen the question that have the best subjective fit in terms of finding the most accurate and useful information regarding our topic, there has likely been a multitude of other research questions that would have been interesting to find answers to. However, any interesting and topic-relevant findings that arise throughout the experiment process will be brought up for discussion at the end of this paper.

2.6 Ethical Considerations

Marketing efforts and common practices, as well as marketing research studies, have often been under scrutiny for being manipulative in nature. This is especially true in present day since marketing research tools have become more precise, delivering more accurate findings, thereby improving the targeting of consumers (Smith & Goldstein, 2007). Many arguments countering these claims believe responsibility lies upon the consumers' lack of awareness or self-discipline. However, studies investigating the effect of subtle or subliminal primes have found that the consumer cannot be controlled unconditionally even when applying subliminal visually salient stimuli. In order to successfully influence consumers, visually salient stimuli have to appropriately match the consumers' own goals, states of need or motivations. Thus, if the consumer does not already have a previous degree of willingness and reception towards the influencing stimuli, they cannot be successfully persuaded (Bargh, 2002). Furthermore, consumers are bombarded with an overwhelming amount of marketing messages every day, and the more precise targeting of consumers might lessen irrelevant marketing noise (Lee et al., 2006).

The increasing research using neuromarketing research tools that look into how visually salient stimuli affects the consumer unconsciously has also been criticized for its manipulative tendencies (Fitzsimons et al., 2002). The attempt by researchers who apply neuroscientific measures to find the "buy" button within the brain has been criticized as being immoral (Lee et al., 2006). However, it is arguable that it is not inherently immoral to use neuromarketing measures to advance commercial interests (Eaton & Illes, 2007). Additionally, Murphy et al. (2008) have argued it is immoral to exploit advanced neuroscientific techniques to attain involuntary information about the participants. However, all participants who took part in this study voluntarily signed a form of consent and were told that they could withdraw from the experiment at any point. They were also told that they could retract consent for our usage of their data at any time. To ensure participants were aware that unconscious processes would be measured, they were informed of all parts of the experiment, and made aware that their eye movements and sweat secretion data would be measured. Therefore, we do not believe that any information was taken 'involuntarily'. Lastly, some strains of impulsivity have been perceived as highly negative, degenerate, and maladaptive (Oas, 1985; Reich, 1970; Evenden, 1999; Eysenck & McGurk, 1980; Stanford et al., 1996). It has often been described as more extreme carelessness, lack of planning, inappropriate, counterproductive to society, disordered behavior and putting oneself at risk (Ainslie, 1975; Eysenck & McGurk, 1980; Oas, 1985; Stanford et al., 1996).

However, this is mostly from psychological perspectives when examining impulsive behavior approaching compulsive disorders, a strain of impulsivity which this paper does not concern.

3. Literature Review

The following literature review focuses on three main areas of research (see figure 2 for graphical presentation of components in the literature review) and their contribution to online impulsive shopping behavior and the further study of it. Firstly, impulsive behavior is examined from a psychological perspective to understand how human nature can be impulsive and lead to impulsive actions. This is to establish a general understanding of the fundamental properties of impulsive behavior. Afterwards, we examine impulsivity from a consumer behavior perspective, i.e. online impulsive purchases. This section clarifies which stimuli can trigger impulsive purchases online, which products are purchased on impulse and by which target segment. Lastly, neuromarketing methods (eye-tracking and GSR specifically) are elaborated on as these will be used in this paper's experiment. Neuromarketing methods have proven highly useful in addition to traditional methods, and they will therefore be utilized to investigate how to stimulate impulsive shopping behavior online.

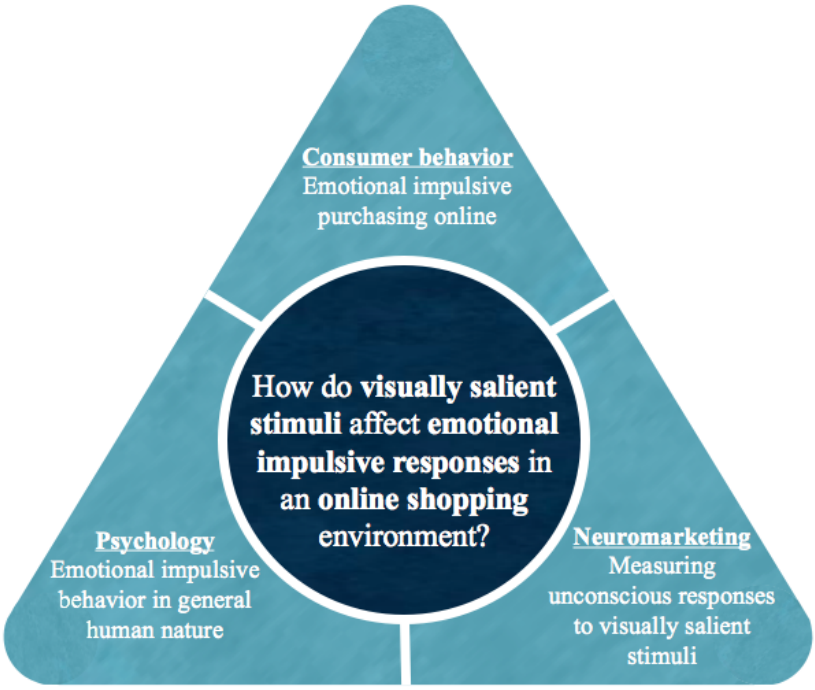


Figure 2: Components of literature review

3.1 Impulsivity from a Psychological Perspective

Within the definition of impulsivity lies the assumption that impulsivity is embedded in human nature to a lesser or larger degree (Hilgard, 1962). The idea of impulsiveness being a part of human nature dates back thousands of years. The impulsive aspect of humans has been portrayed as the lesser of two systems, one representing the instinctual and "hot" part of humans, the other representing the "cold" reasonable and rational part of humans (Trope et al., 2006). This dualistic conceptualization of a hot and cold system is a recurring theme that is discussed widely by Freud, among others (Hilgard, 1962). He named the primary processes as such because humans are born with them and are by default the first processes within humans. These processes are primitive, illogical and impulsive, whereas the secondary processes, which develop later, are orderly, rational and reality-oriented. Primary processes coordinate with the pleasure principle (the instinctive seeking of pleasure), whilst the secondary processes coordinate with the reality principle (the mind assessing the reality of the external world and acting accordingly and appropriately) (ibid.). According to Freud, impulses are a result of the pleasure principle that is in competition of the reality principle, which functions as a control measure that humans have to learn (Ainslie, 1975).

While the innateness of impulsivity is undisputed, the concept of impulsivity has been defined and described by many fields and many researchers. This has led to several partly overlapping, yet no conclusive definition of impulsivity or impulsive behavior. Oas (1985) has described impulsive behavior as "*socially inappropriate behavior or maladaptive*" being "*quickly emitted without forethought*" (p. 142). Eysenck (1980) has similarly pointed to the lack of conscious deliberation and added a risk-taking factor, in which the impulsive person unconsciously takes risks, contrary to the venturesome person who deliberates and then decides to run the risk. Frijda et al. (2014) also include lack of preceded conscious deliberation and further elaborates on the purpose behind the impulsive actions, namely, to change the relation to "*the object, event or state of the world*" (p. 1), which is responsible for the impulsive action. Correspondingly, Farmer and Golden (2009) argue impulsive actions can be taken to provide relief by avoiding private events such as emotions, thoughts or physiological sensations, or altering the intensities, frequencies or durations of said private events. Several other scholars have also mentioned the role of urgency, supplying the energy behind the impulsion and perceived necessity to act immediately (Frijda et al., 2014; Wallace et al., 1991; Whiteside & Lynam, 2002 in Farmer & Golden, 2009), thus time is a factor as well. Cognitive psychologists and neurophysiologists have explained impulsivity as the lack or inability to inhibit

impulsive behavior or resist impulsive desires (Sebastian et al., 2013; Farmer & Golden, 2009). Likewise, social psychologists also emphasize the disinhibitory aspect and further contribute with the notion of lack of conscious self-control (Trope et al., 2006). There are a multitude of features when examining impulsivity. In order to examine impulsivity holistically, it will be further elaborated under the three relevant topics: (1) unconscious impulsive behavior, (2) lack of self-control, and (3) impulsive behavior is emotional behavior.

3.1.1 Unconscious Impulsive Behavior

As a component of our non-conscious mind, unconsciousness is comprised of all processes carried out unaware to our conscious mind. Despite Freud's extensive literature emphasizing the sharp contrast between the conscious orderly rational mind and the irrational and primitive unconscious mind, contemporary psychologists have modified the polarity of the two states of mind (Bargh, 2014). The unconscious mind is not only reached through dreams, as argued by Freud, but is rather constantly carrying out processes beyond the reach of consciousness. While unconscious thought is postulated to solve complex matters better than conscious thought (Dijksterhuis & Nordgren, 2006), it is also believed to be involved in impulsive behavior. As previously mentioned, Eysenck (1980) differentiates between venturesomeness and impulsivity, in which a person about to act impulsively has not consciously chosen to make a certain decision, but carries the choice out based on non-evaluative and unconscious effort. This aspect of the definition of impulsivity regards it as swift action that lacks forethought, planning, and conscious judgement (Moeller et al., 2001). It does not have a "conscious representation of some action goal" but serves to alter "*one's relation to the object, event, or state of the world more pleasant or less unpleasant*" (Frijda et al., 2014, p. 1). Moeller et al., (2001) argue that the impulse to act is urgent and reaction time is short to the extent it precedes the opportunity for conscious planning. The overpowering urgency of the impulse forces the individual to *take action* based on attentional bias, over-attending to selected features, or simply not focusing attention to the current task (Moeller et al., 2001), and leads to unconscious, impulsive decision making. Furthermore, when stimuli affect the unconscious mind it is vastly more difficult to overcome the impulse to act on the stimulus, and more conscious thought has to be applied, even more so for habitual behaviors (Bargh, 2014). Contrarily, the activation of impulses requires very little or no conscious thought and can be processed by the unconscious. Fujita (2011) argues that even stimulus such as subtly priming words can trigger positive hedonic thoughts. It can influence

individuals to the extent that they are unaware of how the goal they are pursuing originated or even unaware of the pursuit itself (Bargh, 2014).

3.1.2 Lack of Self-control

It is generally thought that when individuals behave impulsively, they have failed to exert self-control. Analytical psychology, believes it is the disability of not being able to conceptualize distant goals and thereby convert motor impulses to deliberate and rational thoughts (Ainslie, 1975). Higgins' (1997, 2000) regulatory fit theory of self-regulation (in Dewitte, 2013) argue that people who have a greater tendency to act impulsively have a greater focus on gain, i.e. reward drive. This type of person values temptation highly, as temptations usually promise gains and pleasure, and they therefore need more conscious effort to control their urges, especially when exposed to salient stimuli that captures attention, thence inhibiting the ability to self-control. On the other hand, people who focus more on the aspect of losses value temptation lower and therefore distance themselves from it, as they do not want to pay the potential cost of temptations. Their strategy is therefore to avoid temptations altogether in order not to have to use extensive effort to control themselves if they exposed themselves to tempting stimuli (ibid.).

Trope et al. (2006), who have done extensive research on self-control, describe the internal conflict as a hot and cold system, similar to earlier scholars. The former is "*composed of affective mental representation and, when activated, leads to appetitive, impulsive responses*", and the latter "*is composed of emotionally neutral cognitions that guide behavior in a contemplative, reflective manner*" (p. 351). When failing to exert self-control, the individual activates the hotter system and appetitive stimuli catering to this system activate visceral reactions, i.e. involuntary functions such as sweat secretion, and cause physiological arousal, and consequently hamper self-control. The authors explain that individuals with less self-control focus on subordinate, unique, and specific features of actions and events, and consequently have a harder time controlling impulsive urges. They found that exposure to features which place individuals in this mindset results in indulging in temptation and impulsive urges. Lastly, they argue that salient and specific stimuli can trigger visceral reactions and undermine self-control.

3.1.3 Impulsive Behavior is Emotional Behavior

This section will examine impulses in relation to emotions, more specifically the effect of impulses in relation to emotional actions. Emotion plays an integral part in impulsive behavior, as all impulsive actions are emotional; note, however, that not all emotional actions are impulsive (Frijda et al., 2014). The significance of emotion when examining impulses leads us to firstly examine what emotions are. While some emotions are arguably culturally specific, clinical psychologist Paul Ekman listed five emotions in which no strong evidence has disputed their universality, namely, fear, anger, disgust, sadness, and enjoyment (Ekman, 1993). These are recognized as innate, basic emotions.

There is currently not an existing conclusive definition of emotion; however, three lines of thought are often used in describing emotion. The first concerns our conscious perception of changes we undergo when experiencing emotional bodily reactions. This line of thought emphasizes: (1) action readiness and *change* in action readiness (Frijda et al., 2014), (2) that emotions are intentional as they have a referent (Chamberlain & Broderick, 2007), and (3) the physiological consequences of this change (Adolps, 2010). Emotions can motivate behavior and contribute to changes in action readiness, as the individual, after either beneficial or aversive appraisal, is motivated to act in order to alter their relation to an object, event, or state of the world. The individual transitions from being ready to act to acting upon the external stimulus, which is of significance or personal concern to the individual (Frijda et al., 2014). For instance, if an individual experiences joy due to exposure to a stimulus, they not only feel joy, they also feel the urge to become closer to the stimulus that caused the joy (Frijda, 1988). Note, however, that the object/stimulus must be of concern to the individual. The second line of thought includes dual-process theories which contrast emotion and cognition. Emotion is considered implicit, rapid, and automatic (such as the hot system), and cognition is explicit, slow, and deliberate (such as the cold system) (Adolphs, 2010). Previously, it was perceived that thinking (cognitive activity) controlled feeling (emotional activity); however, neuroscientist Antonio Damasio argues that reasoning and complex decision in fact *require* emotion, emphasizing the significant role of emotion and questioning the assumption of that order of priority (ibid.).

Lastly, several attempts to place emotions along dimensional continuums have been made, the most widely used being the two-dimensional valence-arousal model, where valence ranges from unpleasant to pleasant and arousal indicates the intensity of the emotion (Chamberlain & Broderik, 2007). Arousal and valence are subjective states of being activated or deactivated and feeling pleasant or

unpleasant. If an object is appraised as helpful in achieving an individual's motives, they will experience a feeling of pleasure and a desire to get closer to the object (Lo & Lin, 2013). If an external stimulus is successful in causing high arousal levels, i.e. feelings of activation, this leads to an urge to act impulsively and can become the driving force in making impulsive decisions depending on the level of intensity of the feeling (Groeppel-Klein, 2005). While it might be an oversimplification of a holistic understanding of emotions, it is still a widely used and accepted model due to its simplicity and ease of use. According to this arousal-valence model, emotions are global constructs and specific emotions can be placed along the dimensions according to an individual's arousal-valence levels (Chamberlain & Broderik, 2007). As depicted in figure 3 (Yu et al., 2016), if an individual experiences high arousal and positive valence they can be excited, delighted, or happy, placing them in the first quadrant.

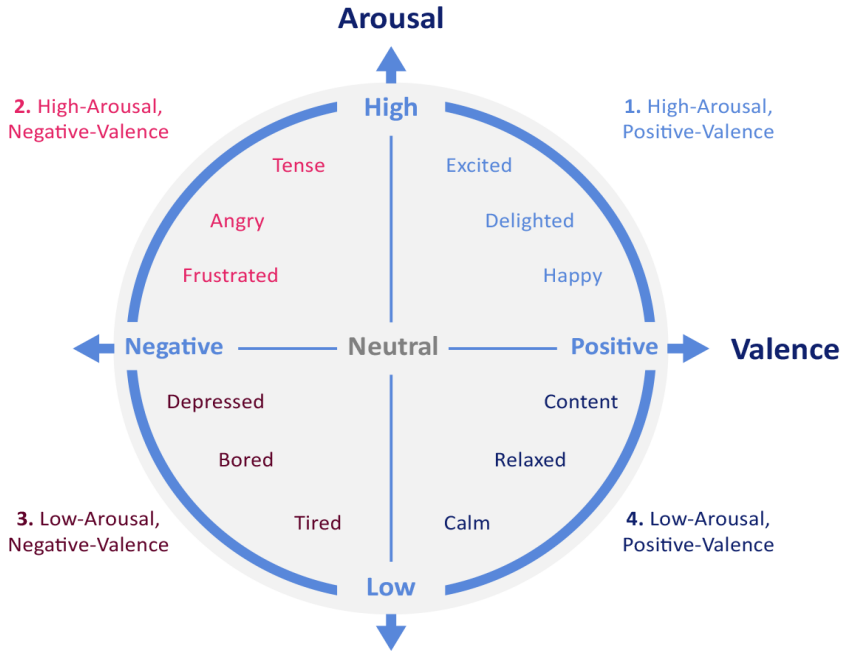


Figure 3: Arousal-valence model

As such, emotions are present in all impulsive actions. Similar to how emotions have referents, impulsive actions are also elicited by external stimuli, more specifically how these are appraised by the individual as either beneficial or harmful (Frijda et al., 2014).

To conclude, impulsivity is widely regarded as an inherent feature in humans, in which some are more capable than others in inhibiting their impulsive urges. According to the literature, impulsive

behavior is highly emotional, closely related to the unconscious mind or affected unconsciously by stimuli and is most successful when individuals are either not able to or willing to control their impulses. Impulsive reactions are a result of an individual's interaction with a situation or an object of great concern to them and are therefore not inherently negative.

3.2 Impulsivity from a Consumer Behavior Perspective

The following section will discuss literature regarding consumer behavior theories, as well as the definitions of impulsive purchasing (both online and offline), the types of products commonly purchased on an impulse, and lastly which stimuli are said to trigger impulsive shopping behavior. Although the theory of impulsive purchasing in offline stores (i.e. physical stores) is not directly irrelevant and will only be touched upon, it will not be the basis for the literature review as the process of shopping online vs. offline is different in terms of which stimuli are used to trigger impulses. The literature chosen for this section will therefore primarily consist of online-specific research.

3.2.1 Evolution of Consumer Behavior Theory

There is vast literature regarding consumer behavior, and it has been an ever-evolving definition process, as marketers must consider many variables, e.g. culture, society, and personal and psychological factors (Brosekhan & Velayutham, 2013). There are numerous well-researched and critiqued perspectives on consumer behavior theory, one of the first being the rational perspective, in which consumer behavior is based around the rational and conscious shopper as a means of spending income on products with utilitarian value depending on personal preference and price point limits (ibid.). This perspective was utilized with the intention of measuring certain shopping behaviors and using them as predictors for future behavior (Ajzen & Fishbein, 2000). However, the consumer that impulsively shops does not fit this definition and it does not take into account certain internal (personal attitude, knowledge, mindset, information processing) or external (environmental) factors (Abbasi, 2017). Therefore, predicting this type of consumer behavior is much more complex than the traditional consumer. The following sub-chapter attempts to explain the impulsive consumer.

3.2.2 Consumer Behavior Theory and Impulsive Purchasing

Impulsive purchasing is a phenomenon that began peaking researchers' interest in the 1940s and 50s (DuPont Studies, 1945, 1949, 1959, 1965; Clover, 1950; West, 1951), with the first official studies on impulsive purchasing being carried out by DuPont in a consumer buying habits study (Aragoncillo

& Orús, 2018). These studies were focused around understanding the behavior and attempted to measure the extent of the phenomenon (ibid.). The interest in impulsive purchasing throughout this time period has been aroused due to researchers' and companies' wishes to comprehend the behavior behind these shopping tendencies, as well as to recognize what might be the triggering factor of these tendencies in order to increase overall sales (Beatty & Ferrell, 1998; Kacen & Lee, 2002; Kacen et al., 2012; Amos et al., 2014 in Piron, 1991).

Impulsive purchasing has throughout relevant literature been defined in different ways; however, many authors utilize similar concepts, such as stimuli, hedonic reactions, urges and the amount of pre-purchase planning that has taken place. Furthermore, the decision-making time is significantly shorter for an impulsive purchase (i.e. reaction time from first consideration to the actual purchase action is consequently faster) (D'Antoni & Shenson, 1973; Han et al., 1991 in Coley, 2002). Clover (1950), one of the first impulsive purchasing researchers, defined impulsive purchasing as an unplanned purchase; however, this definition has been criticized as having been too simple. Critics argue that not all unplanned purchases are impulsive, as not all products needed by a consumer might have been added to the shopping list (Stern, 1962; Rook, 1987). In the 1950s and 1960s, the definition of impulsive purchasing, according to several researchers, began the inclusion of a stimulus (Applebaum, 1951; Stern, 1962; Kollat & Willett, 1969). Yet this is also a criticized definition attempt, as the stimuli in question are exclusively promotional messages, which also creates an oversimplified depiction of a more complicated phenomenon. Piron (1991) reviewed previous definitions of impulsive purchasing in order to create a comprehensive definition: a "*purchase that is 1) unplanned, 2) the result of an exposure to a stimulus, 3) decided "on-the-spot*" (p. 512).

Beatty and Ferrell (1998) defined impulsive buying as the following: "*[I]mpulse buying is a sudden and immediate purchase with no pre-shopping intentions either to buy the specific product category or to fulfill a specific buying task. The behavior occurs after experiencing an urge to buy and it tends to be spontaneous and without a lot of reflection (i.e., it is "impulsive"). It does not include the purchase of a simple reminder item, which is an item that is simply out-of-stock at home*" (p. 170). These concepts were defined in terms of offline purchasing behavior and have since been applied to online purchasing behavior, for which research remains scarce (Shen & Khalifa, 2012). A further discussion of the differences that are apparent between online and offline impulse buying can be found later in this chapter *3.2.3 Offline vs. Online Impulse Shopping*.

In terms of online impulsive purchasing behavior, Chan, Cheung and Lee (2017) outline the evolution of impulse buying as a concept including the following definitions: (1) a response to in-store (either online or offline) stimuli, (2) an occurrence in which the intended purchase goal does not line up with or outweighs the actual purchase outcome, and (3) the more recent conceptualization of impulsive purchasing, in which an impulsive purchase is a response to a psychological urge to make a purchase right away. In other words, that certain people might have a predisposition to buy more impulsively than others given their hedonic state.

With this more recent development within impulsive purchasing definition that now includes a hedonic element, Stern (1962) and Chan, Cheung and Lee (2017) discuss that purchase impulsivity can be categorized into four categories: suggested, reminder, planned, and pure impulse buying. Reminder impulse buying occurs when the consumer buys an item based on a reminder stimuli (e.g. low stock or sale items) or recall a stimuli (e.g. advertisement or previous purchasing intention). For clarification, this reminder impulse buying is not to be confused with the abovementioned definition by Beatty and Ferrell (1998), in which a reminder purchase is simply out-of-stock at home, while Stern (1962) and Chan, Cheung and Lee's (2017) definition considers a number of different types of reminder purchases, one of which includes items that are out-of-stock at home. Suggestion impulse buying occurs when the consumer purchases and item after realizing their need for said item once they see it. Planned impulse buying occurs when the consumer is in search of specific items when shopping yet reserves the option to purchase outside of the specified items should a good opportunity present itself (e.g. promotions, on sale). Lastly, pure impulse buying occurs when the consumer breaks their ordinary purchasing behavior by buying a certain item. This is a highly stimulating and emotional process (Rook, 1987 in Chen & Wang, 2015) during which the consumer is focusing on the satisfaction gained from the product rather than its utilitarian value (Carroll, 2013). This is also the type of impulse buying that aligns best with the aforementioned definition of impulse buying by Beatty and Ferrell (1998).

With reviewing this literature from a psychological and consumer behavior perspective, the definition of impulse purchasing utilized throughout this paper will include the most recurring aspects from the aforementioned impulse buying definitions: (1) Beatty and Ferrell's 1998 definition, (2) the concept of pure impulse buying, and (3) the emotional aspect introduced in the previous chapter. With this in mind, the following definition of impulsive purchasing is formed: *an impulsive purchase is a highly stimulating unconscious emotional purchasing process in which the consumer makes a sudden and immediate purchase with no pre-shopping intentions after experiencing an urge to buy. The purchase lacks effort to self-control and lacks reflection prior to purchase in terms of risk and consequences.* A graphical depiction of this definition can be found in figure 4.

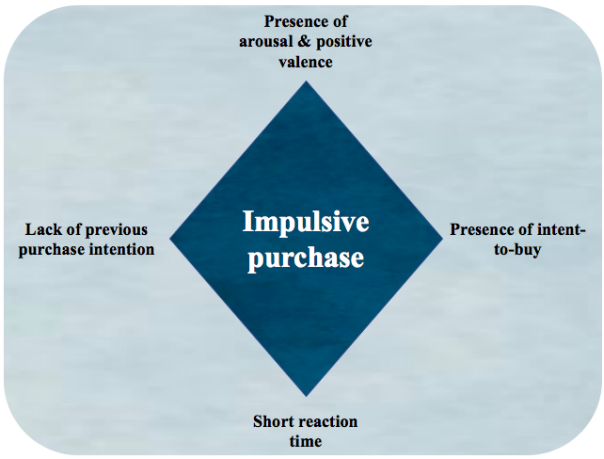


Figure 4: Impulsive purchasing diamond

3.2.3 Offline vs. Online Impulsive Shopping

In comparison with webshops, physical stores have the ability to make use of sensory salient stimuli that can cater to all five senses. Therefore, there is an aspect of inducing impulsive shopping behavior that can be capitalized on in stores that is not possible in an online setting. Gupta (2011) finds that the sensory experiences a store can create, in combination with the atmosphere of the physical store, can be conducive to triggering impulses in customers. As previously mentioned in this paper, there is a presence and importance of emotions during impulses in general and impulsive purchases specifically. In relation to this, research has found that stimulating sensory experiences also has a deep root in emotions and hedonic reactions (Krishna, 2012). Therefore, it is quite evident why impulses are able to be triggered in the offline setting. Physical stores will utilize stimuli such as product presentation (allowing consumers to see and touch), price, sale promotion, background music, scent, salesperson competency etc. in order to trigger impulses, as these will likely command a sort of emotional reaction within the consumer (Xiao & Nicholson, 2013). Peck and Childers (2006) also research the salience of touch when impulse buying, which for obvious reasons is a stimulus that can only be utilized in an offline setting (Shen & Khalifa, 2012). While some of these tactics are able to be transferred to webshops (e.g. price, sales, and product presentation), there are some that require

physical presence (e.g. capable sales employees), and therefore online stimuli had to be adapted in order to most effectively influence the consumers. In comparison to offline shopping atmospheres in which a store can affect all five senses (vision, hearing, touch, smell, taste) in hopes of depleting a customer's limited self-control stamina (hereby increasing the chances of impulsive purchasing), online platforms can only affect vision and hearing, forcing online stores to more efficiently attempt at invoking an emotional response in its customers (Lo et al., 2015).

In comparison to offline impulse shopping, researchers argue that impulsive purchasing happens relatively more often in online shopping environments. Shen and Khalifa (2012) argue that of the money spent on e-commerce platforms, around 40% can be attributed to impulsive purchases. This is arguably due to a greater assortment of products, 24-hour shopping period opportunity from the comfort of any location, and personalized marketing techniques (Aragoncillo & Orús, 2018). Furthermore, ease of payment methods is also said to have an impact on the occurrence of an impulsive purchase because it speeds up the payment process, during which the consumer will think of potential financial ramifications of said purchase less, thereby increasing the probability of an impulse (ibid.). Lastly, another obstacle in online impulse buying is the inability to physically activate human senses (Aragoncillo & Orús, 2018).

Factors that should be mentioned in terms of the difficulties of triggering impulsive purchasing online are (1) a delayed gratification from purchase to first use, (2) ease of comparing this product to others and hence quickly finding alternatives, and (3) the costs associated with product delivery and refunds.

3.2.4 Stimuli Triggering Online Impulsive Purchases

Impulse triggers are, in the context of this paper and experiment, the external visually salient stimuli that will be applied and tested. As previously mentioned, situations or objects can arouse emotions, which are then directly perceived and quickly evaluated. Furthermore, the concept of self-control (or lack thereof) can be related to impulse purchasing, in that within the hot and cold systems, a stimulus can activate the hot system and evoke involuntary physiological functions such as arousal and lowered level of self-control (Trope et al., 2006) when shopping. According to Lo et al. (2015), stimuli can have hedonic benefits, utilitarian benefits or a combination of both. In general, the design of a webshop can influence whether or not a hedonic reaction will take place. This can be executed via ease of navigation on the website, visual appeal, perception of the safety level of payment methods,

etc. Furthermore, given the lack of opportunity to stimulate via human senses, websites that help customers accurately view the product via detailed images also benefit from product recognition and therefore initiate a more emotional or automatic behavior, an important factor in impulsive purchases (ibid.). Via the literature analysis of impulsive purchasing behavior, Chan et al. (2017) describes the factors present in terms of online stimuli utilized today. These factors are divided into five categories: media format, payment feature, persuasive claim, website feature, and website trigger. Each of these factor categories can be implemented in various ways, depicted in table 1:

Factor category	Implementation
Media format	Product presentation in product description, photographs, or video
Payment feature	Number of clicks from product page to checkout page; trustworthy and recognized payment methods; running total of current shopping cart
Persuasive claim	Scarcity; time limit on availability; popularity (claims of high customer demand)
Website feature	Visual appeal e.g. using colors, backgrounds, graphics; ease of website navigation and cart checkout; clarifying safety of shopping on the specific website
Website trigger	Vivid display, interactivity, and movement on-screen

Table 1: Online impulse shopping stimuli

Aside from these factors, there are also marketing tactics, which may be used by online stores to elicit impulsive purchasing behavior (Aragoncillo & Orús, 2018). For example, sales promotions are a tactic that can be used both in online and offline settings. However, with increased data exchange from online browsing, marketing tactics can be customized to each individual, taking into account their personal preferences based on previous purchasing history (ibid.). This hereby increases the chance of causing an emotional response to said tactic. Another marketing tactic commonly used to increase impulsive purchasing is using cues to spark ideas in the customer of how to use the product (Dawson & Kim, 2010). An example of this is featuring product pictures with a product in use in combination with other products (e.g. a model wearing a pair of shoes that are the main product, but also featuring a pair of socks that can be worn with the shoes). Another example of this is formatting the website, allowing customers to shop by style or price points in order to garner inspiration (ibid.).

3.2.4.1 Color Theory

Figure 5: Example of red color background implementation

In terms of which visually salient stimuli will trigger emotional responses, Cheng et al. (2009) states that the colors used on a webshop interface significantly affects the user's emotional response to the products shown. Through their research, these authors were able to discern that warmer toned colors triggered a more positive emotional response in comparison with cooler toned colors. Warm hues (e.g. red and orange) elicit a higher level of arousal and excitement, while cool colors (e.g. green and blue) more often are associated with peacefulness and relaxation (Zollinger, 1999 in Cheng et al., 2009; Valdez & Mahrabian, 1994). Therefore, in order to spark a positive emotional response that may lead to an impulsive purchase, using warm toned colors may be more successful, as it will stimulate a more positive and active response in the shopper (i.e. potentially place them in the first quadrant of the arousal-valence model). Furthermore, previous experiments conducted have found that physiological measures (such as a GSR test and electroencephalography (EEG)) have shown tendencies for reds and yellows to be more arousing than blues and greens (Gerard, 1958; Jacobs & Hustmyer, 1974; Wilson, 1966 in Valdez & Mehrabian, 1994). One way of practically implementing this concept into an experiment design within online shopping would be to show a product on a warm-toned background (see figure 5).

State of Mind	Male	Female
Excited	47%	50%
Bored	28%	32%
Sad	14%	28%
Angry	8%	10%
Intoxicated	13%	5%

Table 2: States of Mind When Making an Impulsive Purchase (Saleh, 2017)

In terms of which emotional states are more conducive to impulsive purchasing, as seen in table 2, both genders experience a considerably higher level of impulsive purchasing when their state of mind is excitement (Saleh, 2017; Creditcards.com, 2014). This coincides with the effect of warm hues throughout the purchasing process. Another notable aspect of the effect of color in marketing is regarding how color is registered by consumers. As previously mentioned, emotions trigger action readiness, i.e. the willingness to act always accompanies an emotion. Feeling joy is accompanied by the desire to seek contact with the source of joy (Frijda, 1988). According to Gerard (1958), there may be a connection between a strong response of emotion and seeing the color red specifically because a physiological response occurs during this time which leads to a feeling of needing to take action (for instance if arousal levels are high and positive, then the individual feels activated and motivated to move towards the product). Furthermore, out of every color, red is the second most visible and attention-grabbing color after yellow (Morton, n.d.). Kuneicki et al. (2015) argue that the color red appears to direct attention, particularly in situations in which emotions are present, which indicates that the impact of color on attention and shopping behavior can be exploited.

Depending on which consumer a retailer is looking to influence, they will tune the colors used to match or evoke a certain emotion within their target consumer (Kumar, 2017). Clearance sales are known for using colors such as red, orange, and black in order to evoke a sense of urgency towards impulse shoppers, whereas when retailers wish to evoke calm and soothing emotions in browsing and leisurely shoppers, they will utilize pinks and light blues (ibid.).

3.2.4.2 Product Zoom Element

Literature on this topic within the realm of impulsive purchasing is not too prevalent. In fact, just one study has been conducted that directly looks at the effect of e-commerce features (e.g. product interactivity, product details, “sale” pages, etc.) and product presentation online on impulsive purchasing behavior (Moser et al., 2019). However, this study uses content analysis of already existing webpages and surveys given to impulsive shoppers rather than biometric or neurometric techniques. Even so, other studies have shown that there is a connection between visual complexity and arousal and pleasantness in terms of website design (Lo & Lin, 2013) or visual complexity in physical store layout (Jang et al., 2018).

Despite the lack of extensive research on the subject, product presentation features have been found to increase the emotional arousal of impulsive shoppers. Previously, product presentation features have been reported as having an effect on emotional affect, wherein photos using visual complexity have been rated higher in terms of pleasantness and arousal (Madan et al., 2018). Furthermore, when vividness and interactive features (i.e. zoom or spin features) on online product images are enhanced, it can help consumers feel physically closer to what they are looking at (Moser et al., 2019). In other words, with enhanced information on the product from the product presentation, the consumer will in a sense be able to lessen perceived proximity and thereby impart a feeling of (partially) owning the product, as well as perceiving loss if the product is not purchased (ibid.).

In a physical store, this phenomenon can be observed when a consumer physically tries the product (e.g. trying a piece of clothing), whereas in an online environment, the same feelings must be evoked via different methods, such as 360 degree spin features on product photos or web-cam mirrors (in which a consumer can virtually "try on" a product using their computer's webcam (ibid.). With this perceived ownership of the virtual product, an emotional attachment to the product is stimulated, which can lead to a higher chance of an impulsive purchase (Verhagen, 2014). While it is not possible to create animated or interactive product features for this experiment, static product images will be edited to emphasize special details of the chosen products to emulate the effects of product presentation features. These will be further elaborated on in Experiment Design, chapter *6.5 Stimuli*, however, an example of the product zoom element in practical implementation can be seen in figure 6.

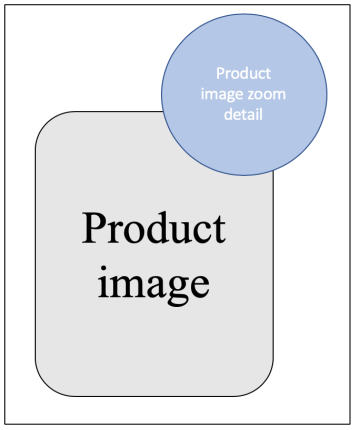


Figure 6: Example of product zoom element implementation

3.2.5 Products Purchased on Impulse

The following subsections discuss literature on the common consumer segment that tends to engage in impulsive purchasing most often, as well as which products are commonly purchased on impulse by this segment. This will aid in narrowing down the research design for the experiment conducted for this paper.

3.2.5.1 Who is the Target Segment?

There are distinct differences in men and women's shopping behavior, and therefore logically a difference in the way in which they impulsively purchase. According to Tifferet and Herstein (2012), men take more risks than women in general; however, in terms of impulsive purchasing specifically, women are more prone to hedonic consumption than men. Tifferet and Herstein (2012) continue to state that women may be more likely to suffer from mental conditions such as anxiety or depression (Feingold, 1994; Wade et al., 2002), and may potentially impulsively purchase in the attempt to better their current mental condition due to the fact that there is a link between negative emotions and impulsive purchasing (Silvera et al., 2008; Verplanken et al., 2005 in Tifferet & Herstein, 2012). Looking back at table 2, women also have a high level of impulse purchasing when the state of mind is within the category "sad" (Saleh, 2017; Frijda et al., 2014; Creditcards.com, 2014;), whereas men score significantly lower in that category. Lastly, one key difference in gender-specific buying behavior concerns the way in which each gender shops. Where men more often shop if there is a specific need and therefore have a focused shopping purpose in mind, women tend to browse while shopping (Bezzina, 2011), which significantly increases the opportunity to find products to purchase on impulse. Furthermore, when asked "When shopping online do you buy only what you planned to?", 71,7% of men answered "Yes" whereas only 52,9% of women answered "Yes" (Attest, 2015). To the same question, men and women answered "No" 13,4% and 21,7% respectively (ibid.)[1]. Interestingly, while women do impulsively purchase more often than men, they spend on average $10 less than men per impulse purchase - $31 vs. $41 (Gaille, 2017).

Shopping behavior, specifically impulsive shopping behavior, also varies depending on age group of the shopper. Of the age groups 18-24, 25-34, 35-44, 45-64, and 65+, there is a downward trend in terms of frequency of impulsive purchasing as the group increases in age (Thredup, 2018). From this set of statistics, the youngest age group surveyed, 18-24, stated that 49% of their purchases were unplanned/bought on impulse. According to the consumer data statistics firm, Attest (2015), Generation Z and Millenials have the two highest rates of impulse buyers in their generational groups with 41% and 34% respectively. The classification of Generation Z is individuals born after 1997, ranging between 22 years old or younger in 2019, and the classification of Millenials is individuals born between 1984 and 1996, ranging between 23 to 35 years old in 2019 (Rao, 2017). Within these

[1] Other possible answers were "Once or twice" and "Won't say"; however, these were small percentages of the total 1000 answers

generations, online impulse purchasing is becoming increasingly common, when surveyed, merely 21,8% of older millennials state that they have never made an impulse purchase, hereby leaving almost 80% in the group that have conducted an impulse purchase (Carter, 2018; Johnson, 2018).

3.2.5.2 Which Products are Purchased on Impulse?

Since the beginning of impulse purchasing research, even when it only considered physical offline purchase environments, the common conclusion among researchers is that impulse purchases are more commonly low-involvement products. Older research found that low-value and low-involvement product categories, such as candy or magazines, are common impulsive purchases (Kollat & Willet, 1969 in Drossos et al., 2014). This idea remains consistent with newer research, even when taking online shopping environments into account. Drossos et al. (2014) researched the connection between product involvement, impulsive purchasing, and purchase intentions and found that impulse purchases are more commonly low-involvement products. This is due to the fact that low-involvement products pose a very low risk for repercussions or negative consequences and therefore will not garner a long, analytical thought-process in the mind of the consumer regarding whether or not they should add the product to the cart. These low-involvement categories, as with many of the aspects of impulsive purchasing, differ based on gender; however, clothing is generally the item that is impulse purchased most often after food (Gaille, 2017).

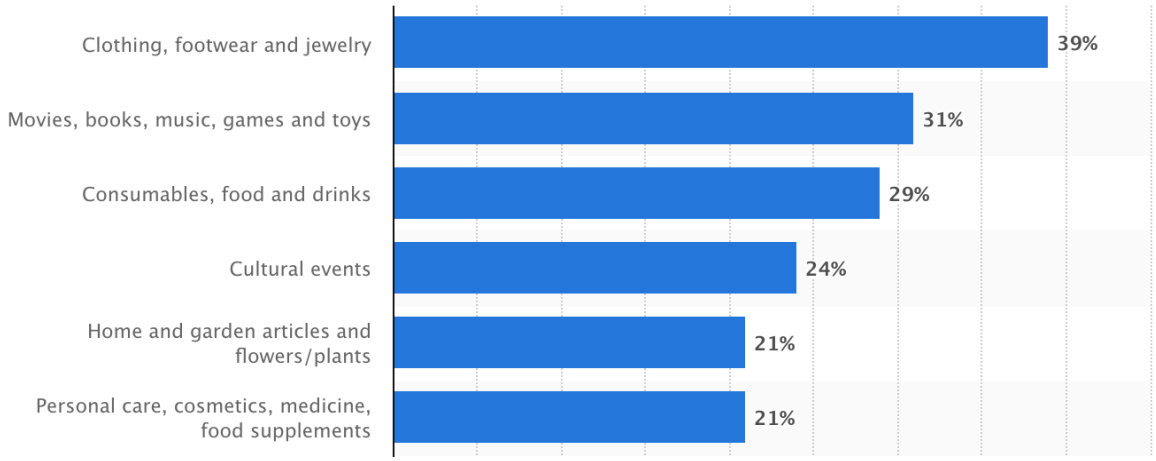


Figure 7: Product categories most common in impulse purchasing (FDIH, 2016)

Specific to gender, females tend to be more drawn to products that are aesthetically captivating, such as clothing, whereas men more often favor practical or personal items, such as electronics or

entertainment items (e.g. video games, music) (Bezzina, 2011). In 2016, The Association for Danish Internet Trading (FDIH) researched which product categories were most common for impulse purchasing (see figure 7), which coincides with the aforementioned product categories. 39% of online shoppers bought (on an impulse) from the clothing, footwear, and jewelry product category (FDIH, 2016) - a significantly higher percentage than other product categories.

In terms of triggers that can be used to encourage an impulse purchase of a low-involvement item, Drossos et al. (2014) also elaborate on the effect of advertisement on the impulse purchase of low-value or low-involvement products and discover that (mobile) advertising significantly increases the number of impulse purchases, as there is a sense of instant gratification that is enabled by the shopping portal. Utilizing color in advertising methods, specifically on low-involvement product categories, has also proven successful when compared to grayscale counterparts (Amsteus, 2015). This is due to the fact that consumers are having to focus less on processing the advertisement combined with the proven effectiveness of the reception of colors in a shopping environment. This was discussed in the previous section. Lastly, particularly in low-involvement conditions, triggers such as peripheral activity has been found to increase impulse activity and positive attitudes towards a product within the consumer (Drossos et al., 2014).

3.3 Applied Neuromarketing Methods

In order to measure emotional experiences and responses occurring during the experiment, physiological measures will be applied. It has been established that there are several physiological responses which accompany different emotional states and can be used quite accurately to measure emotional experiences in a non-intrusive manner (Glimcher & Fehr, 2009, chapter 1). The two measures applied are electrodermal analysis and eye movement analysis. Sweat secretion is controlled by the autonomic nervous system (ANS), and eye movements are under the control of the somatic nervous system (SNS) (Wang & Minor, 2008). The ANS cannot be controlled consciously and takes place without conscious effort. It can be roughly divided into two parts, the sympathetic division which quickly responds to mobilize the body for action i.e. fight/freeze/flight, and the parasympathetic division which acts slower and dampens responses (Cherry, 2019).

3.3.1 Galvanic Skin Response as a Research Tool

Sweat secretion is a result of physical need and emotional stimulation and is subconsciously controlled as a part of the ANS (Farnsworth, 2018). Changes in sweat gland activity in the ANS has been linked to changes of interest, emotional arousal, and pleasure (Wang & Minor, 2008). It has also been shown that motivations and expectations of potential rewards can influence the amount of sweat secretion (Chamberlain & Broderik, 2007). GSR refers to changes in sweat gland activity and measures the amount of sweat secretion and has been considered a reliable method of measuring emotional arousal as even miniscule changes in levels of sweat secretion can be measured (Wang & Minor, 2008). GSR has a wide range of applicability, and as all impulsive behavior has been suggested to be emotional (see chapter *3.1.3 Impulsive Behavior is Emotional Behavior*), applying GSR should therefore be fruitful in detecting which stimuli result in most emotional arousal. It has been used widely within psychological studies to understand how humans respond to visually salient stimuli. Within the field of consumer neuroscience, the method has been used to evaluate consumer preferences more effectively than traditional methods (GSR Pocket Guide, 2016).

3.3.1.1 Tonic and Phasic Arousal

Arousal is a basic feature of human behavior and forms the basis for emotion (Groppel-Klein, 2005). It is a highly subjective state of feeling and plays a significant part when making decisions, especially impulsive decisions (Lo & Lin, 2013). There are two signals GSR can gather, the tonic and phasic level. The tonic level slowly varies and can be referred to as the raw signal. Tonic arousal is a "long-term state of consciousness" changing extremely slowly (Groeppel-Klein, 2005, 429). This signal is not as informative as the second signal, skin conductance response (SCR), which is the phasic response, and are abrupt increases and slower decreases of conductance of skin, i.e. the decay time is slower (Empatica Support, 2019). Phasic arousal results in short-term arousal levels, is closely related to attention, and thereby reflects an enhanced sensitivity to relevant stimuli, which has been processed by the brain (Groeppel-Klein, 2005). The peaks occurring when exposed to salient stimuli is also known as phasic activation. When sweat gland activity causes a peak between 1-5 seconds after exposure to a salient stimulus, it is defined as event-related skin conductance response (ER-SCR). To examine how intense the participant was aroused, the amplitude of the peak can be measured and compared to the individual participant's average peak amplitude (Tobii Pro, 2018).

Evoking arousal within consumers has proven effective in encouraging sales, especially impulsive purchases (Groppel-Klein, 2005). In an online shopping context, marketers can manipulate features such as website layout, graphic elements, pictures, colors, etc. As mentioned previously, colors with longer wavelengths such as red, elicit more excited reactions, i.e. they are physiologically arousing and stimulating (Buechner & Maier, 2016). Wilson (1966) found that red colors lead to higher skin conductance levels as a result of high arousal levels (in Buechner & Maier, 2016). If red color backgrounds or features on a website are successful in arousing the participant, it should therefore theoretically be possible to measure the extent of the reaction by measuring the skin conductance level. Furthermore, in physical stores, consumers are able to use all senses to gather information and determine the value of products; however, in an online shopping context, consumers can only experience the products indirectly, limiting the means to stimulate arousal. There is a lack of studies which have examined how to elicit arousal through interactive features of product pictures. One study by Liao et al., (2016) examined whether interactive features, such as enlarging or rotating functions, were able to generate high levels of arousal. They only found that product presentation features resulted in higher levels of pleasure (valence), not arousal. However, since arousal is proven to be a leading factor in impulsive buying behavior, it would be relevant to examine if other interactive picture presentation features could stimulate high arousal concurrently with high valence, and consequently lead to impulsive purchases.

Despite its added value to traditional methods, there are some difficulties when using GSR analysis. Firstly, it can measure arousal but cannot differentiate between positive or negative valence and cannot indicate which particular emotions are experienced (Glimcher & Fehr, 2009, chapter 1). It is also advised to redo the experiment of several rounds as electrode placement is critical and might bias results. However, this is often not possible due to limited resources (GSR Pocket Guide, 2016). Individuals also tend to have different responses, and findings must therefore be compared against every individual's baseline (Cacioppo & Petty, 1983; Ben-Shakhar, 1985). The environment or lab setting can potentially also bias results and influence participant responses and is critical to the accuracy of results if not carefully chosen, cleaned, and controlled (Stewart & Furse, 1982).

3.3.2 Eye-tracking as a Research Tool

Eye-tracking is able to supplement valuable information about the consumers' conscious and unconscious reactions to visually salient stimuli, in contrast to traditional marketing research methods which can only gather conscious information, thereby failing to examine the impact of visually salient

stimuli that never breaches the threshold of awareness. Since attention precedes awareness and can have considerable influence on the consumer's subsequent choice, much information is lost if only applying traditional measures (Milosavljevic and Cerf, 2008). As previously mentioned, priming studies have proved that consumers often make decisions unconsciously, and sometimes even make better decisions when choices are made without awareness (Dijksterhuis & Nordgren, 2006). Bagdziunaite et al. (2014) also argue that upon exposure to a product, decisions to purchase are instantly made.

In marketing, eye-tracking has been widely used to examine reactions to print advertisements or images, videos, or graphics (Duchowski, 2002). Eye-tracking can be used to examine cognitive load and arousal (Meißner & Oll, 2019), however, within marketing studies, the technology is most commonly used to observe the effect of controlled visually salient stimuli on the participant's reaction. Typically, eye movements are analyzed through examining fixations and saccades. Fixations are when the eye is fixated at a certain point/object, allowing it to take in information of the object either consciously or unconsciously. Saccades are usually in-between two fixations when the eye is moving from one to another location (Oliveira & Giraldi, 2015). Through several measures, eye-tracking can provide information about: (1) which elements are attention-grabbing or are involved in retaining attention (2) when the participants fixate at certain points, (3) how quickly the participants redirect attention elsewhere (fixations, saccades and durations of such), (4) the pattern of their eye movements from one location to the next (scanpath), and (5) whether stimuli is exciting (pupil dilation) etc. (ibid.).

Meißner and Oll (2019) describe two kinds of eye-tracking setups. The first setup includes mobile eye-tracking glasses allowing participants to move around, consequently, being highly suitable for experiments examining real-life and in-store behavior or other marketing environments. The second setup is a stationary eye-tracker, where the participant sits in a fixed position, having their gaze tracked using infrared light casted towards the pupils, which enables the measurement of eye movement (Farnsworth, 2019). This setup has often been used to test the effect of online marketing activities, such as the effect of banner ads (Lee & Ahn, 2012), effect of visual design on online product assortments (Kahn, 2016), or the design of online websites' effect on online impulsive shopping behavior (Akram et al., 2018) etc.

3.3.2.1 Visual Attention and Preference Formation

Due to the limited capacity of the brain, not all information can be gathered and processed, i.e. there is an attentional bottleneck (Milosavljevic & Cerf, 2008). The brain must therefore select which information is the most relevant and prioritize this. Visual attention is defined as "*selectivity in perception*" (Orquin & Loose, 2013, p. 191) and refers to operations selecting relevant information and discarding irrelevant information (McMains & Kastner, 2009). If an object is deemed irrelevant and fails to attract attention, the object cannot be identified and will never have the possibility of reaching awareness of the consumer (Orquin & Loose, 2013). It is therefore essential that marketers are able to grab consumers' (visual) attention, especially in an online assortment, where the consumer easily and quickly browses through a vast number of products all competing for attention (Kahn, 2016).

Our visual behavior is an interplay of overt and covert visual attention. The former is directly measurable by eye-trackers, providing the fundamental eye-tracking data since it is a result of visual targeting. Information gathered through overt attention enters the fovea, which provides the clearest vision due to its high density of sensory neurons. Therefore, information gathered from overt visual attention is processed in greater detail (Orquin & Loose, 2013). Covert attention cannot be directly measured by eye-trackers, as it examines all the peripheral scenery without deploying the eyes directly, i.e. it examines the information surrounding the visual target. These two components interplay as one movement e.g. visually salient stimulus is detected in the peripheral field of vision, whereafter the eyes move towards the specific visually salient stimulus, fixating on it directly (Tobii Pro, 2019). Visually salient stimuli have proven effective in grabbing attention and is described as the visual salience bias. This concept explains that the most salient stimuli are more likely to be processed in the brain and is especially present when making impulsive purchases (Cerf & Garcia-Garcia, 2017, p. 115). Colors are effective tools for visual saliency, and warm colors are especially effective in gaining visual attention (Gelasca et al., 2005). Females have also been found to respond more positively to red, pink, and yellow (Ellis & Ficet, 2001). Since warm colors have proven more effective in attracting attention, it is more likely that objects with these colors are fixated on overtly and will therefore be processed in greater detail. This type of salience-based attention refers to bottom-up influences on visual attention.

3.3.2.2 Visually Salient Influences on Visual Attention

Bottom-up vs. top-down processes

There are two types of influences on attention, bottom-up and top-down. Bottom-up attention is rapid, automatic, and is highly influenced by the intrinsic salient properties of an object, for instance a strong color, contrast, size, or movement (Milosavljevic & Cerf, 2008). Top-down attention depends on prior knowledge of the object (e.g. brand familiarity), personal goals or expectations, or on the demands of the task at hand (Pieters & Wedel, 2004).

In several cases, studies have argued that attention capture is more influenced by top-down processes. These can include situations in which a reward is promised, if there are semantic or contextual cues (Orquin & Loose, 2013), or if task demands are strong, as proven in Alfred Yarbus' famous experiment showing that eye-movements highly depend on task demands (DeAngelus & Pelz, 2009). On the other hand, the manipulation of influencing bottom-up processes through applying visually salient stimuli has proven effective in influencing both attention and the decision. There have also been established clear links between attracting bottom-up attention and emotionally arousing salient stimuli (Madan et al., 2018). A study by Navalpakkam et al. (2012) showed that salient color ads on websites did affect attention and the subsequent decision in favor of the colorful ads. Furthermore, when brands are similar or the brand plays a less significant role, Milosavljevic et al., (2012) found that visually salient items were chosen 40% of the time. When browsing on online shopping websites, brand symbols are usually less prominent than in offline stores, therefore, bottom-up processes might have more influence in online shopping, especially when shopping impulsively and quickly browsing through a large assortment of items within a similar product category. In an environment where a large part of the shopping is performed impulsively (as described in chapter *3.2.5 "Products Purchased on Impulse*"), it is relevant to take visual saliency into account, as it can capture overt visual attention and result in greater processing, hereby influencing the decision to purchase. Kahn (2016) suggests that online retailers create eye-catching regions in an online display of products that consumers are likely to prefer.

System 1 vs. System 2

The properties of bottom-up processes and the effect of unconscious impulsive behavior discussed in chapter *3.1.1 "Unconscious impulsive behavior"* can be related to Kahneman's notion of system 1 under his two-system view. System 2 operations are "*slower, serial, effortful, and deliberately controlled*" and its job is to monitor system 1, intervening when system 1 potentially is making errors

(Kahneman, 2002, p. 450). System 1 is "*fast, automatic, effortless, associative, and difficult to control or modify*" (ibid.). One of its tasks is to generate (involuntary) impressions of objects' attributes. Visually salient stimuli can affect system 1's impression of the object in focus, affecting the consumers unconsciously, and can potentially lead to impulsive actions if system 2 is not activated. In the experiment conducted for this study, the powers of visually salient stimuli will be tested in order to examine if it can cause such arousal and positive valence that the fast, automatic, and effortless system 1 acts impulsively without the interference of system 2.

3.3.2.3 Preference Formation

Eye-tracking provides valuable information about the consumer's preference formation, which is the process of deciding which product is perceived as most valuable from the choice set (van der Laan et al., 2014). Orquin and Loose (2013) found two effects of visual attention on preference formation and decision making. Firstly, since our brain has limited capacity, the decision is limited to items which have previously been fixated on; secondly, as more visual attention is devoted to an object, the consumer is more likely to be influenced by the information gained from the fixation (ibid.).

The measure of first fixation (objects are firstly fixated on) and the time to first fixation (TTFF) has often been used to analyze consumer's attitude towards objects, despite differing opinions on its effectiveness in explaining preference formation. On the one hand, several studies argue there is a higher probability that visually salient items are fixated on first and longer and suggest that the first fixation and total fixation duration (TFD) play an important role in the decision-process (Navalpakkam, 2012). Shimojo et al. (2003) argue that objects fixated on first have an advantage due to the mere-exposure effect, i.e. people prefer objects they have already seen and therefore are familiar with. Thus, objects which have received visual attention previously are more likely to be chosen (Kahn, 2016). On the other hand, Orquin and Loose (2013) argue the first fixation merely serves to enter an object into the consideration set. A study conducted by van der Laan et al. (2014) present empirical evidence in favor of Orquin and Loose's proposition, suggesting that the first fixation itself is not significant; however, by being visually salient and attracting attention, the object is entered into the consideration set.

Several studies also suggest there is a downstream effect of TFD on preference formation and decision-making (van der Laan et al., 2014), and have found fixation duration to be a reliable method for predicting future choice (Reingold, 2009). There is a higher likelihood of consumers choosing a

product they have looked at for a longer period (Guyader et al., 2017); however, when using TFD researchers must be aware it is not only influenced by preference formation, but also the decision goal/instructions provided by the researchers. If, for instance, participants are instructed to determine the healthiness of a product, they will fixate longer at health logos, mostly due to the task requirements rather than preference formation (van der Laan et al., 2014). Therefore, instructions or task requirements must be carefully constructed if using TFD in eye-tracking experiments.

3.3.3 Compatibility Between Eye-tracking and GSR

The features of GSR and eye-tracking make them very compatible. While GSR can measure the level of arousal, applying eye-tracking allows for a more precise indication of what made the participant react physiologically, linking visual attention with behavioral responses (TobiiPro, 2017). Nevertheless, due to the 1-5 second delay when measuring skin conductance, experimenters must adapt the test so that the eye-tracking can be used to correctly assess which visual cues resulted in a physiological response.

3.4 Critique of Existing Literature and Apparent Research Gaps

The process of conducting this literature review has been both enlightening, yet also proven to be challenging. On one hand, there is a decent amount of material on the internal and psychological effects of the impulse process and impulsive shopping behavior concerning physical stores. Furthermore, the review has given a good overview of the history of impulse purchasing as a concept and the aspects that are related to this area of consumer behavior research. It is evident that interest in this area has increased at an impressive rate over the past half century; however, from analyzing the available research conducted in this field, it seems some concepts are accepted without much scrutiny or inquisition about the applicability in the quickly evolving shopping environment. Furthermore, material tends to be much older than what would be deemed relevant and reliable by the standards of this research paper.

Impulsive purchasing in an online setting is not widely covered by biometric and neurometric methods (most utilize surveys and interviews), which is deemed necessary for this paper due to the emotional characteristic of this phenomenon. There is also minimal prior research using the combination of eye-tracking with GSR, which is the research design of the experiment for this paper.

In terms of specific knowledge that was sought for the purpose of creating a well-informed experiment design, there are significant gaps in terms of literature. For example, literature regarding product presentation features (specifically a product zoom element), particularly literature investigating the relationship or effect of a product zoom element on arousal, are scarce to non-existent. Additionally, it proved difficult to find literature testing or discussing the effect of the chosen visually salient stimuli on total fixation duration.

In general, the literature on general impulsive purchasing is antiquated, and it is evident that the same definitions and sources are used throughout newer material without much discussion on the necessity of expansion or amendments to some of the foundational concepts, i.e. the definition of impulsive purchasing. On the other hand, some authors may add a small change to definitions in order for it to better suit their topic; however, this leads to many slightly different definitions instead of a universal definition for a concept that is widely accepted and studied. Furthermore, a great deal of the available literature tests the impulse triggers that are not emotionally-laden - e.g. free shipping, sales, deals, scarcity, website features etc., most of which are are accepted as effective triggers. There is not much information to connect to the emotional and more subconscious triggers that this paper aims to tackle.

Therefore, on the basis of the findings from this literature review, it proves there is a potential opportunity to fill several information gaps. This study will attempt to provide valuable insights with the intent of filling or minimizing some of the mentioned knowledge gaps, specifically concerning what impulse purchases actually consist of and how they can be triggered using visually salient stimuli. While we are gaining a clearer and more accurate picture of what impulsiveness is, there is a remaining lack of a universally accepted definition of impulsive behavior. Currently, the existing literature can be found that backs up the individual components of impulsive purchases, but as of yet, literature that tests or investigates the combination of all components has not been found. Consequently, this experiment will aim to reduce the gap in literature regarding product presentation features (zoom elements) in an online shopping environment, as well as the effect of the chosen visually salient stimuli on total fixation duration.

4. Theoretical Framework

This section will briefly outline the framework upon which this experiment is based, stimulus-organism-response (SOR) framework. While this paper is primarily based around quantitative and

statistical data analysis, the consumer behavioral aspects can be supported with the SOR framework. Other theoretical aspects of our experiment that will be described in the following section include the Self-Assessment Manikin (SAM) and Barratt Impulsiveness Scale (BIS).

4.1 Stimulus-Organism-Response

This study will use SOR framework to examine how certain salient/neutral stimuli affect impulsive shopping behavior. The framework was originally introduced by Mehrabian and Russell (1974), who describe a process in which a shopping environment will utilize certain stimuli (S) that have an impact on organisms (consumers; O) and thereby resulting in behavioral responses (R), which may include certain shopping behaviors, such as intent-to-buy, searching in-store, and intent to repurchase (Peng & Kim, 2014). A large factor in the SOR process is the fact that the stimulus will often produce an *emotional* response (in the form of arousal (readiness of action), valence (preference or liking), or dominance) that causes the behavioral response. The further explanation of these emotional concepts can be found in chapter *3.1.3 Impulsive Behavior is Emotional Behavior*. The framework is commonly visually presented in three components, under which an experiment or survey's variables and expected outcomes are outlined (see figure 8).

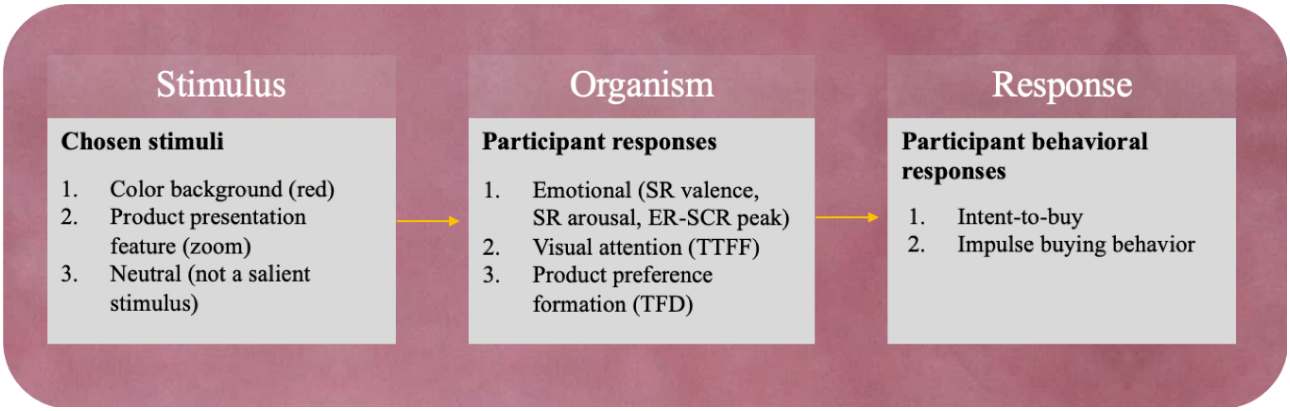


Figure 8: Stimulus-organism-response framework

In terms of the experiment conducted for this paper, the above depiction of SOR has been created. The salient/neutral stimuli chosen will likely produce certain reactions within the organism (in the form of emotion, visual attention, and product preference formation), thereby causing a behavioral response (in the form of an impulsive purchase).

4.2 Self-Assessment Manikin

The SAM is a non-verbal pictorial questionnaire, used to measure emotional response on three dimensions which are central to emotion research. The three visualized dimensions are valence/pleasure measured from positive (smiling), perceived arousal measured from high (wide eyes, and explosive) to low (closed eyes, a small dot), and dominance measured from low (small figure) to high (large figure) (see figure 9) (Bynion & Feldner, 2017). Generally, the SAM is measured on a 9-point or 21-point scale. Because it is a brief, inexpensive, and relatively easy to comprehend questionnaire, it has been widely used. The non-verbal feature also avoids potential misunderstandings or different interpretations of verbal descriptions (Bradley & Lang, 1994).

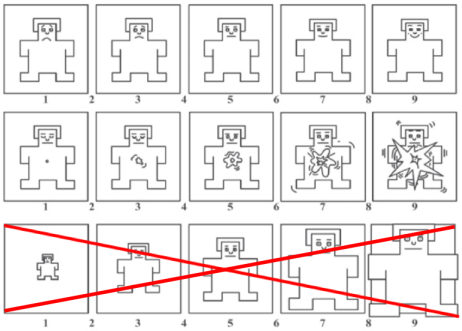


Figure 9: Self-Assessment Manikin

In the following experiment, dominance has been excluded. Dominance assesses the participant's perceived feeling of control or freedom to act in the specific situation. The participants are most likely constantly aware of and considering the fact that they are participating in an experiment in a lab setting, therefore there is a high risk they will misunderstand when rating their perceived feeling of control. While it could be interesting to examine the participants' perceived feeling of personal control when stimulated by visually salient stimuli, the focus is mainly on the resulting emotional states of the participants (consumers), and due to the risk of unreliable answers on the dominance dimension, it was excluded.

4.3 Barratt Impulsiveness Scale

The BIS was created by psychologist Ernest Barratt (1959) and revised by Patton et al. (1995). It has been the most influential impulsiveness scale in psychometric assessment of impulsiveness since its conception (Stanford et al., 2009).

1: Attention facet	2: Motor facet	3: Planning facet
- {reverse} I plan tasks carefully. - I do things without thinking. - I make-up my mind quickly. - I am happy-go-lucky. - I don't "pay attention." - I have "racing" thoughts. - {reverse} I plan trips well ahead of time. - {reverse} I am self controlled. - {reverse} I concentrate easily. - {reverse} I save regularly.	- I "squirm" at plays or lectures. - {reverse} I am a careful thinker. - {reverse} I plan for job security. - I say things without thinking. - {reverse} I like to think about complex problems. - I change jobs. - I act "on impulse" - I get easily bored when solving thought problems. - I act on the spur of the moment. - {reverse} I am a steady thinker.	- I change residences. - I buy things on impulse. - I can only think about one thing at a time. - I change hobbies. - I spend or charge more than I earn. - I often have extraneous thoughts when thinking. - I am more interested in the present than the future. - I am restless at the theater or lectures. - {reverse} I like puzzles. - {reverse} I am future oriented.

Table 3: Barratt Impulsiveness Scale

BIS consists of 30 statements describing actions (see table 3). The participant must rate all statements on a 4-point scale ranging from: rarely/never, occasionally, often, and almost always/always. After rating the statements, the participant will receive a BIS score, indicating their level of impulsiveness on a scale of least impulsive (30x1 = 30 BIS-score) to most impulsive (30x4 = 120 BIS-score). The "direct" statements indicate impulsiveness, in which an answer of "almost always/always" gives them 4 points (e.g. "I do things without thinking"). The "reverse" statements indicate carefulness (reversely phrased statements such as "I plan tasks carefully"), in which an answer of "rarely/never" gives them 4 points. In other words, if a participant answers rarely/never on a direct statement, they receive 1 point, yet if it is a reverse statement, they receive 4 points (Patton et al., 1995).

The BIS assessment is used to determine each participants' baseline of impulsivity that will be used to test whether a participant's impulsivity level affects their impulse shopping behavior.

5. Hypothesis Formulation

The following hypotheses aim to answer the research question:

*How do **visually salient stimuli** affect **emotional impulsive responses** in an **online shopping environment?***

In order to answer the research question, the hypotheses will be broken down into components of impulsive shopping behavior. As a result of the previously mentioned definition of impulsive purchasing behavior, figure 10 is a visualization of four necessary components which must be present for a purchase to have been impulsive. These components are the presence of high levels of arousal and positive valence, presence of purchase intent, no recent previous purchase intent, and relatively quick reaction time. The order of the hypotheses is designed to test the interaction between visually salient/neutral stimuli and the individual components of impulse purchasing before ultimately seeking the effect of our chosen visually salient stimuli when all impulsive components are present. Additionally, in order to compare the efficiency of each of the three visually salient/neutral stimuli to one another, we look toward the eye-tracking measures showing product preference formation and visual attention, as well as reaction time to see if one stimulus is more effective on impulsive shopping than the others. Consequently, the structure of our hypothesis section will be as follows:

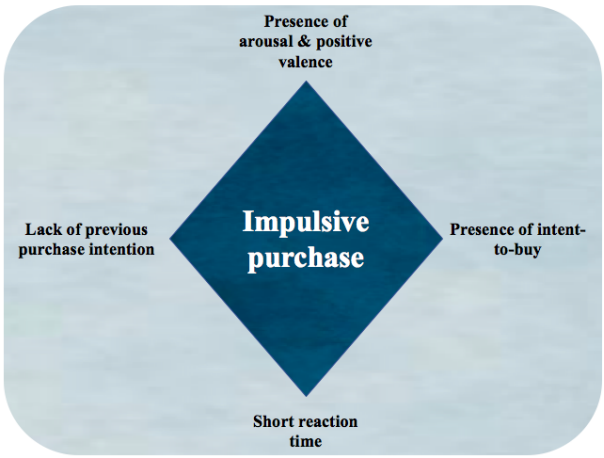


Figure 10: Impulsive purchasing diamond

(H1) Interaction between visually salient/neutral ***stimuli*** + ***emotion*** (measures: SR valence, SR arousal, SCR peak)

(H2) Interaction between visually salient/neutral ***stimuli*** + ***visual attention*** (measure: time to first fixation)

(H3) Interaction between visually salient/neutral ***stimuli*** + ***product preference formation*** (measure: total fixation duration) and visually salient/neutral ***stimuli*** + ***purchase intention*** (measure: intent-to-buy)

(H4) Interaction between visually salient/neutral ***stimuli*** + ***unplanned (emotional) shopping behavior*** (measures: emotion, intent-to-buy, previous purchase intention) and visually salient/neutral ***stimuli*** + ***impulsive shopping behavior*** (measures: reaction time, emotion, intent-to-buy, previous purchase intention)

To clarify, from this point on, unplanned (emotional) purchases is a term used to describe purchases that have all components of an impulsive purchase except short reaction time. The different variables used in the experiment will be elaborated in Experiment Design, chapter *6.1 Definition of Variables*.

As only some of our research can be supported with the available literature and previous experiments, this leads to this section being a combination of exploratory and explanatory hypotheses. The explanatory hypotheses (H1, H2a, H3.1a, H3.2a, H4) are based on/explained by the literature review and the exploratory hypotheses (H2b, H3.1b, H3.2b) are included to find a possible answer to questions we have posed with unsupported and previously unverified results.

5.1 H1 - Emotion

Color theory proposes that red colors are effective in causing a fast-acting and biological urge/reaction that encourages action to be made. Warmer toned colors such as red elicit positive and intense emotions, such as excitement (Cheng et al., 2009; Valdez & Mehrabian, 1994). Red colors have especially been proven to cause physiological responses i.e. higher levels of arousal (Gerard, 1958; Jacobs & Hustmyer, 1974; Wilson, 1966 in Valdez & Mehrabian, 1994). While certain product presentation features have also proven to cause emotional responses, literature and studies on its effectiveness is scarce, and has mostly found it has an effect on valence and not significantly on arousal (Liao et al., 2016). Therefore, it is hypothesized that product images edited with a red color background will result in more positive valence and higher arousal levels than a product zoom element. On the other hand, despite scarce literature, product presentation features have also been found to result in increased emotional responses such as positive valence, therefore we hypothesize that a product image edited with product zoom elements will lead to more positive valence and higher arousal levels than a product image with no editing, i.e. a neutral product image. Therefore, the following hypotheses are:

H1.1a) Participants will have more positive valence when viewing product images edited with color than a product image edited with product zoom element. This will be reflected through significant differences in self-reported valence levels:

H1.1a) Self-reported valence level will be more positive for red color background than for product zoom element

H1.1b) Participants will have more positive valence when viewing product images with a product zoom element than a neutral product image. This will be reflected through significant differences in self-reported valence levels:

H1.1b) Self-reported valence level will be more positive for product zoom element than for neutral

H1.2a) Participants will have stronger arousal when viewing product images with red color background than a product image with product zoom element. This will be reflected through significant differences in self-reported arousal levels:

H1.2a) Self-reported arousal level will be higher for red color background than for product zoom element

H1.2b) Participants will have stronger arousal when viewing product images with a product zoom element than a neutral product image. This will be reflected through significant differences in self-reported arousal levels:

H1.2b) Self-reported arousal level will be higher for product zoom element than for neutral

H1.3a) Participants will have stronger arousal when viewing product images with red color background than a product image with a product zoom element. This will be reflected through significant differences in the amplitude of ER-SCR peaks:

H1.3a) The amplitude of ER-SCR peaks will be higher for red color background than for product zoom element

H1.3b) Participants will have stronger arousal when viewing product images with a product zoom element than a neutral product image. This will be reflected through significant differences in the amplitude of ER-SCR peaks:

H1.3b) The amplitude of ER-SCR peaks will be higher for product zoom element than for neutral

5.2 H2 - Visual Attention

As the color red is one of the first colors registered in human sight (Morton, n.d.), we hypothesize that it will have the best effect on attracting visual attention, demonstrated by the lowest TTFF. There is no prior research on the topic of product zoom element and TTFF; and therefore, H2b is exploratory in nature. However, visually salient stimuli in general have been shown to decrease TTFF due to their ability to capture attention. Therefore, we hypothesize that they will stimulate higher visual attention than neutral stimulus.

H2a) Red color background will be the more effective stimulus in terms of attracting initial visual attention compared to a product zoom element. This will be reflected through a significant difference in TTFF:

H2a) TTFF is shorter for red color background than for product zoom element

H2b) A product zoom element will be the more effective stimulus in terms of attracting initial visual attention compared to a neutral product image. This will be reflected through a significant difference in TTFF:

H2b) TTFF is shorter for product zoom element than for neutral

5.3 H3 - Product Preference Formation and Purchase Intention

While H3.1a and H3.2a are explanatory, H3.1b and H3.2b are more exploratory in nature since almost no research has been conducted on the effect of TFD or ITB on product zoom element. Based on the literature, color is able to cause high levels of arousal (Gerard, 1958; Jacobs & Hustmyer, 1974; Wilson, 1966 in Valdez & Mehrabian, 1994), and warm hues are in general said to be able to elicit excitement (Cheng et al., 2009), indicating that red is able to elicit high arousal and positive valence (as indicated by excitement's placement on the arousal-valence model). These properties of red lead us to hypothesize that because red is able to make participants feel pleasant and aroused, they will

form positive preferences for these product images, resulting in the longest TFD. In addition, our literature review also states that fixation duration is a reliable method in predicting future choice (Reingold, 2009; Guyader et al., 2017).

Based on these two assertions, we consequently hypothesized that because red is likely to excite participants (positive effect), they will look at products with a red color background longer and thence this fixation duration will have an impact on their ITB, which will be the highest for red color background. While there is not much literature on the effect of product zoom element on both TFD and ITB, previous literature findings state that visually salient stimuli lead to longer TFD in comparison with neutral stimulus, as the purpose of visually salient stimuli is to elicit higher arousal and positive valence, thus product preference is formed. Therefore, we hypothesize that product zoom element is able to elicit longer TFD than neutral, and higher ITB than neutral.

H3.1a) Product images with red color background will be preferred to product images with a product zoom element. This will be reflected through a significant difference in TFD:

H3.1a) TFD is longer for red color background than for product zoom element

H3.1b) Product images with a product zoom element will be preferred to neutral product images. This will be reflected through a significant difference in TFD:

H3.1b) TFD is longer for product zoom element than for neutral

H3.2a) Product images with red color background will have a higher ITB compared to product images with a product zoom element. This will be reflected through a significant difference in intent-to-buy:

H3.2a) ITB is higher for red color background than for product zoom element

H3.2b) Product images with a product zoom element will have a higher ITB compared to neutral product images. This will be reflected through a significant difference in ITB:

H3.2b) ITB is higher for product zoom element than for neutral

5.4 H4 - Unplanned (Emotional) and Impulsive Purchasing

The following four hypotheses examine unplanned (emotional) purchases and impulsive purchases. Up to the current point, the two visually salient stimuli and the neutral stimulus have been examined in relation to individual components (emotion, visual attention, preference formation, purchase intention). These hypotheses follow that H1-H3 are accepted. Contrary to the previous hypotheses (H3.2a and H3.2b), H4.1a an H4.1b require the following conditions to be accepted (1) there is an emotional presence (SR valence>50, SR arousal>50 OR presence of a ER-SCR peak), (2) there is an intent-to-buy (ITB>2), and (3) there was no previous purchase intention (PPI<2). Since H4.1a and H4.1b are based on the results from H1-H3 which all favour the red color background, this visually salient stimulus has been chosen as the most effective, followed by PZE, then neutral stimulus.

For H4.2a and H4.2b, we examine which visually salient/neutral stimuli are better at encouraging impulsive purchases. Therefore, the same conditions apply as in H4.1a and H4.1b. These two last hypotheses test reaction time, as this is the final component of impulsive purchases according to the definition used in this study, hereby changing it from an unplanned (emotional) purchase to an impulsive purchase. Similar to H4.1a and H4.1b, due to all the previous hypotheses postulating that red color background is the most effective at eliciting emotional arousal and valence, capturing attention, forming positive preference formation leading to a higher ITB, we also believe it will lead to the shortest reaction time. Thus, a red color background is favored as being the most effective in triggering impulsive purchases. The same line of argument claims that product zoom element is the second best, and neutral is the least effective.

H4.1a) Red color background will trigger more unplanned (emotional) purchasing behavior than a product zoom element. This will be reflected through a higher ITB when the above-mentioned conditions for unplanned (emotional) purchasing apply:

H4.1a) ITB is higher for red color background than for product zoom element

H4.1b) A product zoom element will trigger more unplanned (emotional) purchasing behavior than neutral product images. This will be reflected through a higher ITB when the above-mentioned conditions for unplanned (emotional) purchasing apply:

H4.1b) ITB is higher for product zoom element than for neutral

H4.2a) Red color background will trigger more impulsive shopping behavior than a product zoom element. This will be reflected through a faster reaction time when the above-mentioned conditions for impulsive purchases apply:

H4.2a) Reaction time will be faster for red color background than for product zoom element

H4.2b) A product zoom element will trigger more impulsive shopping behavior than neutral product images. This will be reflected through a faster reaction time when the above-mentioned conditions for impulsive purchases apply:

H4.2b) Reaction time will be faster for product zoom element than for neutral

6. Experiment Design

The following chapter will cover all aspects of the design of the experiment conducted for this study. As an overview, figure 11 illustrates the research methods chosen combined with the hypotheses.

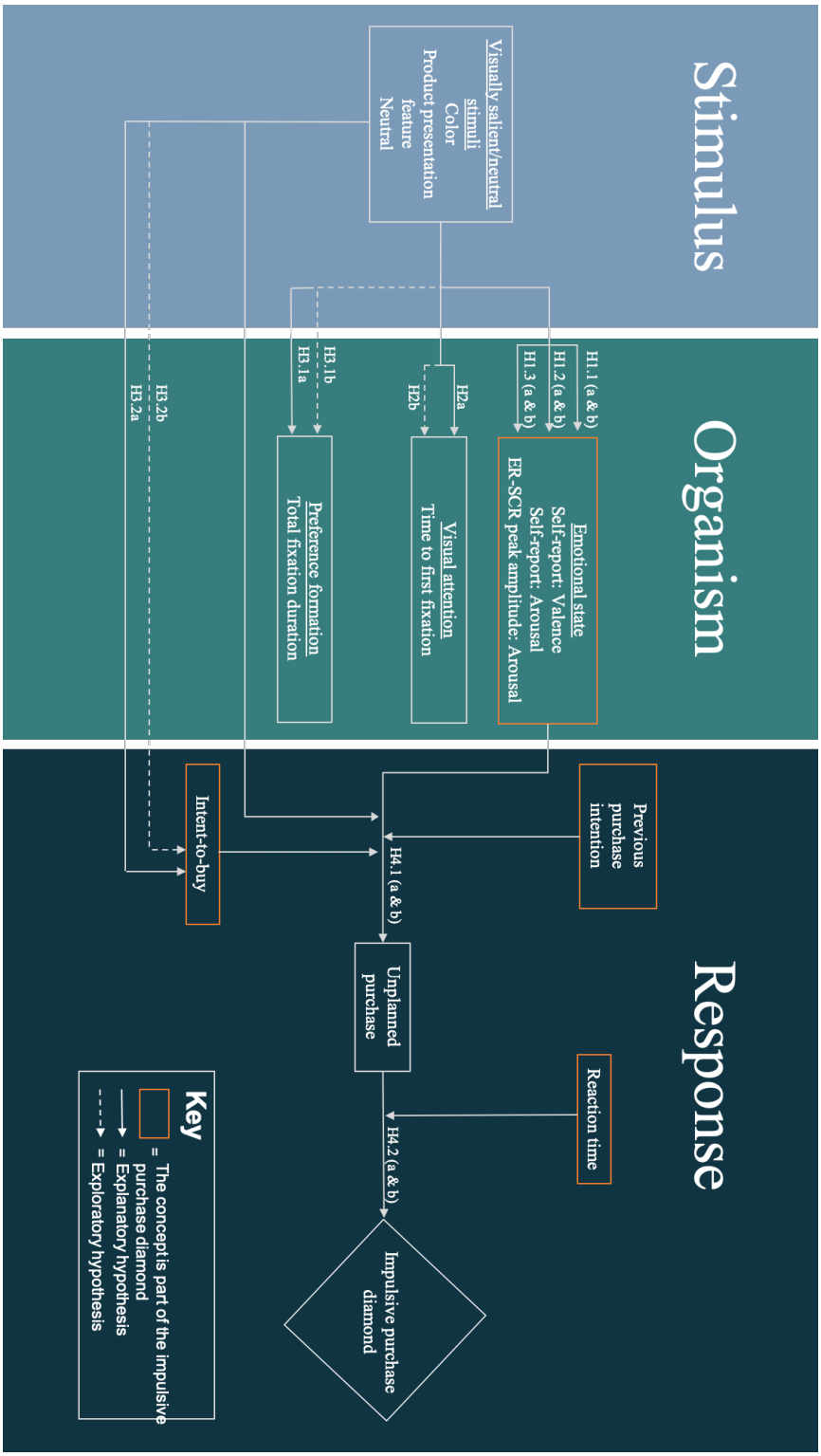


Figure 11: Chosen research methods combined with hypotheses

6.1 Definition of Variables

Table 4 below shows an overview of the chosen variables, as well as the reasoning behind their inclusion as variables for the experiment.

Term	Measurement	Explanation
Measurements from eye-tracking		
Time to first fixation (TTFF)	The number of milliseconds it takes for a participant to direct their first fixation on an area of interest (AOI) from the moment it is presented on screen	TTFF provides information on which stimuli attract the most attention
Total fixation duration (TFD)	The total number of milliseconds of fixations spent within an AOI	The TFD reflects product preference formation - the longer a participant fixates on an object, the larger the likelihood is they prefer this object and can potentially result in higher intent-to-buy
Measurements from GSR		
Amplitude of ER-SCR (arousal)	Microsiemens (µS) SCR responses are quite subjective; thus, all participants' SCR responses are measured against their own average baseline	If a participant has a relatively high ER-SCR amplitude, they have been aroused, which is an important component of impulsive purchasing behavior
Measurements from reaction time		
Reaction time	Milliseconds (ms) Measured from the moment the products are displayed until the moment the participant clicks "Next".	It reflects how easily the participant's product preference formation and decision-making was. A shorter reaction time reflects quick product preference formation and decision-making

Measurements from self-reports		
Valence	Measured on a scale from 1-100, 1 = negative, 50 = neutral, 100 = positive	If a participant has rated valence > 50, they feel positive, an important component of impulsive buying behavior
Arousal	Measured on a scale from 1-100, 1 = not intense, 50 = neutral, 100 = very intense	If a participant has rated arousal > 50, they feel activated, an important component of impulsive buying behavior
Previous purchase intention (PPI)	Measured on a scale from 1-3 1 = have not previously thought of buying it (in the past 30 days) 3 = have previously thought of buying it (in the past 30 days)	If a participant has rated their PPI level < 2, then they have not previously thought of buying the product within the past 30 days, a necessary component of impulsive buying behavior
Intent-to-buy (ITB)	Measured on a scale from 1-3 1 = would definitely not buy, 2 = indifferent, 3 = would definitely buy	If a participant rates ITB > 2, they intend to buy the product just viewed and selected Ideally the experiment would include a real purchase situation; however, as this is not possible, *intention to purchase* is a widely used replacement used by researchers to simulate an actual purchase (Boshoff, 2017; Clement, 2013; Kemp & Kopp, 2011; Milosavljevic & Cerf, 2008)

Table 4: Overview of chosen variables

6.2 Definition of AOIs

For each slide containing product images, each product is an area of interest (AOI) in itself, thus there are three AOIs in total on each slide. The AOIs only include the image of the product, and not the number, as indicated by the circles in figure 12.

Figure 12: Areas of interest, example with neutral product images

6.3 Sample Population

This study will recruit only females. Men are excluded as it was earlier mentioned that women are more prone to engaging in impulsive and hedonic shopping, and they are therefore a better target group for this experiment. Women tend to browse more while shopping, increasing the opportunity to impulsively purchase products. Furthermore, online shopping behavior varies within different generations, with Millennials and Generation Z being the most active online shoppers. Therefore, participants must be at least 18 years of age and 35 at the most. 41 participants were recruited for the experiment. They had all tried shopping online before and did so on a basis ranging from 1-2 times per week or more to 1-2 times every 6 months.

6.4 Experimental Apparatus

The equipment used for the eye-tracking experiment was a computer based integrated eye-tracker, Tobii Pro, T60bXL, 27 inches. The display measure of the screen was 33.6cm x 59.8cm. The software used was iMotions Biometric Research Platform, version 7.1. To measure skin conductance, a Shimmer3 GSR+ Unit was utilized, although using only two of the electrodes to place on the ring

and middle fingers on the participants' non-dominant hand. The Shimmer GSR+ Unit is compatible and easily combined with iMotions software.

6.5 Stimuli

The three product categories participants will see are hairbands, tote bags, and t-shirts (see appendix 2 for product images). The products chosen had to be products commonly found in a lower price range since we did not want price to influence choice. Furthermore, the products had to be within the clothing, footwear, and jewelry product categories, as women most frequently purchase impulsively within these product categories - recall that 39% of female online shoppers buy impulsively from these product categories online. The participants will be exposed to independent variables: visually salient stimuli (1) red color background, (2) product zoom element, and (3) neutral product image. The red color background fades from red (hue: 3°, saturation: 77%, brightness: 57%) to a deep red (hue: 5°, saturation: 82%, brightness: 37%). This type of slightly darker red was created since it should be suitable for a product image, meaning it should not overpower and dominate the image, as the purpose of the image is to display the product. The purpose of the red is to attract visual attention, elicit emotion, and ultimately increase preference and intention to buy the product. In other words, it acts to complement the product.

The second visually salient stimulus, product zoom element, also serves to complement the product, highlighting unique and detailed components of the product design by including a zoom feature insert. It is therefore a given that this can only be applied to products which have specific details designed onto them and would be suitable for implementation on plain designs. The third independent neutral variable is a simple product image with no manipulation/editing on a white background. See figure 13 for examples.

Figure 13: Red color background; Product zoom element; Neutral product image

Previous literature states that colors in general significantly affect the consumer's emotional response to the products shown, and red color specifically can trigger a positive emotional response and higher level of arousal and excitement. The color red is the second most attention-grabbing color and can possibly trigger readiness for action, increasing the intent-to-buy the product. The second visually salient stimulus aims at highlighting specific features of the products, drawing attention to the specific and unique details by creating a "zoom" feature insert. This is to increase the sense of (emotional) interaction between the consumer and the product and to provide additional information of the products' details without using semantics and activating cognitive thought.

Each participant will see the following combinations (table 5) of visually salient/neutral stimuli in randomized order:

T-Shirt (TS)			
Neutral product image (N)	TS 1 N	TS 2 N	TS 3 N
Red color background (R)	TS 4 R	TS 5 R	TS 6 R
Product zoom element (Z)	TS 7 Z	TS 8 Z	TS 9 Z
Hairband (HB)			
Neutral product image (N)	HB 1 N	HB 2 N	HB 3 N
Red color background (R)	HB 4 R	HB 5 R	HB 6 R
Product zoom element (Z)	HB 7 Z	HB 8 Z	HB 9 Z
Tote bag (TB)			
Neutral product image (N)	TB 1 N	TB 2 N	TB 3 N
Red color background (R)	TB 4 R	TB 5 R	TB 6 R
Product zoom element (Z)	TB 7 Z	TB 8 Z	TB 9 Z

Table 5: Combinations of product images and visually salient/neutral stimuli

Thus, in total they will see nine slides with three products presented on each, making it 27 product images in total, nine neutral product images, nine product images with red color background, and nine product images with product zoom element. For each of the nine slides, they have to form a preference, determine their ITB, and report their SR valence and SR arousal levels when making each decision.

6.6 Procedure

Upon arrival, the participants will need to sign a form of informed consent and willingness to participate in the study, and permission for their data to be used. Afterwards, there are three parts to the entire experiment setup they need to go through. See figure 14 below for an overview of the three parts, the length of each part is an approximate estimation.

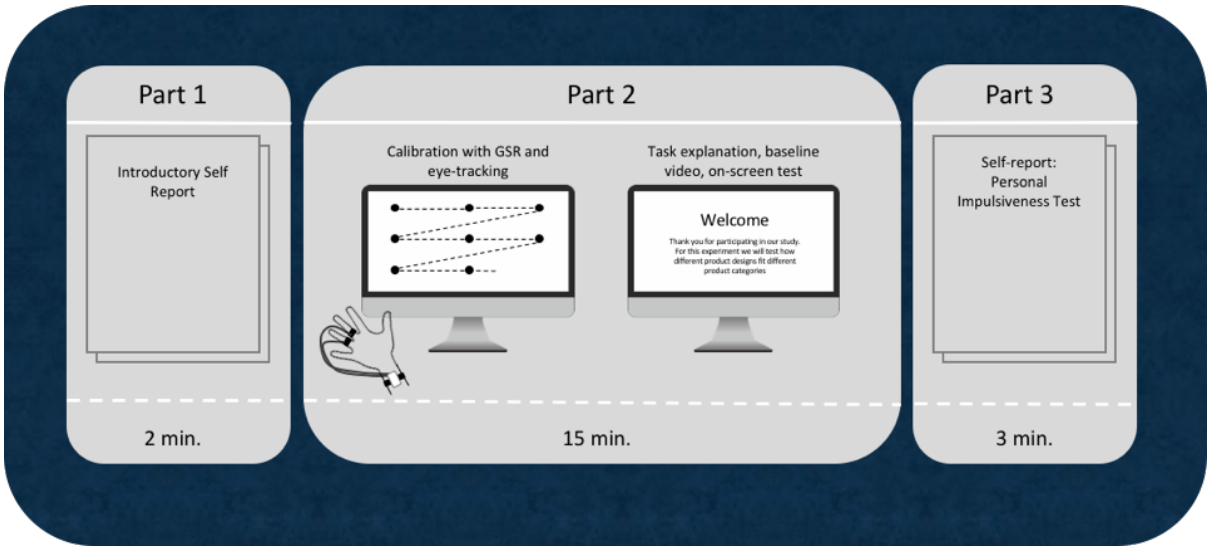


Figure 14: Overview of the entire experiment

6.6.1 Part 1: Introductory Self-report

In *part one* participants fill out an anonymous introductory self-report of demographic information, and answer four questions concerning their online shopping behavior: “Do you shop online?”, “If yes, how often do you shop online on average?”, “What do you shop online?” and “Why do you shop online” (see appendix 1) This is to give a preliminary indication of the participants’ online shopping habits and to ensure that they are all familiar with online shopping.

6.6.2 Part 2: Eye-tracking and GSR On-screen Test

In *part two,* participants will be tested using our biometric measures eye-tracking and GSR. First, they will all be given the same instructions of the tasks given in the experiment and how to interact when wearing the electrodes and being eye-tracked. They will be placed in front of the computer, after which electrodes will be placed on their non-dominant hand, as they will have to use their dominant hand to click the mouse when responding to on-screen visually salient/neutral stimuli. The electrodes will be placed on their ring and middle fingers since this part of the body has sweat glands responding strongly to emotional stimulation (GSR Pocket Guide, 2016). Eye-tracking calibration will be carried out, and the participant is subsequently ready to continue the experiment. There will always be at least one experimenter in the room should the participant require assistance.

When initiating the on-screen test, the participants are first presented with a cover story to disguise the purpose of the experiment in an attempt to prevent biased answers (see appendix 3 for the full cover story). They will have unlimited time to read the cover story and can manually proceed when ready to continue. Next, a baseline will be collected to evaluate individual GSR characteristics of each participant (ibid.). Therefore, participants will see a 70-second-long video with background music, first showing clips from fashion shows followed by clips of a lookbook. None of the video clips contain brand names or logos. After this video and after every subsequent visually salient/neutral stimulus is presented, a neutral gray background is shown for five seconds, and in the remaining one second, a fixation cross will appear to ensure all participants fixate at the center of the screen. The gray background is shown for five seconds to allow participants' SCR peak to decline before being exposed to new visually salient/neutral stimuli. They will be reminded of the task at hand before each new product slide is shown. Their task is to look at the products and "Decide which you like the most". As noted in the literature review on product preference formation, experimenters who use TFD must be aware that when participants fixate on an object, they do not only form preferences for one of the objects. They also spend time fixating in order to arrive at a decision for the given task at hand. However, since the given task is to decide which product they like the most, i.e. form a preference, the difference between product preference formation and decision goal is minimized, and TFD can be used as a measure to examine how long it takes the participants to form a preference and make a decision.

When viewing the product slides, each participant will see three product images within the same product category and with the same visually salient/neutral stimulus applied across all three images. For example, a participant will see three different t-shirts including a close-up image of the details (visually salient stimulus = product zoom element), or three different tote bags with a white background (neutral stimulus). The images will be displayed for a minimum of five seconds, afterwards the participants have free viewing time and are free to manually continue when they have decided which product, they prefer the most. When ready, they manually proceed to indicating which product they prefer the most and are asked "How much would you like to buy this product?" on a scale ranging from "Would definitely not buy" (=1) to "Would definitely buy" (=3), effectively rating their ITB. The question is taken from van der Laan et al.'s study (2015), however, it was modified from "How much do you *want* to have this product" to "How much would you like to *buy* this product" to emphasize the purchase situation. Furthermore, they used a 9-point scale, however, since the question is non-numerical and asking for preference, a continuous scale of 100 bins is chosen instead to detect subtle differences in preference. Lastly, despite naming the variable *intent*-to-buy (ITB), the scales are phrased as "Would definitely not buy" - "Would definitely buy" since phrasing it as *intention* to buy might confuse participants.

The next slide asks two questions, "How did you feel when you made your choice?" and "How intense was this feeling?", and answers are given on a continuous scale with 100 bins allowing for nuanced answers. The first question provides information of valence as neither eye-tracking nor GSR can provide such information, and the second question concerns arousal to support SCR results. The purpose of including a measure of valence is to be able to place the participant along the arousal-valence model and to assess whether the visually salient stimuli are able to elicit pleasantness and high arousal, thereby placing them in the first quadrant. The last slide is not randomized and asks, "Have you in the past 30 days thought of buying from any of the product categories?". Participants then have to rate from "No" to "Yes". If they have thought of buying from a product category within the past 30 days, all their potential purchases (more specifically ITB) for that category are not impulsive decisions based on the definition of impulsive purchase established for this paper. For example, if they have thought of buying t-shirts within the past 30 days, then their intention to buy any one of the t-shirts in the experiment were not impulsive. For an overview of part two, see figure 15 below.

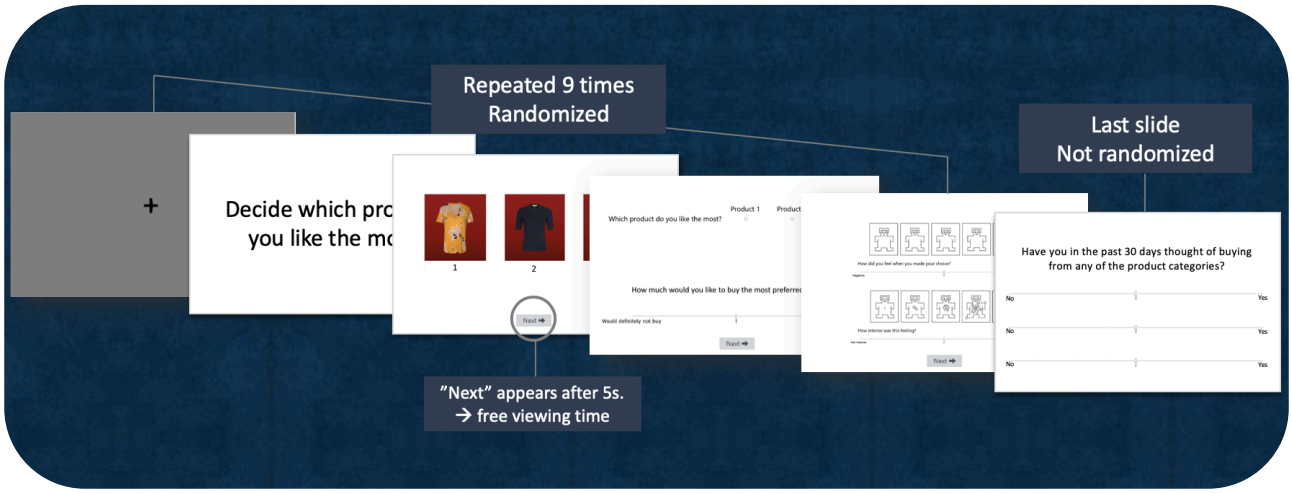


Figure 15: Possible sequence of slides

6.6.3 Part 3: Self-report - Impulsiveness Assessment

Part three consists of a self-report examining personal impulsiveness. This is to verify whether personal differences in impulsiveness can have an effect on their behavior and decisions made during the experiment. It acts as a baseline in terms of showing if there are any outliers, e.g. if someone is very impulsive by nature, then they would perhaps buy the products anyway regardless of the applied visually salient stimuli. The questions for the personal impulsiveness test are taken from BIS test, consisting of 30 statements (see Theoretical Framework, chapter *4.3 Barratt Impulsiveness Scale* for statements and scoring process). The participants will rate statements in terms of how they think they act regarding common impulsive or non-impulsive behavior and will thereafter be given a score of impulsivity. Before beginning the test, participants are told this test is to examine how they act in certain situations and they have to answer based on an honest, initial gut feeling.

Once a participant has finished the BIS assessment, the experiment is finished, and the recorded results are ready for extraction and analysis.

7. Results

The data gathering process was completed over the course of two weeks. Via our experiment, we were able to gather data on the effect of visually salient/neutral stimuli on our selected variables: SR valence, SR arousal, ER-SCR peak amplitude, TTFF, TFD, ITB, PPI and reaction time. If the correlation is not found to be significant between visually salient/neutral stimuli, we then tested to see if the product category may have had an effect on the participants' responses. Using JMP

statistical software, we underwent two steps to answer each hypothesis. First, we conducted a repeated measures linear mixed effects model with red color background (red color), product zoom element (PZE), and neutral as model predictors (i.e. red color, PZE, neutral = independent variables) and impulsive purchasing behavior as the dependent variable. By doing this, we were able to test the correlation between the chosen stimuli and variables designated in the hypotheses. We then found the mean values and standard error of the dependent variables' interaction with the independent variables. In the following section, the results from each hypothesis will be stated.

7.1 Data Cleansing

In order to utilize the most relevant and accurate data for the analysis, we begin by cleansing (e.g. deleting irrelevant data, recoding, and filtering) the data. In terms of the data that is discarded, both the eye-tracking and GSR data obtained must be cleansed of the irrelevant slides, such as introduction, trial, SCR baseline video, and informational slides. Once that data has been discarded, only relevant data points should be left. However, as is common with eye-tracking data, some values must be deemed inaccurate, namely a TTFF of zero seconds because it indicates that the participant's gaze was fixated on the AOI already prior to the onset of the stimulus. Therefore, we have removed 140 data points from the 1107 total obtained TTFF data points when analyzing TTFF as a variable.

Given the complex and specific nature of what **H4 Unplanned (Emotional) and Impulsive purchasing** attempts to answer, we filter the data to analyze only impulsive purchase decisions. As stated previously when defining impulsive purchasing, this is when there has been a presence of emotion (valence > 50, arousal > 50 OR presence of SCR peak), intent-to-buy > 2, and previous purchase intention < 2. These filters are applied after which the correlation between visually salient/neutral stimuli and purchase intention is measured.

Lastly, recoding has been conducted in order to provide consistent variable names that allow different data export files to be merged together (e.g. TTFF data can be merged with TFD data, etc.).

7.2 Results of H1 - Emotion

The purpose of H1 was to test whether there is a correlation between visually salient stimuli and emotional response in the form of high valence, high arousal or presence of SCR peaks.

When answering the following H1 hypotheses, data has been cleansed and no filters have been applied. The data used for this section stems from the participants' self-reported values obtained through the SAM model, as well as the SCR data. After cleansing the data, there are 1107 observations for each SR valence and SR arousal, and 201 observations from the SCR. The amount of data retrieved from SCR will be reviewed further in Discussion, chapter *8.3.1 Improvements on Emotional Dimensions: Arousal and Valence*. For the purposes of this study, we will still report and analyze the SCR data; however, we are aware of the validity issues that come with small sample sizes, as the sample size may be insufficient to obtain generalizable findings. It is important to note that due to this, SR arousal (taken from the SAM) will be the only selected measure of arousal henceforth. If we were to reproduce the same experiment, a larger sample pool would be advisable due to the difficulty of obtaining usable observations from SCR.

H1.1a) Self-reported valence level will be more positive for red color background than for product zoom element

H1.1b) Self-reported valence level will be more positive for product zoom element than for neutral

We attempt to find the significance of the correlation between valence and visually salient/neutral stimuli. We conducted a repeated measures linear mixed effects model with visually salient/neutral stimulus (red color, PZE, neutral) as the model predictor and SR valence as the dependent variable. The main effect of the visually salient/neutral stimulus was **not significant but showed a trend with the following results: F(2,80)=2.88, p=0.06**. The mean SR valence level of red color is 63.82 (standard error: 1.73), the mean SR valence level of PZE is 62.99 (standard error: 1.73), and the mean SR valence level of neutral is 60.21 (standard error: 1.73) (figure 16).

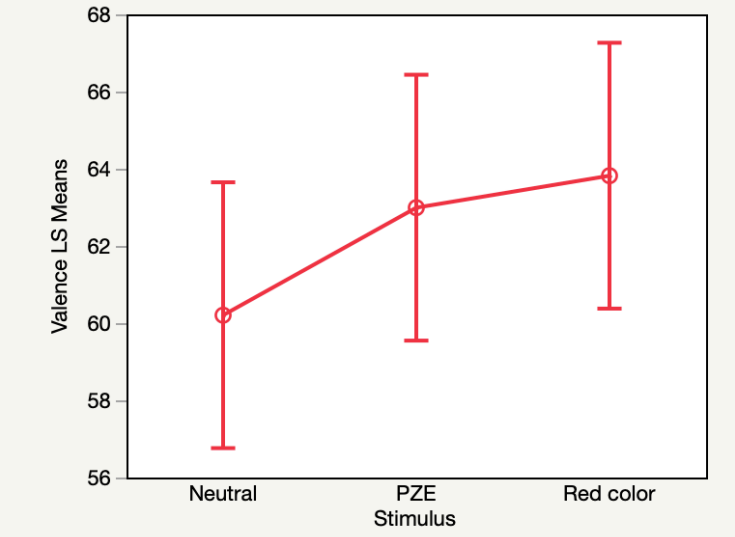


Figure 16: Effect of stimulus on valence

Using category and stimulus as model predictors, the effect of the individual variables (visually salient/neutral stimulus, category) and the interaction between the variables (visually salient/neutral stimulus*category) on valence show the following results:

Effect of stimulus on valence: trend, F(2,80)=2.88, p=0.06

Effect of category on valence: no correlation, F(2,80)=0.36, p=0.70

Effect of stimulus*category on valence: significant correlation, F(4,160)=2.98, p=0.02. A graphical representation of the results is shown in figure 17. The implications of this will be explored in Discussion, *chapter 8.2 Analysis of Results*.

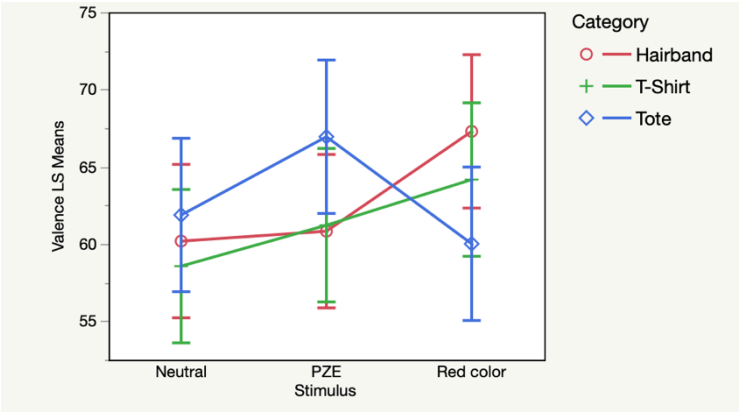


*Figure 17: Effect of stimulus*category on valence*

H1.2a) Self-reported arousal level will be higher for red color background than for product zoom element

H1.2b) Self-reported arousal level will be higher for product zoom element than for neutral

We attempt to find the significance of the correlation between SR arousal and visually salient/neutral stimuli. We conducted a repeated measures linear mixed effects model with visually salient/neutral stimulus (red color, PZE, neutral) as the model predictor and arousal as the dependent variable. The main effect of the visually salient/neutral stimulus shows **no significant correlation with the following results: F(2,80)=0.39, p=0.68.** The mean SR arousal level of red color is 47.61 (standard error: 1.96), the mean SR arousal level of PZE is 47.95 (standard error: 1.96), and the mean SR

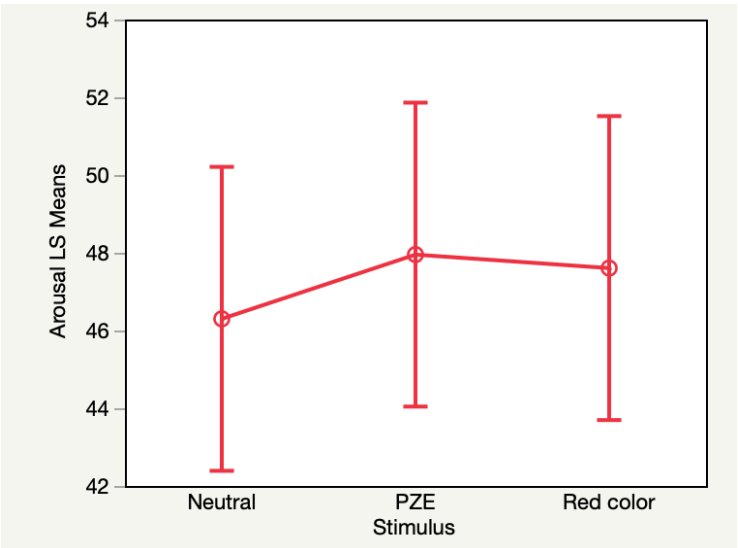


Figure 18: Effect of stimulus on arousal

arousal level of neutral is 46.30 (standard error: 1.96) (figure 18).

Using category and visually salient/neutral stimulus as model predictors, the effect of the individual variables (visually salient/neutral stimulus, category) and the interaction between the variables (visually salient/neutral stimulus*category) on SR arousal show the following results:
Effect of visually salient/neutral stimulus on SR arousal: no significance, F(2,80)=0.39, p=0.68
Effect of category on SR arousal: no significance, F(2,80)=0.14, p=0.87
Effect of visually salient/neutral stimulus*category on SR arousal: no significance, F(4,160)=1.33, p=0.26

H1.3a) The amplitude of ER-SCR peaks will be higher for red color background than for product zoom element
H1.3b) The amplitude of ER-SCR peaks will be higher for product zoom element than for neutral

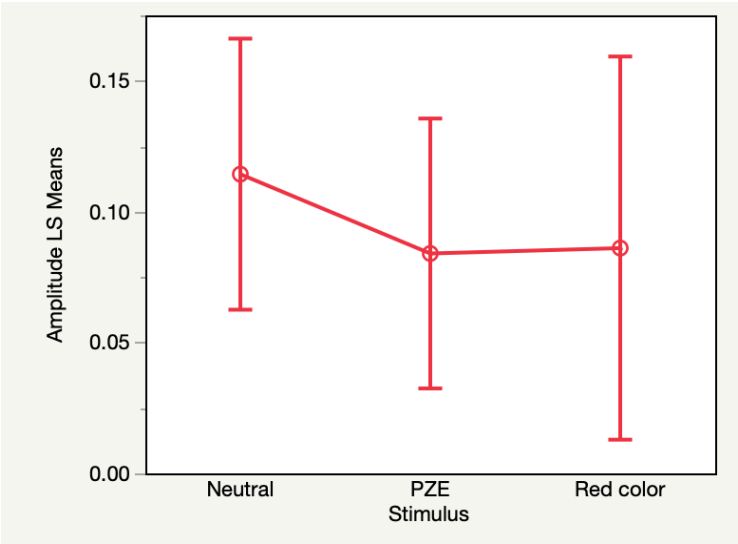


Figure 19: Effect of stimulus on ER-SCR peak amplitude

We attempt to find the significance of the correlation between ER-SCR peak amplitude and visually salient/neutral stimuli. We conducted a repeated measures linear mixed effects model with visually salient/neutral stimulus (red color, PZE, neutral) as the model predictor and ER-SCR peak amplitude as the dependent variable. The main effect of the visually salient/neutral stimulus shows **no significant correlation with the following results: F(2,23.5)=0.50, p=0.61.** The mean ER-SCR peak amplitude of red color is 0.09 (µS) (standard error: 0.04 (µS)), the mean ER-SCR peak amplitude of PZE is 0.08 (µS) (standard error: 0.03(µS)), and the mean ER-SCR peak amplitude of neutral is 0.11 (µS) (standard error: 0.03(µS)) (figure 19).

Using category and visually salient/neutral stimulus as model predictors, the effect of the individual variables (visually salient/neutral stimulus, category) and the interaction between the variables (visually salient/neutral stimulus*category) on peak amplitude show the following results:
Effect of visually salient/neutral stimulus on ER-SCR peak amplitude: no significance, $F(2,17.77)=0.43$, $p=0.65$
Effect of category on ER-SCR peak amplitude: no significance, $F(2,13.63)=0.04$, $p=0.96$
Effect of visually salient/neutral stimulus*category on ER-SCR peak amplitude: no significance, $F(4,34.76)=0.80$, $p=0.53$

In terms of results from the baseline test, the following results are found:

- 37% did not peak
- 26% peaked 1-4 times
- 37% peaked 5+ times

7.3 Results of H2 - Visual Attention

The purpose of H2 was to test whether there is a correlation between visually salient/neutral stimuli and TTFF (and thereby attraction of visual attention).

When answering the following H2 hypotheses, data has been cleansed and no filters have been applied. The data used for this section stems from the eye-tracking data obtained through the Tobii Pro, T60bXL, 27 inches. After cleansing the data of all TTFF values = 0, there are 968 observations.

H2a) TTFF is shorter for red color background than for product zoom element
H2b) TTFF is shorter for product zoom element than for neutral

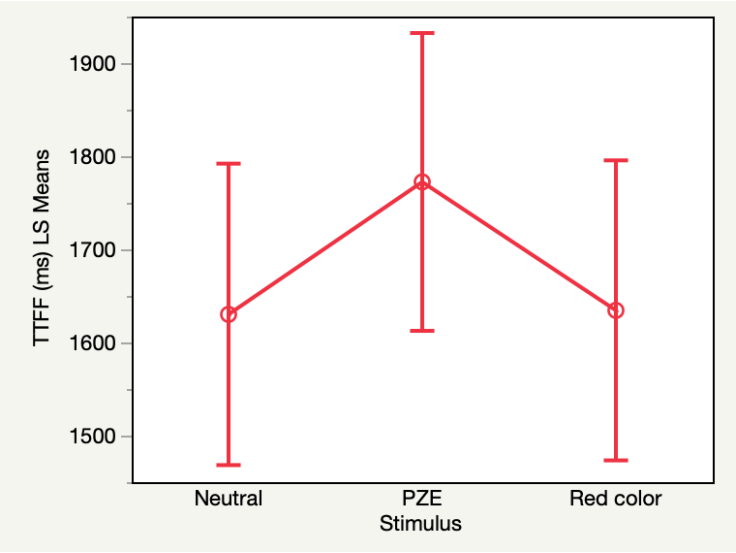


Figure 20: Effect of stimulus on TTFF

We attempt to find the significance of the correlation between TTFF and visually salient/neutral stimuli. We conducted a repeated measures linear mixed effects model with visually salient/neutral stimulus (red color, PZE, neutral) as the model predictor and TTFF as the dependent variable. The main effect of the visually salient/neutral stimulus shows **no significant correlation with the following results: F(2,83.34)=1.43, p=0.25.** The mean TTFF of red color is 1634.44 (ms) (standard error: 81.27), the mean TTFF of PZE is 1772.38 (ms) (standard error: 80.65), and the mean TTFF of neutral is 1630.16 (ms) (standard error: 81.69) (figure 20).

Using category and visually salient/neutral stimulus as model predictors, the effect of the individual variables (visually salient/neutral stimulus, category) and the interaction between the variables (visually salient/neutral stimulus*category) on TTFF show the following results:
Effect of visually salient/neutral stimulus on TTFF: no significance, F(2,83.25)=1.32, p=0.27
Effect of category on TTFF: no significance, F(2,77.29)=0.11, p=0.90
Effect of visually salient/neutral stimulus*category on TTFF: no significance, F(4,163.8)=01.26, p=0.29

7.4 Results of H3: Product Preference Formation and Purchase Intention

The purpose of H3 was to test whether there is a correlation between visually salient/neutral stimuli and TFD (and thereby product preference formation); and visually salient/neutral stimuli and intent-to-buy (and thereby purchase intention).

When answering the following H3 hypotheses, data has been cleansed and filters have been applied. As with TTFF, the TFD data used for this section stems from the eye-tracking data obtained through the Tobii Pro, T60bXL, 27 inches. For this data set, products that are *not chosen* are filtered out due

to the fact that we use TFD to indicate product preference formation, it follows that products not chosen are not preferred. This leaves the TFD data set with 366 observations. In terms of the source of ITB data, this is obtained via participants' self-reported answers via the iMotions experiment. With the participants' self-report of the ITB data set, all available data was used, providing data from 144 observations.

H3.1a) TFD is longer for red color background than for product zoom element
H3.1b) TFD is longer for product zoom element than for neutral

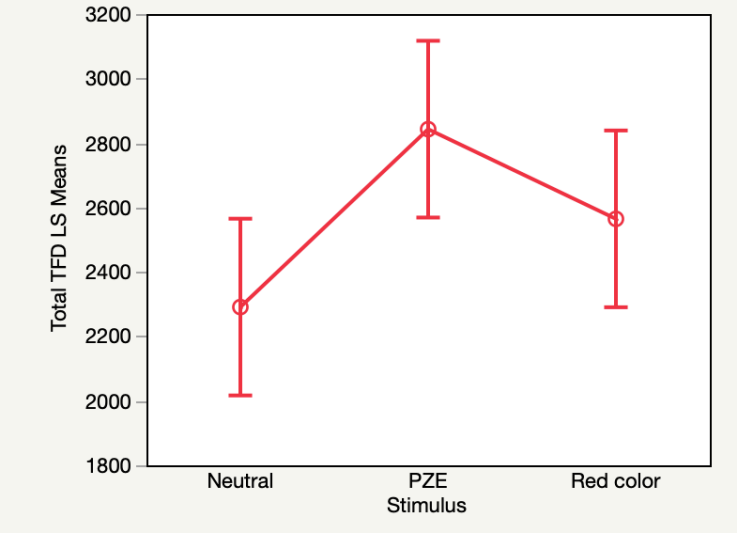


Figure 21: Effect of stimulus on TFD

We attempt to find the significance of the correlation between TFD and visually salient/neutral stimuli. We conducted a repeated measures linear mixed effects model with visually salient/neutral stimulus (red color, PZE, neutral) as the model predictor and TFD as the dependent variable. The main effect of the visually salient/neutral stimulus shows **a significant correlation with the following results: F(2,80)=8.88, p=0.0003.** The mean TFD of red color is 2564.54 (ms) (standard error: 137.64), the mean TFD of PZE is 2842.85 (ms) (standard error: 137.64), and the mean TFD of neutral is 2290.90 (ms) (standard error: 137.64) (figure 21).

H3.2a) ITB is higher for red color background than for product zoom element
H3.2b) ITB is higher for product zoom element than for neutral

We attempt to find the significance of the correlation between ITB and visually salient/neutral stimuli. We conducted a repeated measures linear mixed effects model with visually salient/neutral stimulus (red color, PZE, neutral) as the model predictor and ITB as the dependent variable. The main effect of the visually salient/neutral stimulus shows **a significant correlation with the following results: F(2,80)=11.62, p=0.00004.** The mean ITB of red color is 2.15 (standard error: 0.06), the mean ITB of PZE is 1.98 (standard error: 0.06), and the mean TFD of neutral is 1.91 (standard error: 0.06) (figure 22).

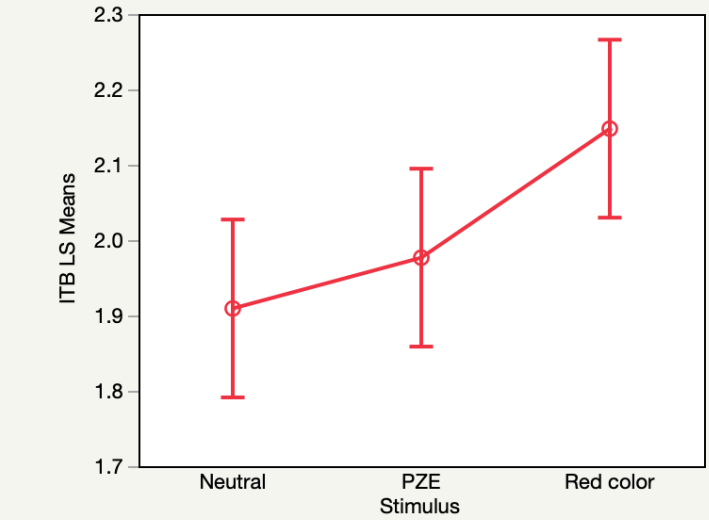


Figure 22: Effect of stimulus on ITB

7.5 Results of H4 - Unplanned (Emotional) and Impulsive Purchasing

The purpose of H4 was to test whether there is a correlation between visually salient/neutral stimuli and unplanned and impulsive purchasing behavior.

When answering the following H4 hypotheses, data has been cleaned and certain filters have been applied in order to extract data consistent with an unplanned (emotional) purchase. The data used for this section stems from participants' self-report (arousal, valence, ITB, PPI), and finally tested against the iMotions software (reaction time (H4.2a and H4.2b)) for impulsive purchases. H4.1a and H4.1b differ from H3.2a and H3.2b, as certain filters are applied on the basis of our definition of unplanned (emotional) purchases. For this data set, products that are not chosen are filtered out, because a product not chosen is interpreted as a purchase behavior not having been "performed". This is also the reasoning behind filtering out ITB < 2. PPI > 2 is also filtered out, since we have defined unplanned/impulsive purchases as having a low previous purchase intention. Lastly, SR arousal and SR valence < 50 are filtered out, since we have defined unplanned/impulsive purchases as having a high arousal and valence. This leaves the unplanned purchase and reaction time data set with 36 observations. The reaction time is measured from when a participant is first exposed to a product image slide to when they click on 'Next' after free viewing.

H4.1a) ITB is higher for red color background than for product zoom element

H4.1b) ITB is higher for product zoom element than for neutral

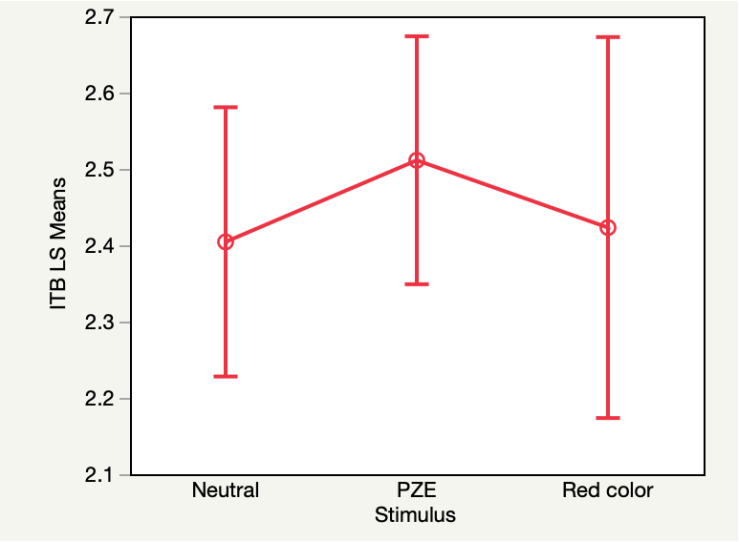


Figure 23: Effect of stimulus on unplanned (emotional) ITB

We attempt to find the significance of the correlation between ITB and visually salient/neutral stimuli. We conducted a repeated measures linear mixed effects model with stimulus (red color, PZE, neutral) as the model predictor and ITB as the dependent variable. The main effect of the visually salient/neutral stimulus shows **no significant correlation with the following results: F(2,21.72)=0.49, p=0.61**. The mean ITB of red color is 2.42 (standard error: 0.12), the mean ITB of PZE is 2.51 (standard error: 0.08), and the mean ITB of neutral is 2.40 (standard error: 0.09) (figure 23).

Using category and visually salient/neutral stimulus as model predictors, the effect of the individual variables (visually salient/neutral stimulus, category) and the interaction between the variables (visually salient/neutral stimulus*category) on ITB show no correlation data, as there are too many variables and not enough observations.

Given the finding of H1 in which visually salient/neutral stimuli is found to not have a significant effect on arousal, we choose to also conduct this same analysis, however using only valence as an indicator of emotional response. By removing the arousal < 50 filter, we now have 70 observations. The main effect of the visually salient/neutral stimulus shows **no significant correlation with the following results: F(2,34.27)=0.83, p=0.44.** The mean ITB of red color is 2.34 (standard error: 0.05), the mean ITB of PZE is 2.42 (standard error: 0.06), and the mean ITB of neutral is 2.33 (standard error: 0.05) (figure 24).

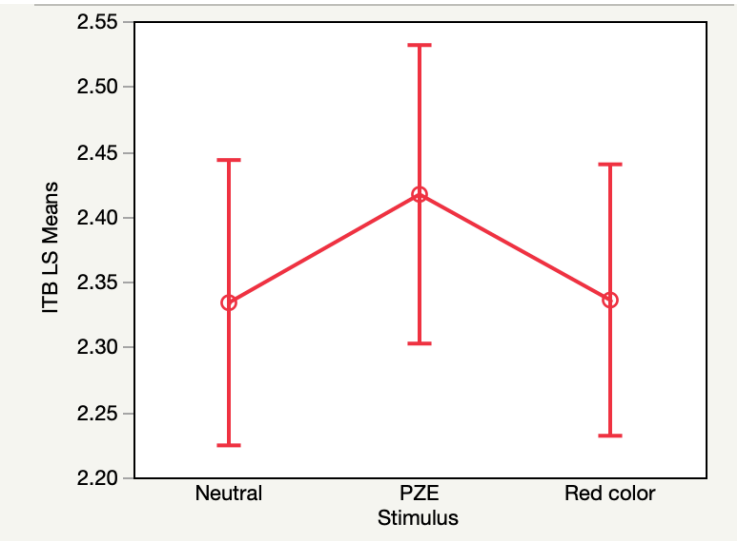


Figure 24: Effect of stimulus on unplanned (emotional) ITB (minus arousal)

Using category and visually salient/neutral stimulus as model predictors, the effect of the individual variables (visually salient/neutral stimulus, category) and the interaction between the variables (visually salient/neutral stimulus*category) on ITB show the following results:

Effect of stimulus on ITB: F(2,35.51)=3.33, p=0.047. The mean ITB of red color is 2.35 (standard error: 0.05), the mean ITB of PZE is 2.55 (standard error: 0.07), and the mean ITB of neutral is 2.39 (standard error: 0.08). This indicates that there is a product category for which impulsive purchases are significantly affected by visually salient/neutral stimuli. In order to find this information, we create an interaction plot with category as the overlay variable (figure 25). The relevant results to note from this figure are the means for the t-shirt category across visually salient/neutral stimuli. The mean ITB of t-shirt (red color) is 2.37 (standard error: 0.12), the mean ITB of t-shirt (PZE) is 3.0 (standard

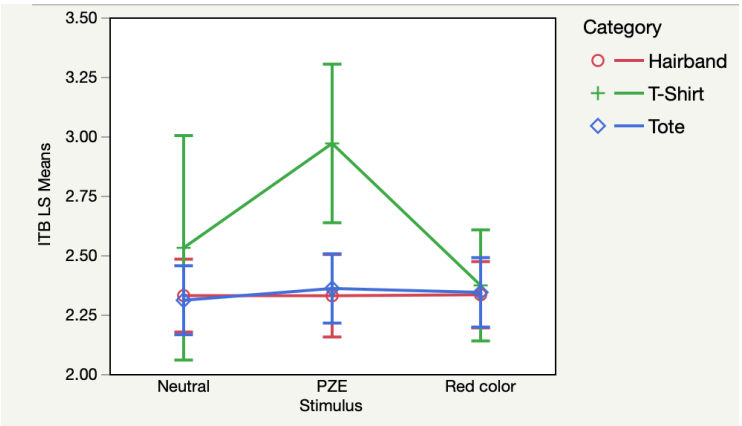


Figure 25: Effect of stimulus on unplanned (emotional) ITB with category overlay

error: 0.17), and the mean ITB of t-shirt (neutral) is 2.53 (standard error: 0.24). The implications of this interaction plot will be explored in Discussion, chapter *8.2 Analysis of Results*.

Effect of category on ITB: trend, F(2,27.74)=3.10, p=0.06

Effect of stimulus*category on ITB: no significance, F(4,40.55)=2.01, p=0.11

H4.2a) Reaction time will be faster for red color background than for product zoom element

H4.2b) Reaction time will be faster for product zoom element than for neutral

We attempt to find the significance of the correlation between reaction time and visually salient/neutral stimuli. We conducted a repeated measures linear mixed effects model with visually salient/neutral stimulus (red color, PZE, neutral) as the model predictor and reaction time as the dependent variable. When including arousal > 50, the analysis showed no p-value (likely due to too few observations), and on the basis of the chosen visually salient/neutral stimuli showing no significant effect on SR arousal, we exclude SR arousal as a filter condition, which leaves 70 observations. The main effect of the visually salient/neutral stimulus shows **no significant correlation with the following results: F(2,29.63)=1.13, p=0.34**. The mean reaction time of red color is 7362.19 (standard error: 559.17), the mean reaction time of PZE is 8199.50 (standard error: 619.26), and the mean reaction time of neutral is 8267.32 (standard error: 609.81) (figure 26).

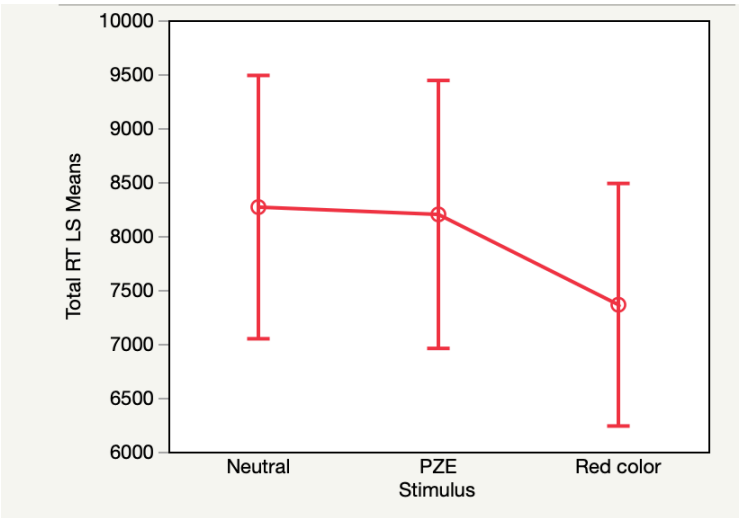


Figure 26: Effect of stimulus on impulsive purchasing

Using category and visually salient/neutral stimulus as model predictors, the effect of the individual variables (visually salient/neutral stimulus, category) and the interaction between the variables (visually salient/neutral stimulus*category) on ITB show no correlation data, as there are too many variables and not enough observations.

7.6 Results from Introductory Self-report

The following sub-chapter provides results concerning the introductory self-report. Although no hypotheses have been made that require the participants' introductory self-reported results, it is a topic that will be studied in terms of validity in Discussion, chapter *8.3.4.3 Validity*. The purpose of this sub-chapter is to test for participant compatibility in terms of the criteria set in place for the sample population. The data used for this section stems from the Experiment Design, chapter *6.6.1 Part 1: Introductory Self-report*, in which the participants complete a self-report regarding their personal information and shopping behavior. This sub-chapter is tested using data from every participant, meaning there are 41 observations.

Figure 27: Number of participants engaging in online shopping

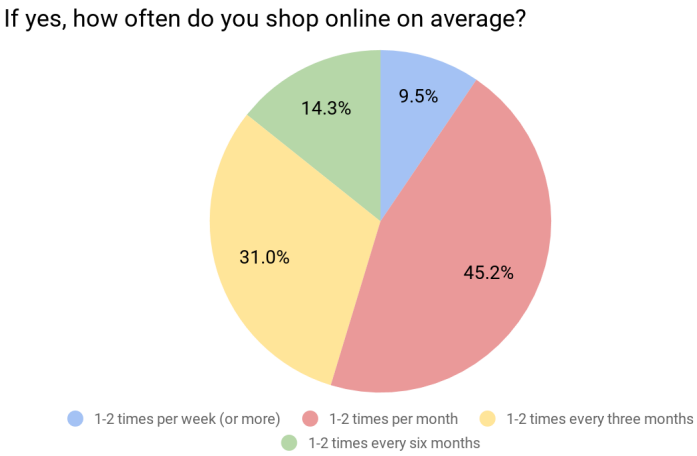


Figure 28: Average frequency of participants' online shopping experiences

The results show that 41 participants (100%) answered "yes" to the question "Do you shop online?" (figure 27). Furthermore, the introductory self-report provides the following results on how often each participant shops online (see figure 28):

- 9.5% shop 1-2 times per week (or more)
- 45.2% shop 1-2 times per month
- 31.0% shop 1-2 times every three months
- 14.3% shop 1-2 times every six months
- 0% shop 1-2 times per year (or less)

Lastly, the results show that 39 out of the 41 participants (95%) in this experiment shop for clothing online (figure 29).

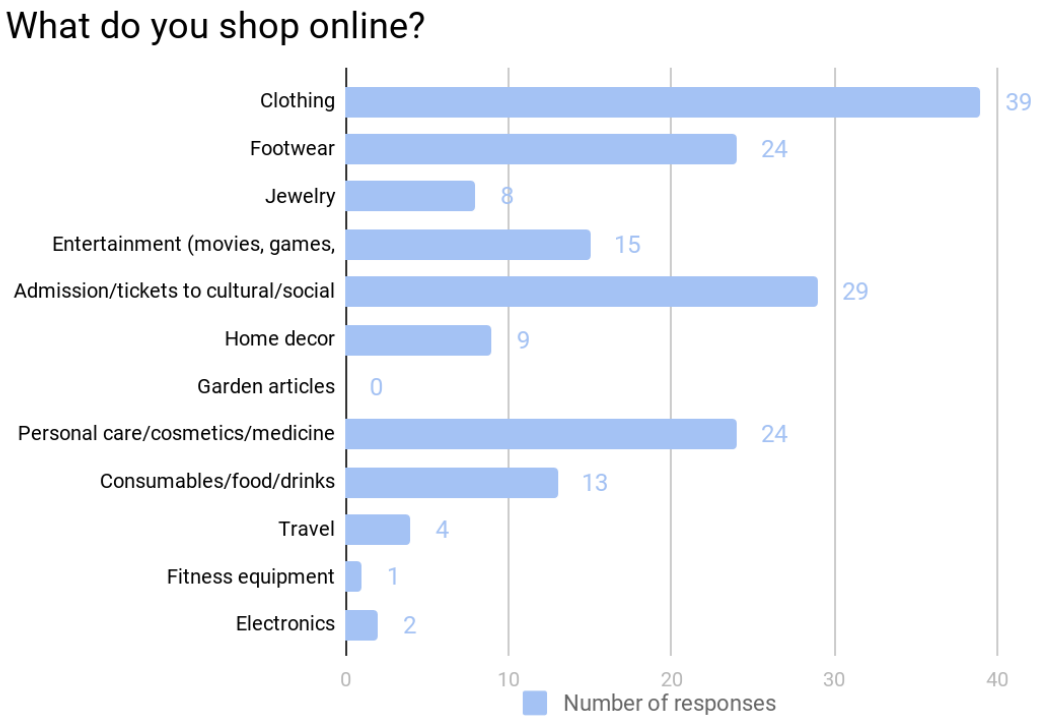


Figure 29: Product categories purchased most frequently online

7.7 Results from Self-Assessment Manikin

The following sub-chapter will reveal the mean SR arousal and SR valence of each visually salient/neutral stimulus (see table 6), and the implications of these results will be further studied in Discussion, chapter *8.3.1 Improvements on Emotional Dimensions: Arousal and Valence*. The source of this data is the self-report during the on-screen. There are 369 observations for each SR valence and SR arousal data points.

Stimulus	Mean SR valence	Mean SR arousal
Red color background	63.82	47.61
Product zoom element	62.99	47.95
Neutral	60.21	46.30

Table 6: Mean SR arousal and SR valence of each stimulus

7.8 Results from Barratt Impulsiveness Scale

Although no hypotheses have been made that require the participants' BIS results, the purpose of this test was to examine whether there is a correlation between a participants' general impulsivity and their tendency to purchase, i.e. whether this variable could affect the dependent variable ITB, rather than the intended independent variables (visually salient/neutral stimuli). The implications of these results will be further studied in Discussion, chapter *8.3.4.3 Validity.* The data used for this section stems from Experiment Design, chapter *6.6.3 Part 3: Self-report - Impulsiveness Assessment*, in which the participants complete a BIS-test. Each participant is given an impulsiveness score, which will be tested for correlation with their general ITB (369 observations) and ITB under impulse purchase conditions specified in Hypothesis Formulation, chapter *5.4 H4 - Unplanned (Emotional) and Impulsive Purchasing* (70 observations).

We conduct a repeated measures linear mixed effects model with BIS impulsivity score as the model predictor and ITB as the dependent variable. The main effect of the stimulus shows **no significant correlation with the following results: F(1,12.32)=1.13, p=0.31** (standard error=0.01). The mean BIS impulsiveness score is 63.33, the minimum score is 44, the maximum score is 94, and the mode score is 59. We conducted the same analysis applying the conditions for impulsive purchases, and find **no significant correlation with the following results: F(1,0.68)=0.04, p=0.88** (standard error=0.01).

8. Discussion

The following chapter will discuss the results from the previous chapter and any topics of interest that arose throughout the experiment process. This chapter is divided into three sections: (1) interpreting and discussing the implications of our findings, (2) critiquing our chosen methods and introducing alternative methods that may potentially have added value to our findings, and (3) further discussion of general topics that arose during our research.

8.1 Overview of Results

H1: Emotion	
H1.1a) *Self-reported valence level will be more positive for red color background than for product zoom element* ***H1.1b)*** *Self-reported valence level will be more positive for product zoom element than for neutral*	F(2,80)=2.88, **p=0.06** **Note:** trend consistent with hypothesis
H1.2a) *Self-reported arousal level will be higher for red color background than for product zoom element* ***H1.2b)*** *Self-reported arousal level will be higher for product zoom element than for neutral*	F(2,80)=0.39, **p=0.68**
H1.3a) *The amplitude of ER-SCR peaks will be higher for red color background than for product zoom element* ***H1.3b)*** *The amplitude of ER-SCR peaks will be higher for product zoom element than for neutral*	F(2,23.5)=0.50, **p=0.61**
H2: Visual attention	
H2a) *TTFF is shorter for red color background than for product zoom element* ***H2b)*** *TTFF is shorter for product zoom element than for neutral*	F(2,83.34)=1.43, **p=0.25**
H3: Product preference formation and purchase intention	
H3.1a) *TFD is longer for red color background than for product zoom element*	F(2,80)=8.88, **p=0.0003** **Note:** a significant correlation is found, but as an exploratory analysis, we hypothesized color would have longer TFD, when in fact the opposite is true.
H3.1b) *TFD is longer for product zoom element than for neutral*	F(2,80)=8.88, **p=0.0003**
H3.2a) *ITB is higher for red color background than for product zoom element* ***H3.2b)*** *ITB is higher for product zoom element than for neutral*	F(2,80)=11.62, **p=0.00004**
H4: Impulsive purchasing	
H4.1a) *ITB is higher for red color background than for product zoom element* ***H4.1b)*** *ITB is higher for product zoom element than for neutral*	F(2,21.72)=0.49, **p=0.61**
H4.2a) *Reaction time will be faster for red color background than for product zoom element* ***H4.2b)*** *Reaction time will be faster for product zoom element than for neutral*	F(2,80.17)=0.84, **p=0.44**

Table 7: Overview of results

8.2 Analysis of Results

The hypotheses will be restated in their respective categories (H1 Emotion, H2 Visual attention, H3 Product Preference Formation and Purchase Intention, and H4 Unplanned (Emotional) and Impulsive Purchasing), as well as whether the results support or reject the individual hypotheses. After each hypothesis category, we will interpret and elaborate on the results.

8.2.1 H1 - Emotion

H1.1a) Self-reported valence level will be more positive for red color background than for product zoom element
H1.1b) Self-reported valence level will be more positive for product zoom element than for neutral

On the basis of the p-value (p=0.06), we reject hypothesis H1.1a and H1.1b, as the correlation is not equal to or less than 0.05. However, there is a suggestive trend that is approaching conventional statistical significance and is also consistent with our hypotheses and information gathered from previous literature. This trend shows that there is the highest level of SR valence associated with the product images shown on a red background, the second highest level of SR valence associated with the product images using a product presentation (zoom) feature, and least level of SR valence associated with the plain product images on a neutral white background. Therefore, this hypothesis would be a topic to research again with the expectation that it may give more significant results with more observations or a different sample of the specified population.

Interestingly, the interaction between category*visually salient/neutral stimulus showed a significant correlation (p=0.02), which means that within some categories, certain visually salient/neutral stimuli have had an effect on SR valence. The results show that hairbands and t-shirts result in the highest SR valence when shown on a red background, whereas tote bags result in the highest SR valence when shown with the inserted PZE. Furthermore, the results show that, surprisingly, tote bags result in the lowest SR valence when shown on a red background.

To conclude from these findings, as pertains to valence levels, these results indicates that there is not one universal visually salient stimuli that yield positive valence levels across all product categories. Various visually salient stimuli have different effects across different product categories. This could be because consumers purchase from different categories depending on their current states of mind,

motivations, or action goals. Therefore, the visually salient stimuli has to complement these goals (Bargh, 2002).

H1.2a) Self-reported arousal level will be higher for red color background than for product zoom element
H1.2b) Self-reported arousal level will be higher for product zoom element than for neutral

On the basis of the p-value (p=0.68), we reject hypothesis H1.2a and H1.2b, as there is no correlation, i.e. none of the visually salient/neutral stimuli were effective in eliciting perceived arousal. According to the literature review, several previous studies have found that color has a strong physiological effect, and colors of longer wavelengths such as red leads to high activity/arousal levels (Buechner & Maier, 2016). This experiment aimed to examine the effect of red color in a context where the participant did not directly focus on the red color but was merely supposed to potentially be affected by it. However, previous studies have designed their experiments in a fashion in which the red color is a clear focus for the participant, and (for some studies) known as the primary focus by the participant (Gerard, 1958; Valdez & Mehrabian, 1994). Therefore, while previous studies have concluded clear effects of red color on their participants, it might not have as strong an effect on arousal in this context because of its intended subtleties. Other scholars who have tested the effect of red colors in the context of online shopping have found correlations between the color red and SR arousal, such as Cheng et al. (2009). However, they test red in comparison to blue with slow or fast background music (2 x 2) and find that red is comparatively more arousing than blue, especially when combined with fast background music. This fitting with previous literature stating red causes higher arousal levels. However, as they did not specify which red they used (hue, saturation, brightness) or how prominent it was in their design, it is difficult to compare their results to ours.

PZE was also not significantly correlated with SR arousal. Similar to color, the effect of the visually salient stimulus might not have been strong enough to create a perceived arousing sensation. While other studies mention the increased use of different graphical elements, displays, interactivities, zoom or spin features in online stores (Chan et al., 2017; Moser et al., 2019), our study did not find that this specific product image manipulation was successful in eliciting higher SR arousal than the neutral stimulus. These results correspond to Liao et al.'s (2016), findings on product presentation features, in which they also found that virtual product experiences did not elicit arousal within participants,

despite successfully leading to higher pleasantness. The literature on this type of visually salient stimulus was scarce and mostly concerned non-static, interactive features (Moser et al., 2019). Due to constraints in software, using the devised static feature on the product image was the most plausible option; however, we discuss alternatives and improvements that can potentially be used for further research in chapter *8.3.2 Influence of Salient Stimuli Choices on the Experiment*. Nonetheless, it is important to mention that hypotheses H1.2a and H1.2b are based on self-reports. Therefore, it is possible that the participants did experience subtle rises in arousal without consciously noticing and consequently were not able to reflect it in their self-reports.

H1.3a) The amplitude of ER-SCR peaks will be higher for red color background than for product zoom element
H1.3b) The amplitude of ER-SCR peaks will be higher for product zoom element than for neutral

On the basis of the p-value (p=0.61), we reject hypothesis H1.3a and H1.3b, as there is no correlation. Since SR arousal assessment and ER-SCR peak amplitude are effectively attempting to measure arousal, most of the discussion points mentioned for H1.2a and H1.2b are applicable to these two hypotheses. In addition, because ER-SCR peaks turned out to be extremely subjective, i.e. the extent to which test subjects react to stimuli varies from person to person (Ben-Shakhar, 1985), the results could not be generalized to a larger population. SCR responses are highly individual and therefore, each participant must always be compared to their own personal baseline (Cacioppo & Petty, 1983; Ben-Shakhar, 1985). Nevertheless, peaks during the stimulating baseline video were also scarce, hereby making the comparison analysis infeasible. GSR as a data collection method in general will be discussed further below (chapter *8.3.1 Improvements on Emotional Dimensions: Arousal and Valence*).

8.2.2 H2 - Visual Attention

H2a) TTFF is shorter for red color background than for product zoom element
H2b) TTFF is shorter for product zoom element than for neutral

On the basis of the p-value (p=0.25), we reject hypothesis H2a and H2b, as there is no correlation. We postulated that red color would be the most effective in capturing the first fixation, as it is one of the most visible colors registered by the retina (Morton, n.d.), and is therefore the most effective in

gaining visual attention (Gelasca et al., 2005; Kuneicki et al., 2015). Furthermore, the visually salient stimulus PZE was also hypothesized to be more effective in gaining attention than the neutral stimulus, however, this was an exploratory hypothesis, as previous research was scarce. A plausible explanation for the results showing statistically insignificant values could be the design of the experiment. Due to the incorporation of GSR as a data collection method, the experiment was designed to have one visually salient/neutral stimulus per slide across the three different product categories. In doing so, it was made possible to determine which visually salient/neutral stimulus was the cause of any occurring ER-SCR peaks (which only occur 1-5 seconds after a stimulus has been seen). However, this may also have resulted in an inability to compare TTFF across the visually salient/neutral stimuli. Nevertheless, TTFF was still chosen as a measure due to the extensive amount of previous literature stating that red color has a significant effect on visual attention i.e. first fixation. TTFF was also chosen as a means of comparing the effectiveness of the visually salient stimuli. In an online shopping context with large amounts of competing product images it is vital to consider the ability to capture visual attention. The exploratory hypothesis 2b aimed at understanding how the PZE compared to red color in attracting attention. As previously mentioned, visually salient stimuli can capture overt visual attention and result in greater processing, hereby influencing the decision to purchase. However, as the results show no significant correlation, a conclusion regarding the effect of visually salient stimuli on TTFF cannot be drawn.

An alternative method of testing TTFF with the chosen stimuli would have been to show all three visually salient/neutral stimulus on one slide (or combinations of two of the three chosen stimuli) and measure the significance of any differences in first fixation, as they would have been directly competing for first fixation. However, this would not allow for the combination of TTFF and measuring ER-SCR peak amplitudes. Foregoing the use of measuring ER-SCR peak amplitudes and conducting this alternative experiment design may potentially have provided us with more useful TTFF data, and thereby results for our hypotheses H2a and H2b. The compatibility of measuring ER-SCR and TTFF is therefore not necessarily conducive to this type of experiment.

8.2.3 H3 - Product Preference Formation and Purchase Intention

These four hypotheses will be discussed together, since TFD and ITB are conceptually strongly related. The literature review found that the longer a participant looks at an object, the stronger the

possibility that s/he prefers this object and consequently will have a higher ITB, however, as seen from the results, this was not the case in our experiment.

H3.1a) TFD is longer for red color background than for product zoom element
H3.1b) TFD is longer for product zoom element than for neutral
H3.2a) ITB is higher for red color background than for product zoom element
H3.2b) ITB is higher for product zoom element than for neutral

Based on the p-value for H3.1a and H3.1b (p=0.0003), there is a significance between all the visually salient/neutral stimuli and TFD, however, contrary to our hypotheses, PZE was on average fixated on the longest, followed by red color, then neutral stimulus, therefore despite significant correlation between variables, we reject H3.1a and H3.1b.

Based on the p-value for H3.2a and H3.2b (p=0.00004), there is a significance between all the visually salient/neutral stimuli and TFD and consistent with our hypotheses. Red color had the highest ITB on average, followed by PZE, then neutral stimulus. Therefore, on the basis of the p-value (p=0.00004), we accept H3.2a and H3.2b.

While there is some literature that investigates color and TFD, it is not applicable to this experiment since the research goal and context is different. As mentioned earlier, the task instructions have a notable effect on the participant's eye movements and patterns (DeAngelus & Pelz, 2009), and therefore the research aim will prompt an experiment design in which TFD is likely affected. As an example, Lee et al. (2005) examined the effect of one's favorite color on TFD and instructed participants to rank items. They found that participants fixated longer on the images containing their favorite color. Therefore, our hypothesis was based on a broader scope of literature examining color in general, such as warm vs. cold colors, the effect of red on emotion (arousal), and the relationship between product preference/choice and TFD (van der Laan et al., 2014; Reingold, 2009).

There was no literature specifically stating the effects of color or product presentation feature on TFD in an online (impulse) shopping context. However, some literature discussed the effect of red color on emotion, therefore, it was hypothesized that given the pleasant emotions, color would be most preferred and consequently fixated on the longest (i.e. highest TFD). With this in mind, H1.2a and

H1.2a are explanatory hypotheses. Due to the lack of literature on the correlation between PZE and product preference formation, emotion, or TFD, H3.1b and H3.2b were exploratory, assuming the same line of argument as color.

Due to extensive literature supporting the relationship between TFD and preference formation, we assumed that TFD and ITB would correlate, wherein the stimulus with the longest TFD would also result in the highest ITB. However, this is in contrast to our results in which the visually salient stimulus that correlated to a significantly higher TFD is not the same one that correlated to a significantly higher ITB. The participants form a significantly stronger product preference to PZE; however, they generally choose to purchase products with a significantly higher intention when shown on a red background. Therefore, it raises the question of whether TFD is an accurate indicator of product preference formation and thereby purchase intention (in the case of this particular study). Images with a PZE were looked at the longest (2842.85 ms), however, the mean purchase intention of said stimulus is under 2, which effectively puts it into the 'not purchased' category (to refresh, the scale of intent-to-buy ranges from "would definitely not buy" (=1) to "would definitely buy" (=3)).

There are several potential reasons as to why product images with PZE had longer TFD. Firstly, it can be discussed that the images with a PZE have a longer TFD, not because they are forming a stronger product preference, but because there are more components to look at, thus increasing their TFD (Bylinskii et al., 2017). The AOI for PZE was not divided between the actual product and the zoom feature insert. To make the analysis consistent across all product images and across all visually salient/neutral stimuli, only one AOI was made for each product image, as seen below in figure 30 (pictures A and B). Images with PZE might have been fixated on longer since participants needed to examine both the product and the zoom feature insert of the details on the product, resulting in a longer TFD. An alternative method of analyzing the data for this visually salient stimulus more effectively would have been to divide the product image into two separate AOIs, as seen in figure 30 (picture C), and analyzing how participants' eye movements were influenced by the added zoom feature e.g. as revisits.

Figure 30: Areas of interest

Given the low mean ITB for PZE (=1.98, meaning no purchase), shows that there is a definite lower purchase intention in general for products with a PZE vs. red color background. This indicates that, despite looking at this stimulus longer, this did not correspond with a higher purchase intention. This challenges a foundational assumption stating that longer fixations translate to higher purchase intention, an assumption made with information gained from previous literature on this topic. Another possibility for the reason behind images with a PZE resulting in longer TFD could be that the visual presentation served as a source of confusion for the participants during the information-processing of the photo, and therefore the fixation duration was longer (Salminen et al., 2018). This is something that could have been established with different AOI allocations (figure 31), and if this experiment was to be repeated, it would be beneficial to assign the zoom insert its own AOI, hereby making it possible to measure number of revisits on the zoom detail to the product image. Having a high number of revisits would be an indicator of confusion (Farnsworth, 2018), and the number of revisits could subsequently be used to support whether the longer TFD on PZE is due to confusion or in fact preference formation.

Another interpretation of the obtained results in which PZE leads to higher TFD but lower ITB could be as follows: the participants' fixation duration is higher on PZE because there is more information to process (higher amount of detail). Hence, the amount of cognitive workload required is slightly higher (Marquart et al., 2015) than e.g. a plain product on a red or white (neutral) background. This may cause them to reflect more upon the purchase situation (e.g. whether the product is worth the

perceived value, whether it suits the consumer's personal style) rather than simply whether they like it, want it, and therefore will purchase it without further reflection (i.e. impulsively). During the hypothesizing and design phases of this study, we presumed the zoom was so simple that it could not cause a significant increase in cognitive workload. However, since results show TFD resulted in longer fixation durations on products with this visually salient stimulus without increasing their ITB, the amount of cognitive load could potentially be a factor. Therefore, if this is the case, one possible conclusion is that using a static PZE on product images is not conducive to impulsive purchasing.

An interesting point to note is that webshops use these tactics in practice already (Moser et al., 2019), and therefore we presumed there must be a reason behind its widespread application. However, our literature review revealed that not many studies had investigated the effectiveness of this type of visually salient stimuli on online (impulsive) shopping behavior. The implications of this will be discussed in chapter *8.3.2 Influence of Salient Stimuli Choices on the Experiment*.

8.2.4 H4 - Impulsive purchasing

H4.1a) ITB is higher for red color background than for product zoom element
H4.1b) ITB is higher for product zoom element than for neutral

On the basis of the p-value (p=0.61), we reject hypotheses H4.1a and H4.1b. Recall that for H4.1a and H4.1b, data was filtered to examine only unplanned (emotional) purchases (ITB < 2 and PPI > 2 was filtered out). Since H4.1a and H4.1b are rejected, it means that a significant correlation between ITB and visually salient/neutral stimuli was not found, thus a red background and PZE was not successful in encouraging unplanned (emotional) purchases. It is relevant to note that H4.1a and H4.1b is built on assumptions and presumed results based on earlier hypotheses, e.g. that the chosen visually salient stimuli produce a positive SR valence and high SR arousal within the participants during their preference formation and decision-making process. However, the results of H1.2a and H1.2b show that the chosen salient stimuli did not, in fact, cause a significant increase in SR arousal, therefore, in the context of this study, it can be argued that including arousal in the criteria for evaluating later hypotheses may negatively (and inaccurately) influence interpretation of results. We therefore found that it would be interesting to conduct a similar analysis of the chosen visually salient stimuli's effect on impulsive purchases without taking SR arousal into consideration (meaning that positive SR valence would be the sole indicator of emotion). In doing so, the p-value shifted from

0.61 to 0.44, and while this is a movement in a positive direction, there is still not a significant correlation between visually salient/neutral stimuli and ITB. Therefore, while previous literature indicates that the chosen visually salient/neutral stimuli should have an effect on the factors influencing unplanned (emotional) purchases (Aragoncillo & Orús, 2018), this is not supported by the experiment conducted for this paper.

Interestingly, when including category as a model predictor, however, the results show a significance of visually salient/neutral stimuli on ITB (p=0.047) and a trend approaching significance of category on ITB (p=0.06), indicating that for different categories the visually salient/neutral stimuli have different effects. The most noteworthy effect is how visually salient/neutral stimuli affect the ITB within the t-shirt category. The mean ITB for t-shirts with red color stimulus applied proved the lowest at 2.37, middle for the neutral stimulus at 2.53, and highest for PZE at 3.0. Thus, when looking at t-shirts, the PZE was successful in eliciting a significantly stronger unplanned (emotional) ITB. The notable difference when including category as a model predictor indicates that some products fare better with particular visually salient stimuli, and this should be taken into consideration when designing product images online. The managerial implications and potential further research of this finding will be discussed in chapter *8.5 Managerial Implications*.

H4.2a) Reaction time will be faster for red color background than for product zoom element
H4.2b) Reaction time will be faster for product zoom element than for neutral

On the basis of the p-value (p=0.34), we reject hypotheses H4.2a and H4.2b. This hypothesis included the last element of impulsive purchasing, namely reaction time. Reaction time is one of the factors determining an impulsive purchase, as impulsive behavior is driven by an urge which compels consumers to act with a sense of immediacy (Frijda et al., 2014; Wallace et al., 1991; Whiteside & Lynam, 2002 in Farmer & Golden, 2009). However, despite arousal also being a factor in impulsive purchases, it was excluded in the filtering process since H1.2a and H1.2b showed there was no correlation between SR arousal and the chosen visually salient/neutral stimuli. It can be discussed that the lack of SR arousal might partly explain why reaction time also has not proven significant. The sense of urgency behind an impulsive action is in part caused by high arousal levels (Groeppel-Klein, 2005), therefore since the participants were not experiencing high perceived arousal levels,

they did not experience an urge to act immediately as a result of being exposed to the chosen visually salient stimuli.

In conclusion, the results from our experiment show that the chosen visually salient stimuli did have a significant impact on preference formation (TFD), purchase intention (ITB), and the unplanned (emotional) purchase of t-shirts. There was also a positive trend approaching statistical significance on valence. These results can contribute to the existing literature for future studies in online impulsive shopping behavior. Regarding the hypotheses that were not accepted, our results can also provide insights into these topics. The results suggest the current knowledge regarding impulsive purchasing can be improved, and this study challenges the relationships between the effectiveness of variables and impulsive shopping behavior that are currently thought to exist. Even so, knowledge on this particular topic, including these types of visually salient/neutral stimuli remains scarce, hence the exploratory hypotheses. Additionally, while only H2b, H3.1a and H3.2b hypotheses were characterized as exploratory, we have mentioned the gap in literature regarding PZE throughout the research process, which is why this study attempted to contribute to lessening the knowledge gap on this particular visually salient stimulus.

8.3 Alternative Experiment Design & Self-critique

The following section highlights limitations of the experiment design partly based on findings discussed in the previous section. It subsequently provides alternative experiment considerations, which could have improved the study.

8.3.1 Improvements on Emotional Dimensions: Arousal and Valence

To measure the emotional impact of the visually salient/neutral stimuli the arousal-valence model was applied due to its ease of use and universal acceptance as an emotional assessment model. Two methods were implemented to measure arousal, namely GSR and self-reports through the use of the SAM framework, which was also used to measure valence. While the SAM is an advantageous tool

due to its non-verbal pictorial qualities, some participants explained their confusion of how to understand the model despite having received an explanation and a practice run. Simply providing them with the actual arousal-valence model and instructing participants to place themselves within one of the quadrants might have been a simpler task (see figure 31).

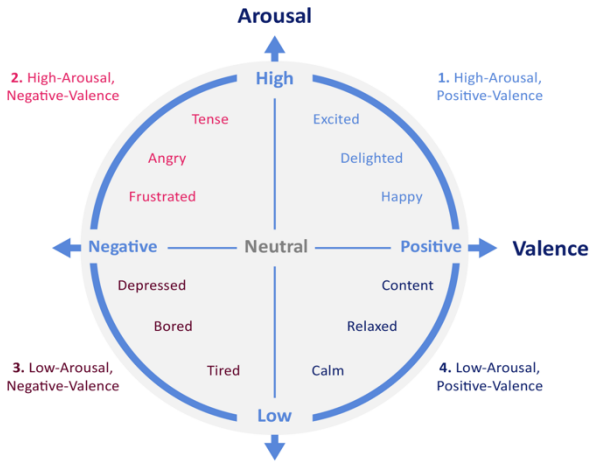


Figure 31: Arousal-valence model

Furthermore, as mentioned in the literature review, traditional methods such as self-reports are only able to collect consciously deliberated information from participants, whose perceptions of even their own reactions might be distorted for previously explained reasons (e.g. we are not always able to determine the catalyst of our emotions, therefore we sometimes wrongly reason/justify them). The visually salient/neutral stimuli used in this experiment were designed to only subtly affect the participants emotionally, therefore, as seen in the results from the self-reports, the range of emotional responses are understandably small (as depicted in Results, chapter *7.7 Results from Self-Assessment Manikin*). Either the participants truly did not experience a change in arousal or valence, or the changes could not be effectively detected due to the challenges of using self-reports. The solution to this was including GSR, which theoretically can detect the potential subtle changes in arousal when exposed to visually salient/neutral stimuli, however, due to too few data points collected through the measure, it unfortunately did not yield useful results. Two potential reasons have already been mentioned 1) visually salient stimuli were simply not stimulating enough, 2) GSR data depends highly on subjective responses which can vary significantly, and some might require very strong visually salient stimuli to produce even a small peak (Cacioppo & Petty, 1983; Ben-Shakhar, 1985). Concerning the first reason, as mentioned in chapter *6. Experiment Design*, the visually salient/neutral stimuli were intended to be visually salient yet subtly arousing to suit an online website and context. It would not have been feasible to test the effect of more extreme visually salient stimuli, as this would not lead to relevant managerial implications for an online website. Since it was expected that the GSR would be able to detect small changes in arousal levels, the relatively subtle visually salient stimuli were assumed to evoke notable reactions.

Regarding the second potential reason for inadequate results, attempts to expose participants to arousing stimuli were made with the baseline video. However, the range of number of peaks was between 0-14. The baseline video was designed to be highly stimulating and included faces (both positive and negative facial expressions), direct eye contact, vivid colors, music, movements and rapid jump cuts (Pönkänen et al., 2012). Regardless, 37% of the participants did not peak at all throughout the 70-second-long video, and 26% only peaked 1-4 times. This could indicate the difficulty in stimulating sweat secretion. There are also other factors which need to be taken into consideration when using GSR. The lab setting might bias participant responses (Stewart & Furse, 1982), and electrode placement is crucial for generating data (GSR Pocket Guide, 2016). Therefore, it is advised to repeat the experiment with participants several times, however, this was not possible. Although, before beginning each trial it was always ensured there was 100% connectivity with the GSR equipment.

Other options could have been to use pupillometry to measure arousal and valence, or electroencephalography (EEG) to measure valence. The reason for not choosing pupillometry was the difficulties involved when using this measure. Winn et al., (2018) argue that experimenters must be careful when adding measures of pupillometry, and only apply the measure when able to carefully plan an experiment setup. This is due to a wide range of potential experiences and external stimuli that can affect the pupil dilation and measurement and contribute with noise. Using pupillometry to measure valence has also been critiqued. While it can indicate levels of valence, changes in individual's pupil sizes can also result from other physiological processes such as arousal, attention, memory, or information processing (Wang & Minor, 2008).

With regards to the use of EEG, it was initially considered as a potential measure. It can measure whether activity occurs in the left or right frontal hemisphere, in which the left correlates with positive feelings and approach motivation, and the right frontal hemisphere correlates with negative feelings and avoidance motivation (iMotions, 2017). However, while EEG is widely used due to its relative inexpensiveness, financial constraints still limited the possible use of an EEG for this experiment. Furthermore, precise electrode placement is crucial as results can differ depending on the placement (Wang & Minor, 2008), which requires a certain level of expertise in order to ensure valid results. EEG can also be affected by external noise or even eye movements and blinks (Beres, 2017), thus the participant must be aware to keep completely still, adding discomfort to the already quite unnatural setting. The most mentioned drawback of EEG is the poor spatial resolution, as it is not able to

pinpoint the exact source of activity (Celikkanat et al., 2017); however, for this study, only information of which frontal hemisphere is activated was relevant.

Another explanation for the lack of emotional responses could also have been the product choices. The product categories hairband, tote bag, and t-shirts were chosen based on findings from the literature review. It stated that low-involvement products pose low risks and therefore do not encourage analytical thought-processes of whether to buy the product (Drossos et al., 2014). We also found that the most purchased product categories under impulses were within the clothing and jewelry categories (FDIH, 2016). Furthermore, the target group was aged between 18 and 35 years old, since this age group was found to carry out the most impulsive shopping online (Attest, 2015). For all the included age groups to realistically imagine buying the chosen products on impulse, the product categories could not include high-involvement items or unobtainable items (for some of the targets) such as an expensive watch, despite its potentially higher emotional effect. To improve the study, more product categories could have been included to increase the possibility that participants would find the products emotionally stimulating. This will be discussed further in the following section. A research gap on specific product categories purchased on impulse remains, therefore, to improve the study and contribute to lessening the gap, future studies could examine which products are more suitable for impulsive purchases.

8.3.2 Influence of Personal Preference Bias on the Experiment Results

A concept that was not controlled for in our experiment was each individual participants' personal preference (specifically in terms of product categories). Given the time constraints of the study, this was a decision made for pragmatic reasons. Several measures to control personal product preferences were considered and would have been designed and implemented as follows. Firstly, and most realistically, the experiment could have included more product types with the same chosen visually salient/neutral stimuli. It is possible that a participant, for example, did not like one of the shown product categories and therefore, the visually salient/neutral stimuli would not have an effect on their ITB. As previously mentioned in Research Design, chapter *2.6 Ethical Considerations*, the stimuli are not going to or even meant to change fundamental opinions within a consumer. In other words, if a participant does not like hairbands in general, their ITB would remain under 2 (effectively meaning no purchase) regardless of when they see it in a neutral setting or a visually salient setting. This would in turn affect the results testing the effectiveness of the stimuli on impulsive purchases.

Having more product categories (that are conventionally well-liked) in the experiment could have potentially diluted this product preference bias. It is important to note, however, that the more conventionally well-liked or common the product category, the more likely it is that the participant feels they have had a previous purchase intention, and it is thence not considered an impulsive purchase in terms of our definition. This was the case in our results regarding t-shirts. Therefore, it is important to find a balance between a well-liked but uncommon product category, which was what was attempted in the experiment by choosing hairbands and tote bags.

It is also important to note that the more product categories a participant is exposed to, the longer each test will take. When being exposed to three product categories, each participant spent 20 minutes being tested on average. It may be plausible to add between one and three more product categories before reaching the threshold of respondent fatigue, which occurs if a survey takes a long time to complete or is repetitive (Lavrakas, 2008). When participants are required to conduct the same task again and again, as is the case in the experiment design used in this paper, it can become taxing and exhausting as they will be forced to make many decisions in a short amount of time.

Another alternative experiment design that could combat the product preference bias would be to prepare several experiment set-ups within many product categories. With this design, each participant would partake in a pre-test measuring which products they tend to like or prefer, after which a personalized combination of experiments will test them using their preferred product categories across all chosen visually salient/neutral stimuli. However, as with choosing additional well-liked product categories, this also poses the risk of the previous purchase intention being unideal for impulsive purchases. If they only view products they particularly like, there is a strong probability they have considered buying from that product category recently. Thus, according to this paper's definition of impulsive purchases, it would leave few purchases as impulsive. Another threat to this method would be the difficulties of comparing participant responses, as they would not be tested using identical variables.

Another solution could have led participants through the same tests, and in the end when asked about PPI, they could also have been asked about their own personal preferences in relation to the product categories shown. If some participants showed strong dislike of certain product categories, their responses to these would be filtered out during data cleansing and analysis. This would also have

solved the issue of strong personal aversion to certain product categories affecting results (Bargh, 2002). For instance, several participants expressed that despite liking the design and styles of hairbands, they would never consider purchasing them because it is a particular product which they do not believe suits them. If certain participants had a strong aversion against certain product categories, then since it was not controlled for, it might have clouded the results of the effectiveness of the visually salient stimuli.

8.3.2 Influence of Salient Stimuli Choices on the Experiment

As the literature review revealed, there are many visually salient stimuli being used by online stores to influence shopping behavior online, such as photo interactivity and movement, backgrounds (e.g. consisting of patterns), other graphical additions (e.g. icons), or claims of high customer demand (Chang et al., 2017). With this vast list to choose from, there are many opportunities to repeat the experiment testing different visually salient stimuli across the chosen product categories. An example of a visually salient stimuli that was considered for this experiment, but was excluded, was *herd mentality*. The idea behind including this as a visually salient stimulus was that literature revealed that seeing several models wearing/using a product in a positive environment would induce a positive emotional response in consumers (or in our case participants) (Gwee & Chang, 2014). This would also serve as an inspiration of how a product can be used/worn, which has been tested as a trigger for online impulsive purchasing behavior (Dawson & Kim, 2010). Given this specific experiment design in which all product images with visually salient stimuli are created by manipulating product images from real webshops, locating photos that could portray herd mentality proved to be difficult, as (1) more than one model in the photo had to be wearing the exact sold product, and (2) each product category required three product photos to be shown on each slide. In other words, nine different photos of models wearing one type of hairband would need to be found (as each product category is also shown three times (one time per visually salient/neutral stimuli).

In terms of the visually salient stimuli that were selected for this experiment, there are changes and enhancements that could be implemented. The red color background was chosen for several reasons. As found in previous literature, red is registered quickly when looked at; however, yellow is the one color that is registered before red (Morton, n.d.). Therefore, it would be interesting to repeat the experiment testing yellow vs. red as a visually salient stimulus. Furthermore, as is true of red, yellow is also proved to spark emotional arousal (Valdez & Mehrabian, 1994). While yellow is indeed

registered first, red was chosen for reasons extending past this, namely the impact of the sense of action it instills in the viewer (Gerard, 1958).

The other chosen visually salient stimulus, PZE, was selected as a static element. As interactivity is stated as being influential in impulse purchasing behavior (Moser et al., 2019), it would be interesting to test other types of product presentation features that allow for more movement, such as 360 degree spin or zoom features that appear when the cursor is hovering over that specific part of a product. For this experiment, a static element was chosen rather than a moving interactive element due to restrictions set in place by the iMotions software as well as time constraints.

8.3.3 Final Considerations for Experiment Design

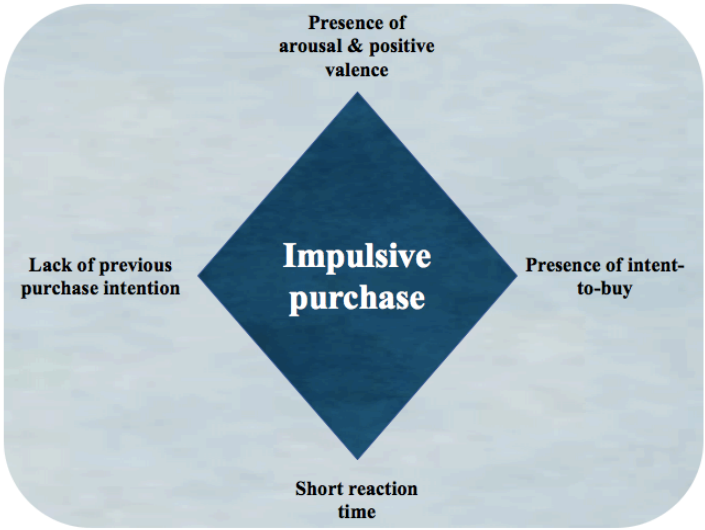
Lastly, there are some final considerations on alternative solutions which are noteworthy to mention. Firstly, the participants did not actually have to purchase the products themselves. While many other studies incorporate intent-to-buy (Boshoff, 2017; Clement, 2013; Kemp & Kopp, 2011; Milosavljevic & Cerf, 2008), and it is an accepted replacement for a purchase, it is still not an actual purchase and, therefore, some participants might have been more indulgent when rating their own ITB. Consequently, the possibility of rewarding them with compensation (e.g. DKK 100) they could use to make an actual purchase during the experiment was discussed, as this would simulate an actual purchase and potentially increase the participant's feeling of ownership over a product - an important factor in e.g. PZE. However, this would lead to more challenges than benefits, as participants' "purchases" would have to be manually placed by the researchers post-experiment. Furthermore, the participants had 27 products to choose from, increasing the extensive work behind the mere attempt to simulate a real purchase vs. using intention as a replacement measure.

Another potential solution was to use a real website either from a company or one created specifically for this experiment. However, using another company's website was not possible since the visually salient/neutral stimuli applied and product images could not be controlled by the researchers. If creating a new website specifically for this experiment the participants would not have gone through the exact same experience, rendering the individual tests incomparable. Another issue of applying real interactive websites would be a matter of willingness to make several purchases. If they had received DKK 100, participants would most likely not have made more than one purchase. This means out of all the possible product images manipulated with visually salient/neutral stimuli,

participants would compare all the products with each other, with the goal of only making one purchase. Contrarily, in the current study participants were forced to make nine decisions in which only three product images were compared to each other per slide, making it easier to theoretically compare the effect of visually salient/neutral stimuli.

Finally, the definition of impulsive purchasing might have been too strict with regards to PPI. Recall the four necessary components for a purchase to have been defined as impulsive:

1. *High levels of arousal and positive valence*
2. *Strong purchase intent*
3. *No recent previous purchase intent*
4. *Relatively quick reaction time (urge)*



Components 1, 2, and 4 are still considered necessary elements for a purchase being considered impulsive. Arousal is an important component in supplying the energy and urge to act (Groeppel-Klein, 2005), and combined with positive valence this places the consumer in the first quadrant of the arousal-valence model, meaning they feel excited which is the state of mind where most consumers buy impulsively (1 - *emotion*) (Saleh, 2017). Without a purchase there is naturally no occurrence of an impulse purchase (2 - *purchase intent*), and the result of high arousal levels leads to the strong urge of purchasing the product which usually happens relatively quickly after the urge is experienced (4 - *reaction time*). However, *previous purchase intention* (3), might not necessarily be a prerequisite for a purchase being considered as an impulsive purchase. Previous purchase intention is a factor for a purchase adhering to a *pure* impulse buy (Stern, 1962; Chan et al., 2017), however, whether it is actually a prerequisite for the majority of impulse purchases could be challenged. This might especially be true for low-involvement products, which includes items more frequently purchased, such as t-shirts. Due to this definition of impulsive purchasing, several of the t-shirt ITBs could not be defined as impulsive purchases because participants had thought of buying t-shirts within the past 30 days. However, replacing previous purchase intention with "on-the-spot" decisions (Piron, 1991) would have defined these purchases as impulsive, and could have had different effects on results.

8.3.4 Evaluation of Research Quality

This sub-chapter will discuss the reliability and validity of the chosen research methods. The research methods eye-tracking, GSR, and self-report assessments were able to provide some noteworthy insights into the topic of online impulsive shopping behavior.

8.3.4.1 Quality of Sources

In order to ensure reliability and validity of the resources used as the foundation of this experiment, it was important that peer-reviewed sources made up the majority of the sources used. Peer-reviewed articles tend to be of a higher standard of accuracy and quality due to the scrutiny received by other experts if information, research design, or results are found to be inaccurate or unlikely (Kelly et al., 2014). To ensure the highest quality of literature of which this paper is based on, the majority of sources used in this study are peer-reviewed. To obtain the newest data however, non-peer-reviewed sources were also utilized, however they were evaluated critically and thereafter deemed reliable, therefore we believe the experiment is still based on reliable background literature. Another important factor that was considered when choosing sources was the currency of the information, especially in the areas of research that develop quickly, to ensure outdated information is not used as the foundation for new experiments (Harvard University, n.d.). The currency threshold of the literature depends on which topic it is providing information on. It is presumed that psychological and biological functions, e.g. how humans register color and react in terms of arousal, are not likely to have evolved greatly, and therefore, the literature available regarding general psychology and human biology was older than other aspects of the literature review. While we agree with this presumption, it seems some new articles still rely on conclusions developed using outdated research methods despite new methods measuring psychological and biological subjects being developed. Therefore, while the psychology or biology may not have changed, our ability to measure and understand it may have. As for sources analyzing online shopping behavior, most available literature was more recent, likely because online shopping environments are in constant development and thence consumers adapt with them.

8.3.4.2 Reliability

Reliability concerns whether data measurement was conducted in a consistent manner (Price et al., 2015, chapter 5.2). To assess the reliability of this study, the questions of reliability posed in Research Design, chapter *2.4.1 Reliability* will be discussed.

(1) Will the measures yield the same results on other occasions?
(2) Will similar observations be reached by other observers?

The experiment was conducted in a controlled lab-setting with volume, brightness and daylight being controlled for consistency. Furthermore, in terms of the use of technologies such as eye-tracking and GSR, each participants' assessment began only when both technologies showed optimal connection (via eye calibrations, participant position and posture, head placement, and GSR connectivity). This paper has full confidence in the data recorded via the technological apparatus throughout this experiment, and that this exact experiment could be repeated by other researchers and garner similar results. The consequence of controlling the lab setting to this extent is that the participants' usual environment when online shopping would likely be vastly different than a lab (e.g. at home, in public transport, in bed etc.). Furthermore, there is a discrepancy between bottom-up and top-down processing when shopping online vs. conducting the experiment in this study. In this experiment, participants are told to look at the products freely, i.e. using mostly bottom-up processing. However, in a participants' usual online shopping experience e.g. while browsing through a webshop, they might engage in product search looking for a certain type of product, style or design, or from a certain brand. Therefore, this processing would not be completely bottom-up. These discrepancies between the experiment and real-life situations may mean that it would be unfitting to apply the results directly to real online shopping behavior. However, these controlled measures are implemented in order to make findings as reliable as possible.

The self-reported assessments conducted may be more prone to inconsistencies due to response bias. Response bias can occur due to multiple reasons ranging from misunderstanding questions to social-desirability bias, in which a respondent answers a survey with answers that portray them as how they wish to appear rather than how they really feel, even if the survey is submitted anonymously (Rosenman et al., 2011). Participants misunderstanding questions was managed by making the questions as simple and straight-forward as possible, applying the non-verbal pictorial SAM, as well as allowing them to ask if they have any uncertainties. Prior to the actual experiment, they were also given a trial in order to ensure understanding of how the test would be conducted. The trial run-through was also meant to give them confidence in their ability to complete the test without proper knowledge to the topic or previous experience with our biometric methods. Furthermore, the emotional state or mood of the participant prior to the experiment may influence their ability to

accurately assess their emotional state when looking at products. This may impact a small amount of the data, but this would require extensive measures to control. Another inconsistency that may arise during SR data gathering is that the subtlety of the chosen visually salient stimuli may not have been registered by the participant, and it would therefore be difficult for them to accurately assess the impact of the visually salient stimuli on their emotions or ITB.

Lastly, we considered the effect of p-values on results and conclusions in terms of validity. A strict p-value significance "cut-off" dramatically decreases the likelihood that the experiment can be repeated with similar results, and therefore, we discuss the implications of not only significant correlations but also trends that approach significance.

(3) Is there transparency in how sense was made from the raw data?
We recorded every aspect of the data gathering process to ensure that any future experiments can reach similar results by conducting an experiment with similar research and experimental methods, sample population, and data analysis methods. This paper portrays the study conducted with as much transparency and accuracy as possible.

8.3.4.3 Validity

Validity concerns the extent to which the data obtained are a result of the independent variables, which is the intended goal (Price et al., 2015, chapter 5.2). Validity has previously been discussed in Research Design, chapter *2.4.2 Validity*; however, this sub-chapter will briefly discuss validity in terms of new information gained throughout the experiment.

In terms of the delimitations of this paper, specifying previous online shopping experience as a required condition of the participants used in the experiment, the introductory self-report determined that 100% of the participants answered "yes" to the question: "Do you shop online?". Furthermore, the results showed that all participants shop at the minimum of 1-2 times every three months; however, the majority (54.7%) of the participants shop online 1-2 times per month or more frequently. Lastly, the introductory self-report found that 39 out of our 41 participants shop for clothing online. As our design did not have past experience in shopping for clothing online as prerequisite, we decided to include the data from the two participants that do not usually shop for clothing online. However, it is suggested that future researchers increase validity by controlling for online clothing shopping if they

are testing online impulsive clothing purchases. This could be accomplished by removing data from participants who do not usually shop for clothing online. Additionally, all participants met gender and age requirements of the sample population criteria. Therefore, the participants used for data gathering fulfil all prerequisites put in place for validity of sample population. As a test of validity, this study also conducted an analysis testing the correlation between a person's individual impulsiveness (from the BIS scale) and their tendency to purchase impulsively during the experiment, for which there was found to be no significant correlation ($p=0.88$). Therefore, it can be argued that personal impulsiveness did not affect the results, hereby increasing validity of the study. This fact is also ideal for managerial implications of the findings of this study. This will be discussed in chapter *8.5 Managerial Implications.*

Concerning the number of test groups, dividing the participants into several groups would have been an improvement, since this would have allowed for more precise testing and increased internal validity. The software used is able to randomize slides yet is not able to randomize the product images within slides, therefore, the order of the product images on each slide was constant. When lacking randomization order, biases might affect the responses (Perreault, 1975). Creating six groups could have solved this issue, since all possible combinations of orders would then have been tested for, see figure 33 for all possible combinations.

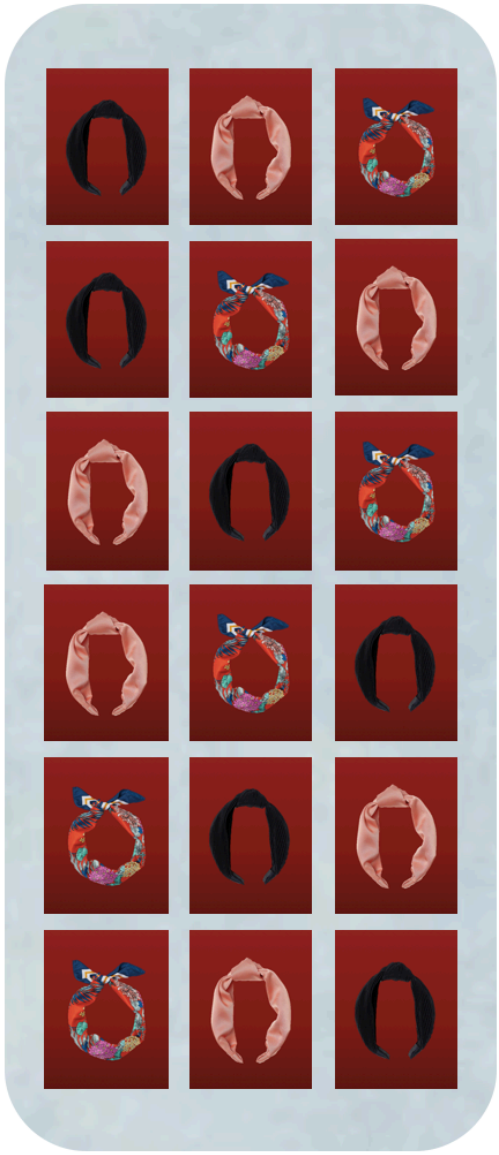


Figure 32: Possible combinations of randomizing product image order

One inconsistency that arose during the data-gathering process is the control for color in the product themselves. While reviewing the obtained results against the experiment design from the red color background stimulus, the potential influence of the product color was questioned. In other words, could it be determined that the response when looking at a product was elicited by the red background, not the product color? This was a consideration that was deemed necessary to explore. Figure 33 shows that black products were purchased most often by the participants, indicating that the product colors (e.g. the red hues on the hairbands or the yellow in the t-shirt and tote bag) did not increase the likelihood of purchase on the sole basis of containing warm colors, and therefore the validity of measuring color as a visually salient stimuli remains intact.

Figure 33: Validity of products tested on red color background

8.4 Further Research

Due to the scope of the thesis being relatively limited, this sub-chapter will discuss interesting directions for future research. This study can provide a foundation of general online impulse shopping insights; however, there are many opportunities for expanding this foundation via further research. In fact, this topic would greatly benefit from more research, not only because of their usefulness in managerial implications (see chapter *8.5 Managerial Implications*), but also because most of the available literature is not backed by biometric data. In the case of impulsive purchases, biometric measures (and especially neurometric measures) are able to discern the small, unconscious reactions to visually salient stimuli that traditional methods, such as surveys (Moser et al., 2019; Gwee & Chang, 2014) and website content analysis (Moser et al., 2019), are not able to.

Throughout the discussion, several improvements and ideas for further research have been mentioned. Given our finding that visually salient stimuli *do* affect emotional valence, preference formation, and

purchase intention, it would be interesting to further investigate this. Ideally, the next logical step to take (using this study as the foundation) would be to expand either the amount of visually salient stimuli, product categories, or both with a bigger pool of participants. Furthermore, this experiment would be interesting to repeat using alternative methods of measuring emotional responses, since the current experiment setup experienced challenges using GSR and self-reports. Alternative methods include more advanced techniques for example EEG or pupillometry. Specific visually salient stimuli that would be a natural succession of this study would be to test the effect of (1) other arousing colors such as yellow, (2) herd mentality using models and pleasant scenarios in product images, and (3) visual movement and product interactivity such product spin or virtual "try-on". These visually salient stimuli would be compatible with the experiment design of this study pending an increased amount of financial and time resources, as well as access to more advanced technical equipment.

A different experiment that could benefit from further research would be to create an experiment with the aim of investigating the relationship between several salient stimuli and their emotional impact. A gap remains regarding finding a balance between very arousing and attention-grabbing stimuli (that would foster a reaction using biometric techniques) that do not cause displeasure or dislike for the product shown and serves to complement/enhance the product.

8.5 Managerial Implications

The findings of this thesis aim to advance the understanding of which visually salient stimuli are effective in encouraging impulsive purchasing online. Much of online shopping is a result of impulsive purchases, yet the ability to intentionally stimulate impulsive purchases is more difficult online, as managers cannot exploit the human senses as possible in a physical store. The studies of this particular topic are scarce (manipulating product images with visually salient stimuli), therefore, in addition to the attempt of lessening the research gap, the contribution of this paper aims to provide practical managerial implications which can be successfully implemented. It is highly advantageous for managers to understand which factors drive these online impulse purchases, as it will enable them to not only reap the benefits of the current trend, but intentionally capture and potentially increase impulsive sales.

Presence of strong emotion is an important factor in impulsive purchases. Studies have shown that decisions based on emotions (e.g. impulsive purchases) lead to greater preference consistency, and a

lower risk of regret post purchase (Lee et al., 2009). Since information online is widely accessible and easy to verify, there is a general higher risk of regret when online shopping. As an example, if a product was purchased online today, the consumer could easily find out that the same product has been put on sale the following day, instilling feelings of regret. It is therefore especially important for online retailers to encourage emotional purchasing (via visually salient stimuli), minimizing the potential risk of regret. As mentioned in the literature review, if an object is of concern to the consumer it will elicit strong emotions (Frijda et al., 2014). It can be deduced that if a purchase is conducted based on emotion, the consumer has consequently bought a product of concern to them, increasing their liking/continued satisfaction of the product/object of concern. Furthermore, if the online shop is able to continuously facilitate successful purchases, this could consequently lead to higher general liking of the website, and in customer retention. As result of this information, it would be beneficial for online retailers to include visually salient stimuli that elicit an emotional connection to the products, as the greater product satisfaction and lower risk of regret instilled by this concept could potentially lower the amount of returns, hereby conserving resources such as personnel, time, financial, logistics, etc.

From the results, we found a strong trend for visually salient stimuli and valence. Consequently, in order to increase their consumers' feelings of pleasantness, managers should include product images with a red color background or with the PZE chosen for this experiment, as these both produced more positive valence than neutral product images. Although, managers must still be careful as to not overstimulate their consumers, as this might repel them (Salminen et al., 2018).

Furthermore, we also found a significant relationship between red color background, PZE, and TFD, which is an indicator of participants forming preferences for products images applied with visually salient stimuli. PZE was especially useful in maintaining fixation, however, as mentioned in the discussion, this could have been due to other reasons than forming positive preferences. A red color background, on the other hand, was effective in maintaining fixations, and was simultaneously the best in causing ITB. If managers can intentionally influence consumers' preference formation, increasing their liking of the products, there is a higher probability the consumers will end up purchasing the products. To conclude, while both visually salient stimuli were able to cause longer fixations and higher ITB, the red color background proved especially effective in leading to highest ITB. Due to the ambiguity of PZE results (i.e. it had the longest TFD but not the highest ITB), it can

be ascertained that PZE is not necessarily the most effective in forming product preferences. Therefore, when applying visually salient stimuli, online retailers must be careful as to implement them in a suitable context. For instance, the application of PZE should be carefully considered, as the findings show it is not equally effective on all product categories in terms of impulsive purchases. The results showed that PZE was significant in causing higher ITB specifically in the t-shirt product category yet did not significantly affect impulsive purchases in the hairband or tote bag categories.

Additionally, retailers must also pay attention to the combination of visually salient stimuli and product category, and the resulting level of valence. The visually salient stimuli proved to have different effects on valence depending on the product category. For instance, PZE had a strong effect on participants' valence level when applied to t-shirts, and red color background had a strong effect on participants' valence level when applied to tote bags and hairbands. As previously mentioned, this could be due to consumers' being in various states of mind/motivations, or goals when online shopping (Bargh, 2002). Consequently, retailers should carefully apply certain visually salient stimuli with certain product categories.

These findings serve to inform managers of how to increase commercial activity. Based on the results from this paper, it is recommended that managers apply the two visually salient stimuli, in order to increase experienced pleasantness, preference formation, and ultimately impulsive purchases.

9. Conclusion

The aim of this research paper was to investigate the impact of visually salient stimuli on impulsive shopping behavior. This was to be examined through the research question:

*How do **visually salient stimuli** affect **emotional impulsive responses** in an **online shopping** environment?*

From the previous literature, no universal definition of impulsive purchases evidently existed, therefore, in order to answer the research question, a definition of impulsive purchases was devised. This definition aimed to incorporate essential and recurrent elements of impulsive behavior, by building upon several established definitions of impulsive purchases, such as Chen & Wang (2015), Chan, Cheung and Lee (2017), Piron (1991), and Stern (1962). The definition is as follows:

An impulsive purchase is a highly stimulating unconscious emotional purchasing process in which the consumer makes a sudden and immediate purchase with no pre-shopping intentions after experiencing an urge to buy. The purchase lacks effort to self-control and lacks reflection prior to purchase in terms of risk and consequences.

To structure the research of the paper the highly compatible SOR framework was incorporated. Based on the literature review, the two chosen visually salient stimuli were red color background and product zoom element. While the color red has been studied in several other contexts, no one has examined the effect a red color will have when implemented as a background on a product image, and its subsequent ability to stimulate an online impulsive purchase (to the best of our knowledge). Few online retailers use background colors in the design of their website. On the other hand, product presentation features are used widely, yet only few studies have verified benefits of its usage. While it was not possible to create an interactive product presentation feature (which is mostly used), we attempted to study how product presentation features influence impulsive purchases through creating a static product zoom element.

Subsequently hypotheses were formulated under the following categories (1) emotion, (2) visual attention, (3) product preference formation and purchase intention, (4) and unplanned (emotional) and impulsive purchasing. The first examined the most significant factor of impulsive purchase behavior, namely the emotional aspects defined as arousal and valence. The second examined the correlation between the visually salient/neutral stimuli and their ability to effectively capture visual attention. The third category focused on the correlation of the visually salient/neutral stimuli's ability to influence positive product formation and consequently a high intent-to-buy. The last category took all previous considerations into account and examined how the visually salient/neutral stimuli fared under conditions of unplanned (emotional) purchases, and impulsive purchases.

A significant correlation was found for H3.1a, H3.1b, H3.2a, H3.2b., H1.1a, and H1.1b were not significant, yet a trend approaching statistical significance indicated a positive relationship, i.e. product zoom element and red background color were the most effective in eliciting valence vs. neutral. See table 8 for an overview of these (nearing) significant correlations.

H1 - Emotion		
H1.1a	*Self-reported valence level will be more positive for red color background than for product zoom element*	Trend (Rejected)
H1.1b	*Self-reported valence level will be more positive for product zoom element than for neutral*	Trend (Rejected)
H3 - Product preference Formation and Purchase Intention		
H3.1a	*TFD is longer for red color background than for product zoom element*	Significant (Rejected)
H3.1b	*TFD is longer for product zoom element than for neutral*	Significant (Accepted)
H3.2a	*ITB is higher for red color background than for product zoom element*	Significant (Accepted)
H3.2b	*ITB is higher for product zoom element than for neutral*	Significant (Accepted)

Table 8: Overview of (nearing) significant correlations

By combining all obtained information on the topic (from the literature review, experiment, analysis, and discussion) the research questions could be answered. Findings are firstly summarized under the sub-research questions:

1) How do visually salient stimuli (red color background and product zoom element) and neutral stimuli compare in their effectiveness of resulting in high arousal and positive valence (i.e. elicit strong and positive emotional reaction)?

Since all impulsive purchases are emotional, one of the goals was to examine whether the chosen visually salient stimuli could elicit emotional responses. The 2-dimensional arousal-valence model was utilized to measure emotional impact. No significant relationship was found between self-reported arousal and the chosen visually salient stimuli. This has been discussed as either being

caused by the stimuli being too subtle, i.e. not arousing enough to cause a skin conductance response in the participant, and the fact that the data on arousal subsequently had to be gathered entirely through self-reports. This was not ideal due to respondent bias and the risk that, again, the subtlety of the visually salient stimuli was not arousing enough to be noticed by the participant, resulting in their difficulty of reporting any change in arousal. However, visually salient stimuli were proven to be influential on valence with a trend approaching significance. The conclusion of this is that red color background is most effective in eliciting positive valence, followed by product zoom element, with neutral stimulus being least effective.

2) How do visually salient stimuli (red color background and product zoom element) and neutral stimuli compare in their effectiveness of resulting in positive preference formation and consequently a high intent-to-buy?

Two other aspects of impulsive purchasing are (1) enhancing preference formation that ideally leads to (2) purchase intention. During the experiment, participants' total fixation duration (as an indicator of product preference formation) was measured, and they were asked to report their purchase intention on a scale from "Would definitely not buy" to "Would definitely buy". The importance of this sub-research question is to investigate how effective the visually salient stimuli are in increasing participants' liking of a certain product and thence converting this liking to an action, i.e. a purchase intention. However, the basis of this sub-research question was problematic in that our results show that the visually salient stimulus causing longest total fixation duration is not the same visually salient stimulus causing the highest intent-to-buy, thereby contradicting the common presumption of the correlation between preference formation and total fixation duration. Product zoom element was most effective in garnering longer total fixation duration; however, the red color background was most effective in garnering higher purchase intention. The answer to this sub-research question is therefore slightly more complex than anticipated. What can be concluded from our research is that red color background does in fact cause a higher purchase intention. However, the presumption that causing longer total fixation duration resulting in increasing purchase intention will likely require further research to confirm or reject. As pertains to this paper, product zoom element was most effective in producing longer fixation durations; however, the cause of this remains ambiguous and therefore, we do not conclude that product zoom elements are more effective in producing preference formation.

Therefore, taking in all components of impulsive shopping behavior into consideration, the main research question is answered: *How do **visually salient stimuli** affect **emotional impulsive responses** in an **online shopping** environment?*

The research shows that visually salient stimuli do have an effect on components of impulsive shopping behavior. The two visually salient stimuli chosen was compared for efficiency in stimulating these components. In terms of the visually salient stimuli's effect on aspects of impulsive purchasing, the red color and product zoom element are similarly effective in creating positive valence. The red color was also most effective in increasing general purchase intention. The product zoom element, while not as effective as red color in increasing general purchase intention, it is still significantly more effective than neutral in increasing general purchase intention. It is also significantly correlated with the impulsive purchasing of t-shirts. However, red background performs better than neutral stimulus in terms of total fixation duration. Therefore, in terms of which visually salient stimuli is most effective at eliciting impulsive purchasing behavior in general, both visually salient stimuli perform positively. While product zoom element is promising as an impulsive purchasing trigger, more research is required to optimize its possible use in online retail and effect on consumers. On the other hand, based on findings red color background performed more effectively on several of the components of impulsive purchasing and is more readily applicable.

Two main implications are found from the results of the experiment. Firstly, emotion is a concept of paramount significance within online shopping. In addition to being an essential component of impulsive purchases, emotional connection to a product results in greater satisfaction of the product and lower risk of regret. Continued satisfactory purchases from the same online retailer will most likely also lead to higher positive opinion of that retailer, potentially increasing consumer retention. Secondly, the red color background was comparatively effective in several of the measurements, notably valence, total fixation duration, and intent-to-buy. Therefore, based on this study, retailers could potentially benefit from implementing red background color.

For further research it is suggested to inquire into other types of visually salient stimuli, and their impact on a variety of (other) product categories. Some visually salient stimuli might have a greater effect if combined with specific product categories. This was indicated as product zoom feature showed more effectiveness when applied to product images of t-shirts. Furthermore, the definition of

impulsive purchasing as defined in this paper was rather comprehensive, possibly misrepresenting legitimate impulsive purchases as non-impulsive, thereby clouding the results.

10. References

Abbasi, B. (2017). Relationship between Consumer Characteristics and Impulse Buying Behavior: The Mediating Role of Buying Intention of New Clothing Buyers. *International Review of Management and Marketing, 7*(1), 26–33. Retrieved from https://dergipark.org.tr/en/download/article-file/367047

Adolphs, R. (2010). Emotion. *Current Biology*, *20*(13).

Ajzen, I., & Fishbein, M. (2000). Attitudes and the Attitude-Behavior Relation: Reasoned and Automatic Processes. *European Review of Social Psychology, 11*(1), 1–33. doi: 10.1080/14792779943000116

Ainslie, G. (1975). Specious reward: A behavioral theory of impulsiveness and impulse control. *Psychological Bulletin*, *82*(4), 463–496. doi: 10.1037/h0076860

Akram, U., Hui, P., Kaleem Khan, M., Tanveer, Y., Mehmood, K., & Ahmad, W. (2018). How website quality affects online impulse buying. *Asia Pacific Journal Of Marketing And Logistics*, *30*(1), 235-256. doi: 10.1108/apjml-04-2017-0073

Amsteus, M., Al-Shaaban, S., Wallin, E., & Sjöqvist, S. (2015). Colors in Marketing: A Study of Color Associations and Context (in) Dependence. *International Journal of Business and Social Science , 6*(3), 32–45.

Applebaum, W. (1951, October). Studying Consumer Behavior in Retail Stores. *Journal of Marketing*, 172-178.

Aragoncillo, L., & Orús, C. (2018) Impulse buying behaviour: an online-offline comparative and the impact of social media, *Spanish Journal of Marketing - ESIC*, *22*(1), 42-62. doi:10.1108/SJME-03-2018-007

Attest. (2015). Share of generational groups who are impulsive buyers in the United Kingdom (UK) in 2017. In *Statista - The Statistics Portal*. Retrieved April 7, 2019, from https://www-statista-com.esc-web.lib.cbs.dk:8443/statistics/790391/individuals-who-are-impulsive-buyers-in-uk/

Bagdziunaite, D., Clement, J., & Nassri, K. (2014). An added value of neuroscientific tools to understand consumers' in-store behaviour.

Bargh, J. A. (2002). Losing Consciousness: Automatic Influences on Consumer Judgment, Behavior, and Motivation. *Journal of Consumer Research*, *29*(2), 280–285. doi: 10.1086/341577

Bargh, J. A. (2014). Unconscious impulses and desires impel what we think and do in ways Freud never dreamed of. *Scientific American*.

Barratt, E. E. (1959). Impulsiveness Scale. *PsycTESTS Dataset.* doi: 10.1037/t61859-000

Beatty, S. E., & Ferrell, M. E. (1998). Impulse buying: Modeling its precursors. Journal of Retailing, 74(2), 161–167. doi: 10.1016/s0022-4359(98)90009-4

Ben-Shakhar, G. (1985). Standardization Within Individuals: A Simple Method to Neutralize Individual Differences in Skin Conductance. *Psychophysiology, 22*(3), 292–299. doi: 10.1111/j.1469-8986.1985.tb01603.

Beres, A. M. (2017). Time is of the Essence: A Review of Electroencephalography (EEG) and Event-Related Brain Potentials (ERPs) in Language Research. *Applied Psychophysiology and Biofeedback*, *42*(4), 247–255. doi: 10.1007/s10484-017-9371-3

Bezzina, J. (2011). *Gender differences in impulse buying behaviour* (dissertation).

Boshoff, C. (2017). An assessment of consumers' subconscious responses to frontline employees' attractiveness in a service failure and recovery situation. *South African Journal of Economic and Management Sciences*, *20*(1). doi: 10.4102/sajems.v20i1.1612

Bradley, M., & Lang, P. (1994). Measuring emotion: The self-assessment manikin and the semantic differential. Journal Of Behavior Therapy And Experimental Psychiatry, 25(1), 49-59. doi: 10.1016/0005-7916(94)90063-9

Brosekhan, A. A., & Velayutham, C. M. (2013). Consumer Buying Behaviour – A Literature Review. *IOSR Journal of Business and Management*, 08–16. Retrieved from https://pdfs.semanticscholar.org/2d34/87f2ecc3016af409838b2f4abe5c396f79af.pdf.

Buechner, V. L., & Maier, M. A. (2016). Not always a matter of context: direct effects of red on arousal but context-dependent moderations on valence. *PeerJ*, *4*. doi: 10.7717/peerj.2515

Bylinskii, Z., Borkin, M. A., Kim, N. W., Pfister, H., & Oliva, A. (2017). Eye Fixation Metrics for Large Scale Evaluation and Comparison of Information Visualizations. *Eye Tracking and Visualization Mathematics and Visualization*, 235–255. doi: 10.1007/978-3-319-47024-5_14

Bynion TM., Feldner M.T. (2017) Self-Assessment Manikin. In: Zeigler-Hill V., Shackelford T. (eds) Encyclopedia of Personality and Individual Differences. Springer, Cham

Petty, R. E., Cacioppo, J. T., & Schumann, D. (1983). Central and peripheral routes to advertising effectiveness: The moderating role of involvement. Journal of Consumer Research, 10, 135–146.

Carroll, A. (2013). The psychology of impulse buying [Scholarly article]. *Institute of Technology Carlow*. Retrieved March 7, 2019, from https://aishlingc.files.wordpress.com/2013/11/the-psychology-of-impulse-buyin.pdf

Carter, S. M. (2018, December 11). 80% of younger shoppers make impulse purchases online-here's how sites trick you into spending. Retrieved April 7, 2019, from https://www.cnbc.com/2018/12/11/80percent-of-young-people-made-an-impulse-buy-online-this-yearheres-why.html

Celikkanat, H., Moriya, H., Ogawa, T., Kauppi, J.-P., Kawanabe, M., & Hyvarinen, A. (2017). Decoding emotional valence from electroencephalographic rhythmic activity. *2017 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*. doi: 10.1109/embc.2017.8037768

Cerf, M., García García, M., & Kotler, P. (2017). Consumer neuroscience (p. 115).

Chan, T. K., Cheung, C. M., & Lee, Z. W. (2017). The state of online impulse-buying research: A literature analysis. *Information & Management, 54*(2), 204-217. doi:10.1016/j.im.2016.06.001

Chamberlain, L., & Broderick, A. J. (2007). The application of physiological observation methods to emotion research. *Qualitative Market Research: An International Journal*, *10*(2), 199–216. doi: 10.1108/13522750710740853

Chen, Y., & Wang, R. (2015). Are humans rational? Exploring factors influencing impulse buying intention and continuous impulse buying intention. *Journal of Consumer Behaviour*, 15(2), 186-197. doi:10.1002/cb.1563

Cheng, F.-F., Wu, C.-S., & Yen, D. C. (2009). The effect of online store atmosphere on consumers emotional responses – an experimental study of music and colour. *Behaviour & Information Technology, 28*(4), 323–334. doi: 10.1080/01449290701770574

Cherry, K. (2019, August 18). The Fight-or-Flight Response Prepares Your Body to Take Action. Retrieved from https://www.verywellmind.com/what-is-the-fight-or-flight-response-2795194

Clement, J., Kristensen, T. & Grønhaug, K. 2013, Understanding consumers' in-store visual perception: The influence of package design features on visual attention, *Journal of Retailing and Consumer Services*, vol. 20, no. 2, pp. 234-239.

Clover, V. (1950, July). Relative Importance of Impulse Buying in Retail Stores. *Journal of Marketing*, 66-70.

CreditCards.com. (2014). State of mind in which consumers make impulse purchases in the United States as of November 2014, by gender. In *Statista - The Statistics Portal*. Retrieved April 7, 2019, from https://www-statista-com.esc-web.lib.cbs.dk:8443/statistics/469681/state-of-mind-in-which-consumers-make-impulse-purchases-by-gender-us/.

Coley, A. L. (2002). *Affective and cognitive processes involved in impulse buying.* (Unpublished master's thesis). The University of Georgia, Athens, Georgia.

Dawson, S., & Kim, M. (2010). Cues on apparel web sites that trigger impulse purchases. *Journal of Fashion Marketing and Management: An International Journal, 14*(2), 230–246. doi: 10.1108/13612021011046084

DeAngelus, M., & Pelz, J. (2009). Top-down control of eye movements: Yarbus revisited. Visual Cognition, 17(6-7), 790-811. doi: 10.1080/13506280902793843

Dewitte, S. (2013). From willpower breakdown to the breakdown of the willpower model – The symmetry of self-control and impulsive behavior. *Journal of Economic Psychology*, *38*, 16–25. doi: 10.1016/j.joep.2012.06.004

Dijksterhuis, A., & Nordgren, L. (2006). A Theory of Unconscious Thought. *Association for Psychological Science.*

Drossos, D. A., Kokkinaki, F., Giaglis, G. M., & Fouskas, K. G. (2014). The effects of product involvement and impulse buying on purchase intentions in mobile text advertising. *Electronic Commerce Research and Applications, 13*(6), 423-430. doi:10.1016/j.elerap.2014.08.003

Duchowski, A. T. (2002). A breadth-first survey of eye-tracking applications. *Behavior Research Methods, Instruments, & Computers*, *34*(4), 455–470. doi: 10.3758/bf03195475

DuPont de Nemours & Co. (1945, 1949, 1959, 1965). Consumer Buying Habits Studies.

Eaton, M., & Illes, J. (2007). Commercializing cognitive neurotechnology - the ethical terrain. *Nature Biotechnology 25*, pp. 393-397.

Ellis, L., & Ficek, C. (2001). Color preferences according to gender and sexual orientation. Personality And Individual Differences, 31(8). doi: 10.1016/S0191-8869(00)00231-2

Ekman, P. (1993). Facial Expression and Emotion. *American Psychologist*, *48*(4). doi: C3-O66X/93i'I2.0O

Empatica Support. (2019, January 29). What should I know to use EDA data in my experiment? Retrieved from https://support.empatica.com/hc/en-us/articles/203621955-What-should-I-know-to-use-EDA-data-in-my-experiment-

Evenden, J. (1999). Impulsivity: a discussion of clinical and experimental findings. *Journal of Psychopharmacology*, *13*(2), 180–192. doi: 10.1177/026988119901300211

Eysenck, S. B. G., & Mcgurk, B. J. (1980). Impulsiveness and Venturesomeness in a Detention Center Population. *Psychological Reports*, *47*(3_suppl), 1299–1306. doi: 10.2466/pr0.1980.47.3f.1299

Farmer, R. F., & Golden, J. A. (2009). The forms and functions of impulsive actions: Implications for behavioral assessment and therapy. International Journal of Behavioral Consultation and Therapy, 5(1), 12-30. http://dx.doi.org/10.1037/h0100870

Farnsworth, B. (2018, August 14). 10 Most Used Eye Tracking Metrics and Terms - iMotions. Retrieved from https://imotions.com/blog/7-terms-metrics-eye-tracking/

Farnsworth, B. (2018, July 17). What is GSR (galvanic skin response) and how does it work? Retrieved from https://imotions.com/blog/gsr/

Farnsworth, B. (2019, April 2). What is Eye Tracking and How Does it Work? Retrieved from https://imotions.com/blog/eye-tracking-work/

FDIH. (2016). Share of online shoppers who did an impulse purchase in Denmark in 2016, by product category. In *Statista - The Statistics Portal*. Retrieved April 7, 2019, from https://www-statista-com.esc-web.lib.cbs.dk:8443/statistics/699040/impulse-buying-in-denmark-by-product-category/.

Feingold, A. (1994). Gender differences in personality: A meta-analysis. *Psychological Bulletin, 116*(3), 429–456. doi: 10.1037/0033-2909.116.3.429

Fitzsimons, G. J., Hutchinson, J. W., Williams, P., Alba, J. W., & Chartrand, T. L. (2002). Non-Conscious Influences on Consumer Choice. *Marketing Letters*, *13*(3), 269–279. doi: 10.1023/a:1020313710388

Frijda , N. H. (1988). The Laws of Emotion. *American Psychologist.*

Frijda, N. H., Ridderinkhof, K. R., & Rietveld, E. (2014). Impulsive action: emotional impulses and their control. *Frontiers in Psychology*, *5*. doi: 10.3389/fpsyg.2014.00518

Fujita, K. (2011). On Conceptualizing Self-Control as More Than the Effortful Inhibition of Impulses. *Personality and Social Psychology Review*, *15*(4), 352–366. doi: 10.1177/1088868311411165

Gaille, B. (2017, May 24). 19 Dramatic Impulse Buying Statistics. Retrieved April 7, 2019, from https://brandongaille.com/18-dramatic-impulse-buying-statistics/

Gelasca, E., Ebrahimi, T., & Tomasic, D. (2005). Which Colors Best Catch Your Eyes: a Subjective Study of Color Saliency. Researchgate.

Gerard, R. M. (1958). *Differential effects of colored lights on psychophysiological functions* (dissertation)

Glimcher, P. W., & Fehr, E. W. (2018). *Neuroeconomics: decision making and the brain*. Amsterdam: Academic Press. Chapter 1.

Groeppel-Klein, A. (2005). Arousal and consumer in-store behavior. *Brain Research Bulletin*, *67*(5), 428–437. doi: 10.1016/j.brainresbull.2005.06.012

GSR integrated with Tobii Pro Lab: combine GSR and eye tracking. (2017, April 28). Retrieved from https://www.tobiipro.com/product-listing/shimmer3-gsr-unit/

GSR Pocket Guide. (2016). GSR Pocket Guide.

Gupta, P. (2011, December 2). Shopping Impulses, Online vs. Off. *The New York Times*. Retrieved from https://www.nytimes.com/roomfordebate/2011/12/01/save-america-shop-at-work/shopping-impulses-online-vs-off

Guyader, H., Ottosson, M., & Witell, L. (2017). You can't buy what you can't see: Retailer practices to increase the green premium. Journal Of Retailing And Consumer Services, 34, 319-325. doi: 10.1016/j.jretconser.2016.07.008

Gwee, M. Y. T., & Chang, K. T. T. (2014). What Triggers Impulse Purchase Behavior: The Moderating Effects of User Expertise and Product Type . In *Thirty Fifth International Conference on Information Systems*. Retrieved from https://pdfs.semanticscholar.org/5334/2fa22ad6b862322ac6d8d100ab180228ac82.pdf?fbclid=IwAR3JVyUTKFI5QxZqvPQw3DD7YDp3TzNGXxboS4jKgMuoe_vdB5q3xPdj8dg

Han, Y. K., Morgan, G. A., Kotsiopulos, A., & Kang-Park, J. (1991). Impulse Buying Behavior of Apparel Purchaser. *Clothing and Textiles Research Journal, 9*(3), 15-21. Retrieved March 7, 2019, from https://doi-org.esc-web.lib.cbs.dk:8443/10.1177/0887302X9100900303

Harvard University. (n.d.). Evaluating Web Sources. Retrieved from https://usingsources.fas.harvard.edu/evaluating-web-sources

Hilgard, E. R. (1962). Impulsive versus realistic thinking: An examination of the distinction between primary and secondary processes in thought. *Psychological Bulletin*, *59*(6), 477–488. doi: 10.1037/h0042630

iMotions. (2017,). *Frontal Asymmetry 101 – How to Get Insights on Motivation and Emotions from EEG*. Retrieved 12 19, 2018, from iMotions: https://imotions.com/blog/frontal-asymmetry-101- get-insights-motivation-emotions-eeg/

Jang, J. Y., Baek, E., Yoon, S.-Y., & Choo, H. J. (2018). Store Design: Visual Complexity and Consumer Responses. *International Journal of Design, 12*(2), 105–118.

Johnson, A. (2018, October 25). Online shopping poll: Most consumers can't resist unplanned buys. Retrieved April 7, 2019, from https://www.creditcards.com/credit-card-news/online-shopping-survey.php

Kahn, B. (2017). Using Visual Design to Improve Customer Perceptions of Online Assortments. *Journal Of Retailing*, *93*(1), 29-42. doi: 10.1016/j.jretai.2016.11.004

Kahneman, D. (2003). A perspective on judgment and choice: Mapping bounded rationality. American Psychologist, 58(9), 697-720. doi: 10.1037/0003-066x.58.9.697

Kelly, J., Sadeghieh, T., & Adeli, K. (2014). Peer Review in Scientific Publications: Benefits, Critiques, & A Survival Guide. *EJIFCC, 25*(3), 227–243.

Kemp, E., & Kopp, S. W. (2011). Emotion regulation consumption: When feeling better is the aim. *Journal of Consumer Behaviour*.

Kollat, D. & Willett, R. (1967, February). Consumer Impulse Purchasing Behavior. *Journal of Marketing Research*, 21-31.

Krishna, A. (2012). An integrative review of sensory marketing: engaging the senses to affect perception, judgment and behaviour. *Journal of Consumer Psychology, 22*(3), 332-351.

Kumar, J. S. (2017). The Psychology of Colour Influences Consumers' Buying Behaviour – A Diagnostic Study. *Ushus - Journal of Business Management*, *16*(4), 1–13. doi: 10.12725/ujbm.41.1

Kuniecki, M., Pilarczyk, J., & Wichary, S. (2015). The color red attracts attention in an emotional context. An ERP study. *Frontiers in Human Neuroscience*, 9. doi:10.3389/fnhum.2015.00212

Lavrakas, P. J. (2008). *Encyclopedia of survey research methods.* Thousand Oaks, CA: Sage Publications, Inc. doi: 10.4135/9781412963947

Lee, L., Amir, O., & Ariely, D. (2009). In Search of Homo Economicus: Cognitive Noise and the Role of Emotion in Preference Consistency. Journal of Consumer Research, 36(2), 173–187. doi: 10.1086/597160

Lee, J., & Ahn, J.-H. (2012). Attention to Banner Ads and Their Effectiveness: An Eye-Tracking Approach. *International Journal of Electronic Commerce, 17*(1), 119–137. doi: 10.2753/jec1086-4415170105

Lee, N., Broderick, A. J., & Chamberlain, L. (2006). What is 'neuromarketing'? A discussion and agenda for future research. *International Journal of Psychophysiology*. doi: 10.1016/j.ijpsycho.2006.03.007

Lee, T. R., Tang, D. L., & Tsai, C. M. (2005). Exploring color preference through eye tracking. doi: 3(5):333–336

Liao, C., To, P.-L., Wong, Y.-C., Palvia, P., & Kakhki, M. D. (2016). THE IMPACT OF PRESENTATION MODE AND PRODUCT TYPE ON ONLINE IMPULSE BUYING DECISIONS. *Journal of Electronic Commerce Research*, *17*(2).

Lo, L., & Lin, S.-W. (2013). THREE WAYS TO CONVERT BROWSING INTO IMPULSE BUYING: WEBSITE STREAMLINE AND DECORATION. In THREE WAYS TO CONVERT BROWSING INTO IMPULSE BUYING: WEBSITE STREAMLINE AND DECORATION. Retrieved from https://pdfs.semanticscholar.org/63ec/ebe7266c18c60f034444cad06fcd448ff06c.pdf

Lo, L. Y.-S., Lin, S.-W., & Hsu, L.-Y. (2016). Motivation for online impulse buying: A two-factor theory perspective. *International Journal of Information Management, 36*(5), 759–772. doi: 10.1016/j.ijinfomgt.2016.04.012

Madan, C. R., Bayer, J., Gamer, M., Lonsdorf, T. B., & Sommer, T. (2018). Visual Complexity and Affect: Ratings Reflect More Than Meets the Eye. *Frontiers in Psychology, 8.* doi: 10.3389/fpsyg.2017.02368

Marquart, G., Cabrall, C., & de Winter, J. (2015). Review of eye-related measures of drivers' mental workload. *Procedia Manufacturing, 3*(6th International Conference on

Applied Human Factors and Ergonomics (AHFE 2015) and the Affiliated Conferences, AHFE 2015), 2854-2861. doi:10.1016/j.promfg.2015. 07.783

McMains S.A., Kastner S. (2009) Visual Attention. In: Binder M.D., Hirokawa N., Windhorst U. (eds) Encyclopedia of Neuroscience. Springer, Berlin, Heidelberg

Meißner, M., & Oll, J. (2019). The promise of eye-tracking methodology in organizational research: A taxonomy, review, and future avenues. *Organizational Research Methods*, *22*(2), 590–617.

Michaelidou , N., Reynolds, N., Greenacre, L., & Hassan, L. M. (2013). Special issue on cross-cultural and cross-national consumer research: psychology, behavior, and beyond. *International Marketing Review, 30*(2). doi: 10.1108/imr.2013.03630baa.002

Milosavljevic, M., & Cerf, M. (2008). First attention then intention. *International Journal of Advertising*, *27*(3), 381–398. doi: 10.2501/s0265048708080037

Moeller, F. G., Barratt, E. S., Dougherty, D. M., Schmitz, J. M., & Swann, A. C. (2001). Psychiatric Aspects of Impulsivity. *Am J Psychiatry*.

Morton, J. (n.d.). Retrieved April 7, 2019, from https://www.colormatters.com/the-meanings-of-colors/red

Moser, C., Schoenebeck, S. Y., & Resnick, P. (2019). Impulse Buying: Design Practices and Consumer Needs. *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems - CHI 19.* doi: 10.1145/3290605.3300472

Murphy, E. R., Illes, J., & Reiner, P. B. (2008). Neuroethics of Marketing. *Journal of Consumer Behaviour*, pp. 293-302.

Navalpakkam, V., Kumar, R., Li, L., & Sivakumar, D. (2012). Attention and selection in online choice tasks. In J. Masthoff, B. Mobasher, M. Desmarais, & R. Nkambou (Eds.), User modeling, adaptation, and personalization, Vol. 7379. (pp. 200–211)Berlin Heidelberg: Springer.

Oas, P. (1985). The Psychological Assessment of Impulsivity: A Review. *Journal of Psychoeducational Assessment*, *3*(2), 141–156. doi: 10.1177/073428298500300205

Oliveira, J. H. C., & Giraldi, J. M. E. (2015). Eye tracking in neuromarketing: a research agenda for marketing studies. *ResearchGate*. doi: 10.5539/ijps.v7n1p32

Orquin, J., & Mueller Loose, S. (2013). Attention and choice: A review on eye movements in decision making. Acta Psychologica, 144(1), 190-206. doi: 10.1016/j.actpsy.2013.06.003

Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Barratt Impulsiveness Scale-11. *PsycTESTS Dataset.* doi: 10.1037/t05661-000

Peng, C., & Kim, Y. G. (2014). Application of the Stimuli-Organism-Response (S-O-R) Framework to Online Shopping Behavior. *Journal of Internet Commerce, 13*(3-4), 159–176. doi: 10.1080/15332861.2014.944437

Perreault, J. W. D. (1975). Controlling Order-Effect Bias. *Public Opinion Quarterly*, *39*(4), 544. doi: 10.1086/268251

Pieters, R., & Wedel, M. (2004). Attention Capture and Transfer in Advertising: Brand, Pictorial, and Text-Size Effects. Journal Of Marketing, 68(2), 36-50. doi: 10.1509/jmkg.68.2.36.27794

Piron, F. (1991). Defining Impulse Purchasing. *Advances in Consumer Research, 18*, 509-514. Retrieved March 7, 2019.

Pönkänen, L. M., & Hietanen, J. K. (2012). Eye contact with neutral and smiling faces: effects on autonomic responses and frontal EEG asymmetry. *Frontiers in Human Neuroscience, 6.* doi: 10.3389/fnhum.2012.00122

Price, P., Jhangiani, R., & Chiang, I.-C. A. (2015). *Research methods in psychology* (2nd ed.). Washington, DC: Saylor.org.

Rao, H. B. (2017, August 25). A Survey of 19 Countries Shows How Generations X, Y, and Z Are - and Aren't - Different. Retrieved April 7, 2019, from https://hbr.org/2017/08/a-survey-of-19-countries-shows-how-generations-x-y-and-z-are-and-arent-different

Reich, W. (1970). The Impulsive Character. *The Journal of Orgonomy*, 4–18.

Reingold, E. (2009). Predicting preference from fixations. Psychnology Journal.

Rook, D. (1987, September). The Buying Impulse. *Journal of Consumer Research*, 189-199.

Rosenman, R., Tennekoon, V., & Hill, L. G. (2011). Measuring bias in self-reported data. *International Journal of Behavioural and Healthcare Research, 2*(4), 320. doi: 10.1504/ijbhr.2011.043414

Saleh, K. (2017, April 12). The State of Impulse Buying Persona – Statistics and Trends. Retrieved April 1, 2019, from https://www.invespcro.com/blog/impulse-buying/

Salminen, J., Jansen, B. J., An, J., Jung, S.-G., Nielsen, L., & Kwak, H. (2018). Fixation and Confusion. Proceedings of the 2018 Conference on Human Information Interaction&Retrieval - CHIIR 18. doi: 10.1145/3176349.3176391

Sebastian, A., Jacob, G., Lieb, K., & Tüscher, O. (2013). Impulsivity in Borderline Personality Disorder: A Matter of Disturbed Impulse Control or a Facet of Emotional Dysregulation? *Current Psychiatry Reports*, *15*(2). doi: 10.1007/s11920-012-0339-y

Shen, K. N., & Khalifa, M. (2012). System design effects on online impulse buying. *Internet Research, 22*(4), 396-425. doi:10.1108/10662241211250962

Shimojo, S., Simion, C., Shimojo, E., & Scheier, C. (2003). Gaze bias both reflects and influences preference. Nature Neuroscience, 6(12), 1317-1322. doi: 10.1038/nn1150

Smith, N. C., & Goldstein, D. G. (2007). 'Hidden Persuaders': Defaults and Consumer Welfare. *Centre for Marketing Working Paper, London Business School*.

Stanford, M. S., Greve, K. W., Boudreaux, J. K., Mathias, C. W., & Brumbelow, J. L. (1996). Impulsiveness and risk-taking behavior: comparison of high-school and college students using the Barratt Impulsiveness Scale. *Personality and Individual Differences*, *21*(6), 1073–1075. doi: 10.1016/s0191-8869(96)00151-1

Stanford, M. S., Mathias, C. W., Dougherty, D. M., Lake, S. L., Anderson, N. E., &

Patton, J. H. (2009). Fifty years of the Barratt Impulsiveness Scale: An update and review. *Personality and Individual Differences, 47*(5), 385–395. doi: 10.1016/j.paid.2009.04.008

Stern, H. (1962, April). The Significance of Impulse Buying Today. *Journal of Marketing*, 59-62.

Stewart, D. W., & Furse, D. H. (1982). Applying psychophysiological measures to marketing and advertising research problems. Current Issues & Research in Advertising, 5, 1–38.

Thredup. (2018). Share of purchases bought on impulse in the United States as of 2018, by age group . In *Statista - The Statistics Portal*. Retrieved April 7, 2019, from https://www-statista-com.esc-web.lib.cbs.dk:8443/statistics/826442/share-of-purchases-bought-on-impulse-by-age-us/.

Tifferet, S., & Herstein, R. (2012). Gender differences in brand commitment, impulse buying, and hedonic consumption. *Journal of Product & Brand Management, 21*(3), 176–182. doi: 10.1108/10610421211228793

Tobii Pro. (2018, March 5). Tobii Pro Lab Galvanic Skin Response metrics. Retrieved from https://www.tobiipro.com/learn-and-support/learn/steps-in-an-eye-tracking-study/interpret/what-can-pro-lab-galvanic-skin-response-metrics-tell-us/

Tobii Pro (2019) What is visual attention?. Retrieved 16 September 2019, from https://www.tobiipro.com/learn-and-support/learn/eye-tracking-essentials/what-is-visual-attention/

Trope, Y., Fujita, K., & Liberman, N. (2006). Construal levels and self-control. *PsycEXTRA Dataset*. doi: 10.1037/e633962013-107

Valdez, P., & Mehrabian, A. (1994). Effects of color on emotions. *Journal of Experimental Psychology: General*, *123*(4), 394–409. doi: 10.1037//0096-3445.123.4.394

van der Laan, L., Hooge, I., de Ridder, D., Viergever, M., & Smeets, P. (2015). Do you like what you see? The role of first fixation and total fixation duration in consumer choice. Food Quality And Preference, 39, 46-55. doi: 10.1016/j.foodqual.2014.06.015

Verhagen, T. (2014, March 31). Online impulse buying: challenging opportunity for content providers: Bloomreach. Retrieved from https://www.bloomreach.com/en/blog/2014/03/online-impulse-buying-challenging-opportunity-for-content-providers.html

Wade, T. J., Cairney, J., & Pevalin, D. J. (2002). Emergence of Gender Differences in Depression During Adolescence: National Panel Results From Three Countries. *Journal of the American Academy of Child & Adolescent Psychiatry, 41*(2), 190–198. doi: 10.1097/00004583-200202000-00013

Wallace, J., Bachorowski, J., & Newman, J.P. (1991). Failures of response modulation: Impulsive behavior in anxious and impulsive individuals. Journal of Research in Personality, 25, 23-44.

Wang, Y. J., & Minor, M. S. (2008). Validity, reliability, and applicability of psychophysiological techniques in marketing research. *Psychology and Marketing*, *25*(2), 197–232. doi: 10.1002/mar.20206

West, J. (1951, January). Results of Two Years of Study into Impulse Buying, *Journal of Marketing*, 362-363.

Winn, M. B., Wendt, D., Koelewijn, T., & Kuchinsky, S. E. (2018). Best Practices and Advice for Using Pupillometry to Measure Listening Effort: An Introduction for Those Who Want to Get Started. *Trends in Hearing*, *22*, 233121651880086. doi: 10.1177/2331216518800869

Xiao, S. H., & Nicholson, M. (2013). A Multidisciplinary Cognitive Behavioural Framework of Impulse Buying: A Systematic Review of the Literature. International Journal of Management Reviews, 15(3), 333-356. doi:10.1111/j.1468-2370.2012.00345.

Yu, L.-C., Lee, L.-H., Hao, S., Wang, J., He, Y., Hu, J., … Zhang, X. (2016). Building Chinese Affective Resources in Valence-Arousal Dimensions. *Proceedings of the 2016 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies.* doi: 10.18653/v1/n16-1066

11. Appendices:

Appendix 1: Introductory self-report

Introductory self-report

* Required

1. **Respondent Number** *

2. **Age** *
Mark only one oval.
- 18-21
- 22-25
- 26-30
- 30+

3. **Monthly income (DKK)** *
Mark only one oval.
- 0-5,499
- 5,500-8,499
- 8,500-10,499
- 10,500+

4. **Do you shop online?** *
Mark only one oval.
- Yes
- No

5. **If yes, how often do you shop online on average?**
Mark only one oval.
- 1-2 times per week (or more)
- 1-2 times per month
- 1-2 times every three months
- 1-2 times every 6 months
- 1-2 times every year (or less)

Appendix 1: Introductory self-report (cont.)

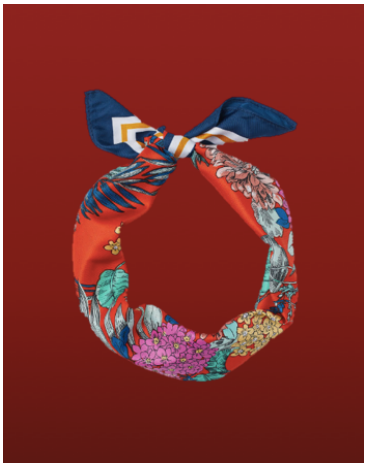
6. **What do you shop online?**
Check all that apply.

- [ ] Clothing
- [ ] Footwear
- [ ] Jewelry
- [ ] Entertainment (movies, games, music, books etc.)
- [ ] Admission/tickets to cultural/social events
- [ ] Home decor
- [ ] Garden articles
- [ ] Personal care/cosmetics/medicine
- [ ] Consumables/food/drinks
- [ ] Other: _____

7. **Why do you shop online?**
Check all that apply.

- [ ] Necessity (e.g. I need a product and the best option is to purchase it online)
- [ ] To pass time (e.g. sitting in a train)
- [ ] Boredom (e.g. sitting at home with nothing better to do)
- [ ] Consolation (e.g. to uplift mood)
- [ ] Reward (e.g. you want to reward yourself after a good result or good behavior)
- [ ] Habit (e.g. you do it on a regular basis making it a mindless action)
- [ ] Entertainment (e.g. you enjoy the experience of shopping online)
- [ ] Recommendation from friends/family (e.g. your friend recommended a webshop/product)
- [ ] Recommendation from SoMe influencer (e.g. a SoMe influencer recommended a webshop/product)

Appendix 2: Product images manipulated with visually salient/neutral stimuli







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AU REVOIR
1989 - 96

Appendix 3: Cover story

“The purpose of this test is to examine which of the following products are most favoured. This is in order to get a better understanding of which types of designs best fit certain types of products.

It is the beginning of the month and you are browsing for products online. Remember not to think about the price.