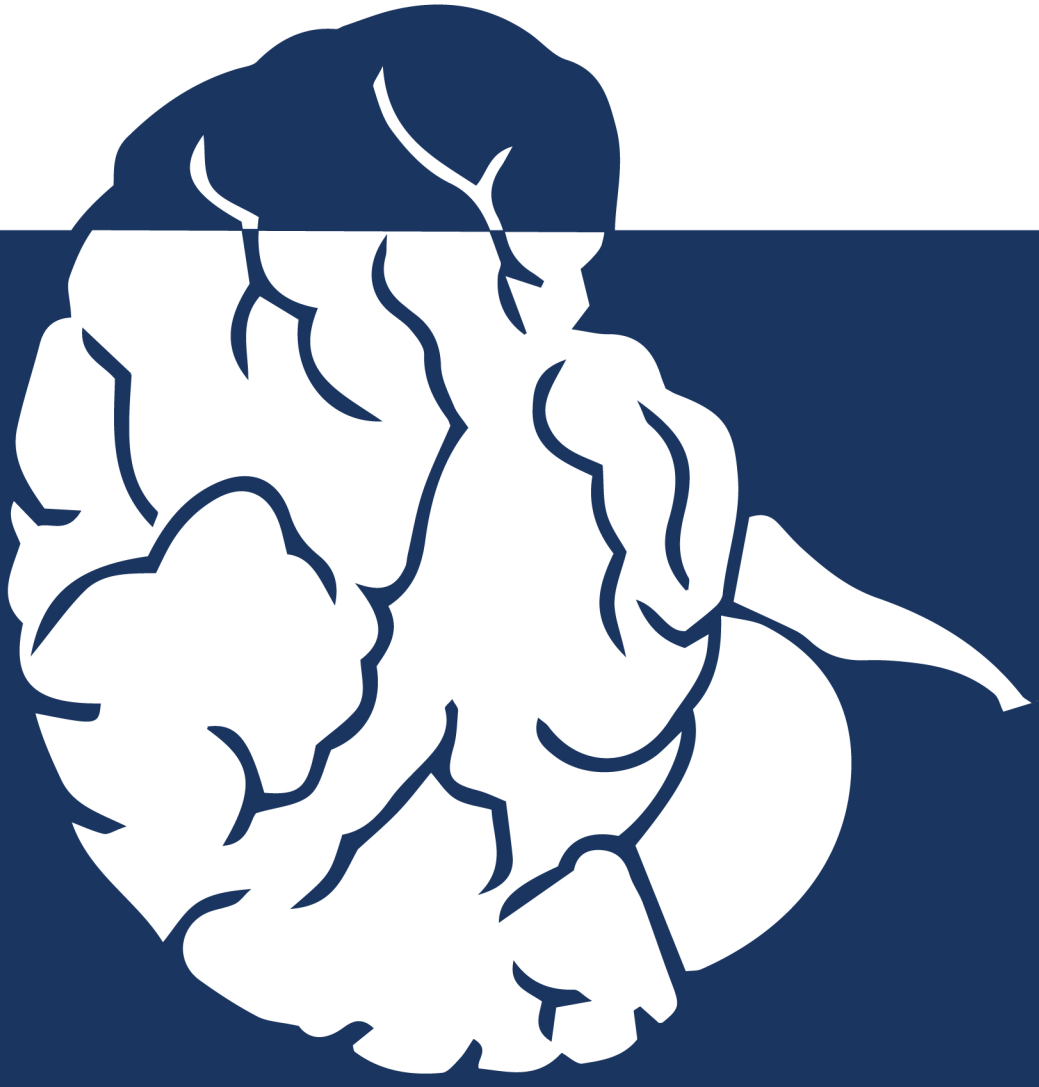

# Analyzing Preferences with Consumer Neuroscience

Master Thesis

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## Executive Summary

This Master's thesis is based upon an interest in the field of consumer neuroscience and a desire to understand the use of methods applied in consumer neuroscience research. The aim is to identify a methodological gap and to perform an experiment in order to investigate whether variations in results of chosen consumer neuroscience methods are able to explain changes in consumers' preferences after commercials exposure.

Extensive advertising research has proposed that advertising shapes consumers' attitudes and preferences, which subsequently influence behavior. Affect and cognition, as the main constructs which are associated with advertising success, stand behind the formation and alteration of attitudes and preferences. However, newest findings suggest that consumers are typically not aware of their affective and cognitive reactions toward advertising stimuli as all information commercials convey cannot be processed consciously. Consumer neuroscience research claims that unconsciousness plays a vital role in consumers' preferences and behavior, and provides means to analyze unconsciousness. Methods applied in consumer neuroscience research can assess consumer attention, emotions, and memory in a real-time which represent important affective and cognitive concepts. Thus, results obtained through these methods should explain the shifts in consumers' preferences. However, for the time being, there has not been conducted many experiments which would investigate this notion.

For the experimental part, four consumer neuroscience methods were applied in order to test hypotheses identified through the literature review – automated facial coding, eye-tracking, implicit association test, and skin conductance. Results obtained by the implicit association test suggest that commercials lead to change in preferences, as they influence unconsciousness, and strengthen an associative network. Moreover, the results were strongly positively correlated with consumers' intentional purchase behavior. Further, only the results obtained by the skin conductance method, next to eye-tracking and automated facial coding, were able to explain the changes in implicit preferences after the commercials exposure by variations in arousal level. Limitations in the experimental settings could however negatively bias the data of the latter stated methods. Further research is needed as it is suggested that Electroencephalography (EEG) in conjunction with skin conductance could explain the preferences changes by justifying whether increased arousal rate is related to positive or negative emotional experience.

Moreover, the research concludes that consumer neuroscience methods have a potential in improving the understanding of consumers' preferences and predicting advertising success based on their results. It is due to the fact that they can assess consumers' unconscious affective and cognitive responses in a real-time unlike traditional self-report measures which analyze conscious responses. There is a premise that data obtained by consumer neuroscience methods in combination with traditional self-report measures can guide towards creating more effective commercials and achieve advertising success.

## Acknowledgments

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*Libor Dolezel*

*June 2016*

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# 1 Introduction

Creating an effective advertisement and subsequently measuring the effectiveness has always been a complex issue. Since the beginning of advertising, which started in the early 20th century, marketers were trying to measure how the presented stimuli were perceived by the audience. In those years, what the message marketers were sending to the audience was quite simple. It simulated a door-to-door salesman, therefore it had to deliver as much information as needed along with persuasive argument for the product and how to buy the product. (Genco et al., 2013)

Nowadays, companies spend millions of dollars each year on advertising to positively influence consumers and create an awareness in their minds in order to generate profit by selling their advertised products and services (Venkatraman et al.: 437). The main problem is whether the money is spent in the right manner, therefore, whether the message is perceived by consumers as intended and leads to advertising success. The major purpose of advertising is to form and/or alter consumers' preferences and attitudes, which influence consumer behavior. Thus, there has always been the importance to measure whether the advertising activity changes consumers' attitudes and preferences. (Finlay et al., 2005: 443) Two key constructs which stand behind the formation and change of preferences are affect and cognition (Vakratsas and Ambler, 1999: 26). These constructs represent mental processes involved during the exposure of a stimulus and affective reactions toward a stimulus (Keer et al., 2013: 896). The advertising success therefore arises from positively influencing these two constructs which subsequently influence the behavior.

Since the mid-20th, the notion that consumers make choices consciously and rationally has been the dominant assumption within marketing research. However, with newer findings it has become clear that this assumption requires a modification. There are indicators that consumer behavior is not the consequence of entirely conscious and cognitive processes. Therefore, concepts such as emotions are important to take into consideration in order to understand responses towards advertising. Consumers are typically not aware of the extent to which advertising influences their attitudes and subsequent behavior, since it is beyond their conscious control. (Maison et al., 2001: 2) Thus, most consumer behavior, which is influenced by the held attitude, takes place without the individual being aware of it.

Because of above-described, traditional self-reported measures are usually not sufficient enough to measure how advertising influences consumer preferences and subsequent

behavior. That is why new measures started to develop in order to overcome these biases. In recent years, consumer neuroscience, that is, applied neuroscience methods to marketing, started gaining on popularity among scholars and practitioners because of the following reasons. First, data obtained directly without participants' explicit reactions are considered to be less noisy than the data obtained from traditional self-report methods. This data is considered to generate more accurate predictors in real-time, and therefore making neuroscience methods cheaper and faster than traditional methods. Secondly, data obtained through neuroscience methods can provide information to advertisers which could not be obtained through traditional marketing methods. There is an assumption that consumers cannot fully articulate and express their preferences and attitudes because of the hidden information and unconscious processes in their brains. (Boksem and Smidts, 2015: 482)

Hence, consumer neuroscience (in the academic environment) and neuromarketing (in the commercial environment) represent fields which can help to understand the brain processes behind consumers' preferences and behavior. Thus, possibly help to create better advertising and marketing strategies by adjusting the message according to consumers' affective and cognitive reactions. Neuroscientific methods such as fMRI, EEG, skin conductance, eye-tracking and others are able to directly measure concepts within affective or cognitive components, or even directly preferences. These concepts associate with advertising success. (Venkatraman et al.: 440)

On the other hand, even though consumers are not very good at stating their preferences and predicting their behavior, it does not mean that self-report measures are useless in advertising research. The opposite is true. (Boksem and Smidts, 2015: 483) Rather, there is a notion that consumer neuroscience can contribute to advertising research by complementing the traditional self-report measures. That is in a way by identifying variations during advertisement exposure which cannot be captured by traditional measures to predict the advertising success. (Venkatraman et al.: 450)

## 1.1 Research Question

As the previous introduction indicates, affective and cognitive constructs play an important role in advertising research as they are associated with advertising success. These two components stand behind the formation and alteration of preferences which influence subsequent consumer behavior. In recent years, consumer neuroscience has started

contributing to marketing and advertising as it brings new notions and methods in analyzing of how consumers respond toward advertising content.

However, for the time being, there has not been conducted many experiments which would investigate how results from the consumer neuroscience methods, that are directly inspecting affect and cognition, explain changes in consumer preferences. Based on this knowledge, this thesis seeks to investigate the following research question:

***"How Can Consumer Neuroscience Contribute to Analyze the Change of Implicit Brand Preferences toward Mature Brands as a Response to Commercials?"***

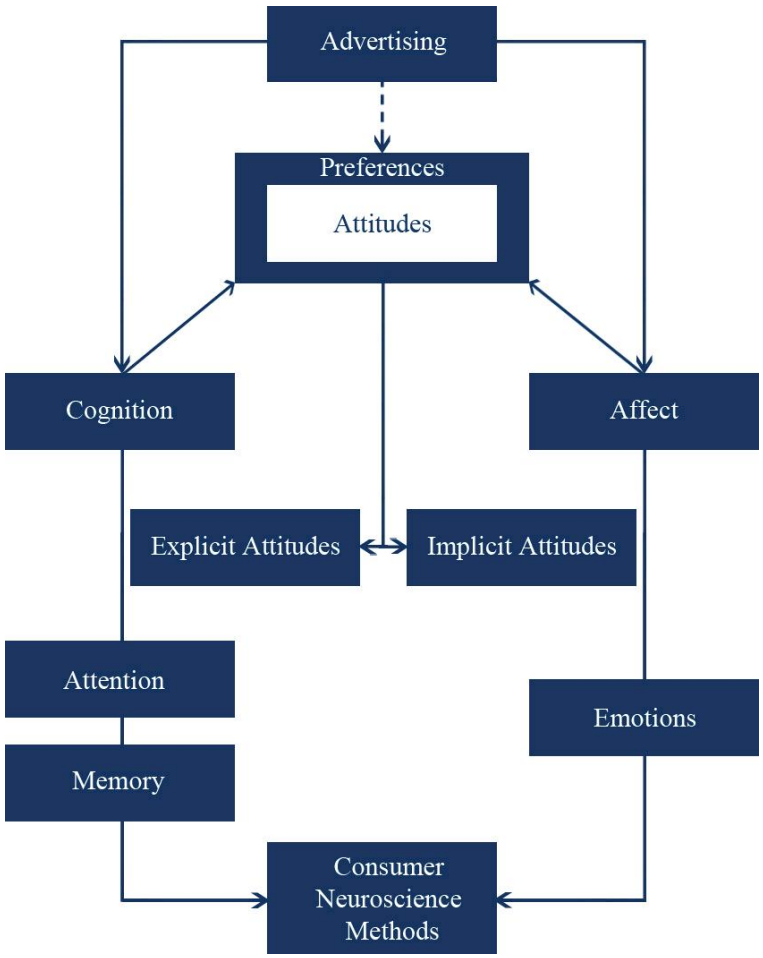
As stated in the introduction, advertising produces an effect in form of formation and/or alteration of consumers' preferences. Thus, when consumers are exposed to advertising stimuli, their preferences are subjected to changes. The application of consumer neuroscience methods is important since consumers cannot process and articulate completely consciously all the information they are being exposed to during commercials. As a consequence, unconsciousness influences their preferences and behavior as well. Consumer neuroscience methods are validated to measure unconscious cognitive and affective responses toward advertising stimuli. Thus, these methods should explain the changes in consumers' implicit preferences.

The literature research is conducted with the use of a traditional scoping review, as the project is based on already existing knowledge within advertising and consumer research, but seeks to explore a methodological gap. However, this project is not based only on the identification of the research gap as it thoroughly reviews and evaluates which consumer neuroscience methods can or possibly could be used to explain preferences. The purpose of this research is also to perform an actual experiment using chosen consumer neuroscience methods to measure consumers' affective and cognitive responses toward two commercials. Thus, this research tests consumer neuroscience methods in order to investigate whether variations in their obtained data are in fact capable to explain changes in implicit consumers' preferences. The commercials represent two competing mature smartphone brands Apple and Samsung, which are selected primarily on their familiarity among smartphone users. Consumers' preferences are therefore already formed for these two brands. This experiment will help to understand whether there is a need for a further research.

# 2 Literature Review

In the following subchapters the emphasis is primarily placed on the literature and research concerned with the concept of attitude, respectively preference, and the main components which stand behind its formation and alteration - cognition and affect. Further the distinction between implicit and explicit attitudes will be revealed, as the consumer neuroscience literature starts to emerge and distinguish between unconscious and conscious processes. Subsequently, emotions, attention and memory as concepts of affect and cognition will be described from the neuroscience perspective together with the summary of some neuroscientific methods applied in the consumer neuroscience research, which measure affect and cognition. Lastly, the literature review chapter also serves as a foundation for hypotheses.

**Figure 1: Model of the Literature Review (Own Source)**




## 2.1 Advertising Effectiveness

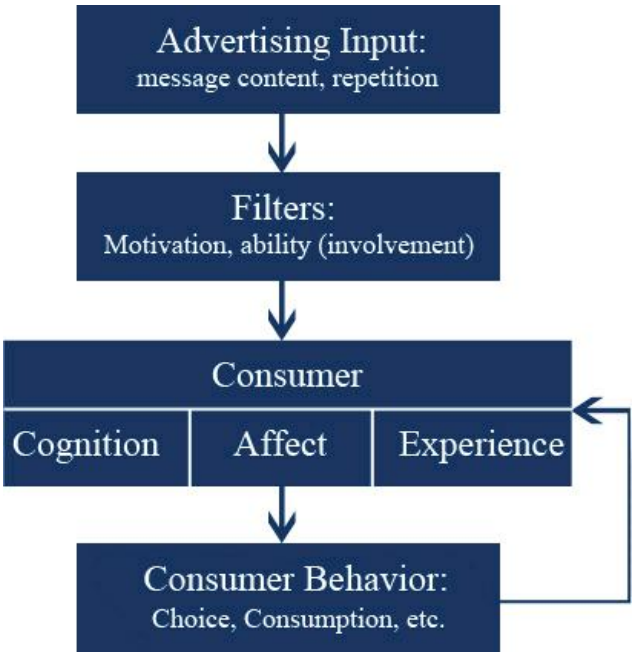
Companies spend millions of dollars building advertising success in order to thrive, but spending such an amount of money does not mean that success will occur. In order to forgo

the financial loss, and perhaps customer loss, advertisers should be concerned with how advertising affects consumers. This will help to communicate more effective advertising messages. (Vakratsas and Ambler, 1999: 26; Venkatraman et al., 2015: 437)

In the extensive research, Vakratsas and Ambler (1999) formulated a simple framework which shows how advertising works (figure 2). First, brand's advertising activity in form of a various choice of media and message content serves as an input for a consumer. Secondly, a consumer filters out the relevant content based on his or her motivation and inner states. Thirdly and primarily, advertising triggers, either consciously or unconsciously, some kind of mental effect such as alteration in consumer preferences and attitudes. Subsequently, these mental effects have a direct effect on consumer behavior. (Vakratsas and Ambler, 1999: 26)

Consumer preferences and attitudes, which have a direct effect on consumer behavior, have two major components, which can be seen in the figure 2. These components are cognition and affect which represent two major intermediate effects of advertising. These two components play the central role of this project as they are responsible for alteration and formation of consumer attitudes and preferences. Cognition and affect include various constructs and some of them will be thoroughly described here. Thus, one of the main focuses will be on the notion of importance particularly of emotions, learning and memory, and attention as three major constructs of the cognitive and affective components.

**Figure 2: A Framework of How Advertising Works (Vakratsas and Ambler, 1999: 26)**



These two components (together with experience) represent the main part of subsequently-listed advertising models in how consumers form and alter their preferences and attitudes after they encounter an attitude object. Thus, there will be an emphasis on their interrelationship and their influence on consumer attitudes and preferences from different perspectives of how advertising works.

## 2.2 Consumer Response Models

According to Vakratsas's and Ambler's (1999) intensive empirical evaluation, there are seven models of how advertising works, more specifically, how consumers respond to stimuli. Since, as above-mentioned, this project is revolving mainly around two dimensions which are cognition and affect, the very first models, which do not take into account these two intermediate effects of advertising, will not be described here. These models are focused primarily on measures such as sales, market share and others, and therefore suggest how market responds to advertising without tapping into consumer's emotions and memory. (Vakratsas and Ambler, 1999: 27-28)

### 2.2.1 Cognitive Information Models

The first models, which started to take into consideration one of the components, are cognitive information models. The core of these models is the assumption that the consumer preferences are not altered with the advertising strategy. It is because consumers make decisions only in a rational way and advertising serves only as a mediator of information. Therefore advertising helps to reduce search costs such as shopping time. (Vakratsas and Ambler, 1999: 29) Thence, according to this model, consumers make only conscious[1] decisions based on provided information.

### 2.2.2 Pure Affection Models

Other models pay little attention to cognitive processes and focus primarily on affective responses which are evoked by advertisement. These models are called pure affect models. (Ibid.) The main paradigm within these models is called "mere exposure" effect which contradicts the stance of the prevalent approach at that time. The prevalent stance was that the affective reactions, such as liking, disliking, and others are based on prior cognitive processes. Hence, affective reactions follow cognitive processes. This means that before consumers like

[1] Conscious: The condition accompanied by awareness of having a clear and vivid experience about particular events, stimuli or thoughts (Dijksterhuis and Aarts, 2009: 471; Ramsøy, 2014)

something, first, they have to know what it is, examine its value, identify the features, and so forth. (Zajonc, 1968: 1-2)

The main premise of the mere exposure effect, on the other hand, is that a merely repeated exposure of advertisement forms consumers' preferences towards a given object or a brand without involved cognitive processes. It does not negate cognitive influences in preferences, nor minimizes their importance, but treats affective and cognitive components as they are independent. Thus, affective reactions can occur with a total absence of cognitive processes. (Zajonc, 1980: 151-160; Zajonc and Markus, 1982: 154-160)

Some researchers suggested that with the absence of cognition within these models, asking consumers about their feelings itself bring cognitive processes into play, and therefore induce cognitive bias. Due to this notion, measures which avoid consumers' explicit responses about their preferences such as Facial Action Coding System, skin conductivity, and EEG, started to emerge. (Vakratsas and Ambler, 1999: 32) These and other methods will be described in the following subchapters.

### 2.2.3 Persuasive Hierarchy Models

The idea behind persuasive hierarchy models is that advertising must first inform and then persuade the consumer in order to be effective. Therefore, persuasive models introduced a hierarchy of effects in order to predict the success of an advertisement. The basic pattern is that, first, advertisement triggers cognitive processes where the consumer evaluates the advertisement, which leads to affective responses (feelings), and these finally influence the consumer's behavior. (Vakratsas and Ambler, 1999: 32)

### 2.2.4 Low-Involvement Hierarchy Models

The main alternative to persuasive hierarchy approach is low-involvement hierarchy models, where the pattern is that cognition comes first, but only in form of mere awareness (low involvement). This is followed by experience (for example product trial), which triggers affective reactions. In these models, the dominant factor which shapes consumers' preference is the product experience. Advertising activity reinforces existing habits and frames experiences. (Vakratsas and Ambler, 1999: 33)

### 2.2.5 Integrative Models

In integrative models, the sequence of cognition, affection and experience is based primarily on the context in which advertising operates, although, cognition and affection dimensions are the dominant consumer's motivators. It might be, for example, the level of involvement of the consumer and/or the product category that will determine the order of the effects. For these models, there is no evidence that consumers would process advertising information in advance given fixed hierarchic manner. (Vakratsas and Ambler, 1999: 34)

### 2.2.6 Hierarchy-Free Models

Finally, the last category of models is orbiting around cognition and affect, but goes against the persuasive models with the assumption that the brain receives information in a parallel fashion. Even though some serial hierarchies exist, due to passing information from stage to stage, different parts of the brain receive information in parallel. (Vakratsas and Ambler, 1999: 34-35)

In the past decade, there has been an expansion of researches within neuroscience and the use of its methods in contribution to marketing, consumer research and advertising. This appliance of neuroscience within these branches is broadly referred to as consumer neuroscience or neuromarketing, depending on the field of focus. The emphasis of previously-listed models, which were used in the past decades of advertising researches was shifted from hierarchy models to core constructs of cognition and affect as independent or combined factors of advertising success. (Venkatraman et al., 2015: 437-438)

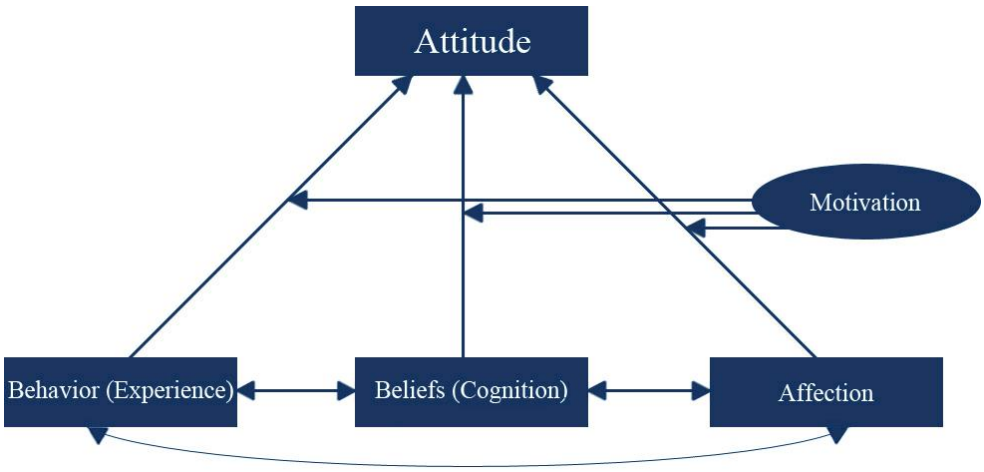
Since all previously mentioned models are revolving around the effect advertising has on consumers that is alterations of attitudes and preferences, these concepts will be developed in the following subchapters as well as what stands behind their formation and alteration.

## 2.3 The Attitude Concept

The general definition of attitude is that attitude is an evaluation of an object, brand, concept, and so forth (Olson and Kendrick, 2012: 230). Attitudes play a highly important role in consumer and advertising research. It is primarily so because attitudes serve as a useful prediction of consumer behavior. Attitudes, the cynosure of social psychology, have been an area of interest of consumer research for a long time. Within most consumer researches attitudes have been used as dependent variables and the final effect of different advertising factors which influence their formation and change. (Najmi et al., 2012: 111). Thus, for

marketers and researchers, understanding how consumers form their attitudes has been of the importance in order to present brands in favorable ways.

**Figure 3: Three-component Model (Maio et al. 2004: 11)**




There are two major perspectives of how attitudes are structured. One of them stands on the premise that attitudes are influenced purely by individual's beliefs (cognition). The second one is based on the three-component model according to which along with the cognitive component, affective and past behavioral component (experience) also stand behind the formation of attitudes. These components often collaborate together in the formation of attitudes. (Maio et al., 2004: 9; Najmi et al., 2012: 112; Olson and Kendrick, 2012: 230)

Another important distinguishing factor is that attitudes can be sorted according to explicit and implicit dispositions. Explicit are those with conscious origins, developed through thoughtful and effortful process, and implicit are formed without conscious intent of the individual. (Olson and Kendrick, 2012: 230)

## 2.4 Preferences

It is important to define the concept of preference at the beginning of the literature review, since this term is included in the research question and will constantly appear in the subsequent subchapters.

According to Ramsøy (2014) preference is an individual's attitude towards an object, brand, stimulus, which is typically reflected explicitly, but can be also implicit. Also, it is an individual's evaluative judgment in the sense of liking or disliking an object, brand or stimulus. (Ramsøy, 2014)

Zajonc and Markus (1982) claim that preferences are primarily affectively based behavioral phenomena, where a preference for an object X over Y represents an individual's tendency to approach the object X more over object Y (Zajonc and Markus, 1982: 124). In short, consumers tend to approach objects which they like more and avoid disliked objects. De Houwer et al. (2001) add that preferences play an important role in determining consumer behavior (De Houwer et al., 2001: 853).

Thus, in this project, preferences and attitudes are tightly connected as consumer attitudes play a subset role to preferences.

## 2.5 Cognitive Component

In this project, the term cognition represents mental actions or processes through which an individual acquires knowledge and understanding of the external world. The cognitive component covers abilities such as thinking, memory and learning, attention, judgment, decision making, and so forth. Cognition is often thought of as an indication of a consumer's rational and conscious evaluations of an attitude object. Thus, for example, if an object is useful or useless, and so forth. (Keer et al., 2013: 896)

For many years, the cognitive perspective (as the only component of the attitude formation) was the dominant view in how attitudes are formed and changed. It is primarily because of Fishbein's theory (1961) according to which "an individual's attitude toward any object is a function of his or her salient beliefs about the object and the evaluative aspect of those beliefs". (Fishbein, 1963: 233-234) An individual holds many salient beliefs about any given object (or brand), which can be represented for example by object attributes and its different characteristics. These are then positively or negatively associated with the given object and are activated from memory in a given situation. (Fishbein, 1963: 233; Mitchell and Olson, 1981: 318)

Thus, for example, a consumer can read a negative review about a particular clothing brand selling products that were manufactured by children and consequently develop beliefs that wearing this brand leads to negative outcomes such as supporting child exploited labor. Therefore, all beliefs about a brand (ad, object, concept, etc.) are according to the cognitive perspective related to an individual's attitude, and only beliefs are forming the individual's attitude.

Hence, an individual's attitude towards a brand can be summarized as a function of the individual's perception of the brand's attributes together with the assessment of the value of each attribute (Lutz, 1975: 49).

Olson and Kenderick (2012: 230-231) also describe in the three-component model that attitudes can be developed through thoughtful routes. An individual's cognitive processes evaluate a brand (ad, object) whether it leads to good or bad outcomes and subsequently shape the attitude towards it. On the other hand, this model does not treat the formation of attitude as it would be purely cognitively based as Fishbein and Middlestand (1995) suggest. Fishbein, as the author of previously mentioned theory (1961) along with Middlestand claim that other non-belief-based determinants of attitudes do not exist.

Most of the frameworks which focus to understand the cognitive origins of the attitude formation rely on thoughtful, conscious and explicit consumer processes. This means that explicit and deliberate effort is presented during the formation process. By having this assumption, it means that consumers can still form their attitudes through implicit (unconscious[2]) or at least less-conscious form of learning. The main premise behind this theory is that consumers can consciously process only a certain amount of information at a time. On the other hand, there is large amount of information which is still left outside of the awareness. Unconscious processing therefore still influences consumers without them being aware of it by processing large amounts of object-relevant information with a consequence of an object evaluation. (Olson and Kendrick, 2012: 231-232) This therefore means that consumer's attitude can be still influenced by the information which is not processed consciously and evaluate brand, object or brand in an implicit manner.

## 2.6 Affective Component

As with cognition, the term affect refers to consumer's emotions and feelings associated with an attitude object. Mood, as another affective state, will not be developed here. The difference between emotions and feelings will be described in the subchapter 2.14. Thence affective component represents the affective reaction consumer experiences when encountering an attitude object. (Keer et al., 2013: 896; Olson and Kendrick, 2012: 232)

As previously mentioned some researchers assumed that an individual's brand attitudes were a function of his or her salient beliefs at a given point in time which were considered relatively stable. Hence, salient beliefs are activated from memory (if already formed) or created through thoughtful processes (both cognitive processes). According to this view,

[2] Unconscious: The condition not accompanied by awareness of having an experience about particular events, stimuli or thoughts, although, can become conscious at some point. (Dijksterhuis and Aarts, 2009: 471; Ramsøy, 2014)

advertising stimuli affect consumer's cognition processes first, thus creates beliefs, which cause attitude. (Mitchell and Olson, 1981: 318-319)

Even though most researchers concur that belief (cognitive component) plays an important role in the formation and change of attitude, they suggest that another factor – affect – makes a significant contribution to attitude formation and change (Kim et al., 1998: 143)

### 2.6.1 Mere Exposure Effect

Probably the most important research which stands behind the notion that attitudes can be formed based on affection was conducted by Zajonc (1968). The paradigm standing behind this notion is that a mere repeated exposure of a stimulus to an individual creates a sufficient condition for the enhancement of the individual's attitude towards this stimulus. This means that when an attitude object is exposed to an individual, the individual's familiarity of this attitude object increases and leads to a more positive attitude towards it.

It was believed that affective reactions towards an attitude object appear after cognitive evaluation of the attitude object. Therefore, affective reactions such as liking or disliking are based on prior cognitive processes, and thus, affect cannot occur without it. Zajonc (1980) argues that preferences are not formed and expressed after and only as a result of considerable prior cognitive activities (deliberate, rational or conscious cognitive processes) (Zajonc, 1984: 118, 154). In fact those activities play little, or even unnecessary role for the generation of affect. Zajonc and Markus (1982: 125) suggest that "under some circumstances, affective reactions, including preference judgments, may be fairly independent of cognition." Zajonc (1980) adds that thoughts enter feelings at various stages of the affective sequence and vice versa. This means that affect and cognition are under control of independent systems that can influence each other in a variety of ways, and thus both constitute independent sources of effects in information processing. (Zajonc, 1980: 151-154)

The view that affect and cognition, although participating jointly in behavior, are independent from each other because they are separate psychological and neural processes, was confirmed later on, as Zajonc (2001: 226) states.

This notion played an important role in advertising and gave an answer to the question whether advertising must entertain in order to sell or whether the entertaining part is irrelevant to consideration of advertising effectiveness. Ray and Batra (1983) in their article summarized how affect influences advertising and how important it is for marketers and researches to pay attention to this important component of the attitude formation and change. Because of

affective component in advertising, consumers pay greater attention to advertising. Thus affective execution may lead to more positive judgments of the advertised message, which can be then remembered better. (Ray and Batra, 1983: 543-544)

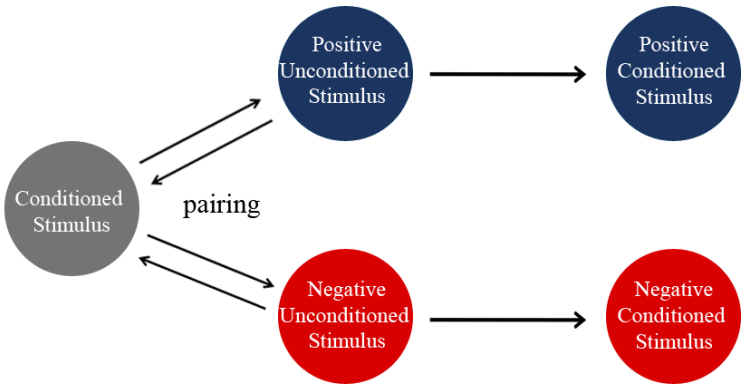
Zajonc (2001: 225-226) suggests that even when consumers are exposed towards subliminal[3] stimuli, it still affect their preferences even without them consciously knowing about it. This means that affect can be induced unconsciously as well. Thus attitude can be formed often in the absent of explicit awareness of the underlying process (Olson and Kendrick, 2012: 233).

### 2.6.2 Evaluative Conditioning

Besides mere exposure effect, evaluative (a subset of classical conditioning) and operant conditioning represent two other processes that lead to formation and change of attitudes. Due to Zajonc's notions (Zajonc 1968; 1980; 1984) that attitudes can be formed and changed via non-cognitive mechanisms, researchers started tapping more into evaluative conditioning. According to Bierley et al. (1985: 317) several authors have argued that cognitive factors explain evaluative conditioning, while others argued that conditioning can occur without cognition. Ramsøy (2014) claims that from neuroscientific perspective, evaluative conditioning is linked to emotional and memory related brain regions, and it is an ability to learn an associate.

In the literature, evaluative conditioning has often been treated as classical conditioning (e.g., Allen and Madden, 1985; Gorn, 1982; Kim et al., 1998), However, there are differences between them as evaluative conditioning is a subset of classical conditioning.

**Figure 4: Evaluative Conditioning (Own Source)**




[3] Subliminal: stimuli or processes that operate under the limen of consciousness, that can still have an effect on consumer's behavior or conscious processes (Ramsøy, 2014)

Evaluative conditioning is a transfer of positive or negative affect from one stimulus to another. In a prototypical study, an affectively neutral stimulus (a conditioned stimulus) is paired with an affective (positive or negative) stimulus (an unconditioned stimulus), which results in a change in the valence of originally neutral stimulus in the direction of the stimulus it is being pairing with as represented in the figure 4. (Baeyens and De Houwer, 1995: 825; De Houwer et al., 2001: 853; Walther et al., 2011: 192)

Despite evaluative conditioning having a long history in social psychology and this notion being widely discussed in advertising as well, there were only few studies that tested such an effect in marketing and advertising. One of the first notable researches was conducted by Gorn (1982). He suggests that hearing a positive or negative music (unconditioned stimuli) as a background feature while being exposed to a neutral product (blue or beige pen; conditioned stimuli) can directly influence product preferences. This can happen even without consumers being aware of it. In the study, when subjects were exposed to a positive, and respectively negative, music (unconditioned stimuli) while pairing with color pens (conditioned stimuli), it led to a subsequent pen choice according to the learned association of the pairing. Majority of the participants indicated that their choice was influenced by the color preference as the main reason, while only few (5/205) said that the music had an influence on their choice. This went against the notion that consumers have to be consciously aware of the presence of the unconditioned stimulus when the conditioned stimulus is present in order for conditioning to take place. (Gorn, 1982: 94-97)

Gorn suggests that evaluative conditioning as well as Zajonc's mere exposure effect can lead to change in the individual's attitude towards an object, but there is a difference between these two concepts. As Zajonc (1968) suggested, repeated exposure to an object leads to individual's positive attitudes towards the object. Gorn states that with evaluative conditioning, pairing an object with a negative unconditioned stimulus can lead to development of negative attitudes towards the product. Despite of exposure, this would lead to avoidance of the product. (Gorn, 1982: 95)

De Houwer (2012) supports this notion and adds that evaluative conditioning, unlike mere exposure effect, does not need repeated occurrence of a stimulus to alter the preference. Instead, the most important factor in the preference change plays the pairing of a conditioned stimulus with an unconditioned stimulus. (De Houwer, 2012: 1180)

Bierley et al. (1985) conducted another evaluative conditioning experiment where they used colored (red, yellow, blue) geometric shapes (conditioned stimuli) and the theme music from the Star Wars movie (a positive unconditioned stimulus) to analyze whether preferences for arbitrary stimuli can be evaluatively conditioned. Here, subjects were randomly assigned into two experimental groups, where for one of the groups red geometric shapes were followed by the theme music, and yellow shapes were never followed by music. Whereas for the other group, yellow geometric shapes always preceded the music and red shapes were not. Blue geometric shapes were followed by music on a random 50% of the trials. A random-control group, where participants were exposed to the shapes and music randomly, and a conditioned-stimulus-only group, where the shapes were presented without music, were also used. After conditioning, subjects rated their preferences toward geometric shapes, and the results of the study show that even though the participants were not aware of the conditioned – unconditioned stimulus relationship, evaluative conditioning took place. The data therefore show that evaluative conditioning can alter preferences

As noted in the Gorn's (1980) and Bierley's et al. (1985) experiments, consumers do not have to be consciously aware that an unconditioned stimulus changed a conditioned stimulus. Even though evaluative conditioning is a subset of classical conditioning, and therefore should occur only when subjects are aware of the conditioned – unconditioned stimulus relationship, it can occur without conscious awareness due to special nature of affective responses. (De Houwer et al., 2001: 859-860; Olson and Kendrick, 2012: 232)

Olson and Kendrick (2012) indicate that it depends whether the attitude formation occurs in an explicit fashion, where the individual is aware of the connection between an attitude object (a conditioned stimulus) and a paired valenced object (an unconditioned stimulus), or whether it occurs in implicit fashion, and therefore, with the absence of awareness. The main factor which stands behind this is whether a conditioned stimulus is paired with a strongly positive or negative valenced stimulus. If it is a strongly valenced stimulus, an individual creates associations between two stimuli consciously, and is therefore aware of the conditioned – unconditioned stimulus relationship. On the other hand, if consumer remains unaware of such a relationship, it might result in implicitly created attitude due to an unnoticeable unconditioned stimulus. Thus, the increasing intensity (relevance) of the unconditioned stimulus determines the degree of awareness. (Olson and Kendrick, 2012: 232-233) Walther et al. (2011) refer to the intensity of the unconditioned stimulus as a motivation parameter which might play important an role in attitude formation and change. (Walther et al., 2011: 195).

### 2.6.3 Operant Conditioning

Another way how individuals' attitudes are acquired is through operant conditioning, which differs from evaluative conditioning at least in two ways. The first is that the operant is conditioned by a consequence which occurs after the behavior. This means that the formation of attitude is given by the consequence of an action of an individual. Further, the probability of such a particular response to occur again is increased or decreased depending on a positive or negative outcome, respectively. Another distinction from evaluative conditioning is that operant conditioning tends to occur in an explicit manner where a consumer consciously perceives the outcomes of a particular behavior. (Nord and Peter, 1980: 38)

This means that if an individual interacts with an attitude object that causes positive feelings, the evaluation of this attitude object will be positive as well. This leads to strengthening of the association and subsequently to positive attitude towards the object. (Olson and Kendrick, 2012: 232)

The three-component model takes into account all the above-mentioned about affect as an independent response towards attitude object from the cognition. Thus, appraisal of a brand (ad, object) only from the cognitive processing perspective is not sufficient enough to provide the complete picture of how attitudes can be formed. Therefore, affect composes the pillar of attitude formation as well and together with cognition influence independently one another (Zajonc, 2001: 226).

Thence, in addition to cognitive component, attitudes can also be formed from the affective responses (emotions and feelings) that consumers experience while encountering marketing stimuli. (Olson and Kendrick, 2012: 232)

## 2.7 Behavioral Component

Although many studies support the view that cognition and affect are the building blocks of attitudes and both influence it (Glaser and Walther, 2013: 182; Keer at al., 2013: 896), there will also be a short theoretical focus on past behavior as a component of attitude formation and change.

According to the three-component model, the behavioral component also restructure attitudes next to affective and cognitive components. According to Olson and Kendrick (2012), it is primarily in situations where an individual lacks either cognitive or affective basis for an attitude, and therefore deduces an attitude toward an object based on past behavior. Hence, if an individual does not have any belief about a product, nor it does evoke any affective

reaction, he or she might recall, that in the past that he or she bought the product. Therefore, one might conclude that he or she has a positive or negative attitude towards the product because of the experience with the product in the past. (Olson and Kendrick, 2012: 234) However, as mentioned in the cognitive component, memory is a cognitive ability, thus recalling a previous experience requires cognition. Therefore it can be concluded that experience is a subset of cognition, and perhaps even affect.

Based on previously-stated about affective and cognitive components, there is a notion that exposure toward an attitude object leads toward an attitude change. Since this research is investigating the research question which takes into account two mature brands the first hypothesis can be proposed:

**$H_1$:** Commercials lead to change of consumer preferences toward mature brands.

## 2.8 Implicit and Explicit[4] Attitudes

The general definition of attitude in this project is that attitude is an evaluation of an object, concept, and so forth (Olson and Kendrick, 2012: 230), which can be positive or negative. This can include both implicit and explicit general attitude definition, although, there are differences between them.

According to a research conducted in social psychology, most decision-making and behavior occur without conscious awareness of individuals, therefore in implicit or unconscious fashion. However, consumer and advertising research is still largely dominated by the notion that decisions are made deliberately and under conscious control. Thence, that attitude towards an attitude object is formed and evaluated explicitly as well. (Ackermann and Mathieu, 2015: 55)

As previously noted, the formation and change of attitudes does not take place only in a conscious manner, where attitudes are deliberative and propositional in nature. Thus, neither the evaluation of an attitude object can be only conscious. With explicit attitudes, consumers or individuals in general are aware of the relationship between an attitude object and its evaluation, and can introspectively identify the attitude towards an object from memory. (Ackermann and Mathieu, 2015: 55-56; Byron, 2008: 178)

[4] The term implicit-explicit captures overlapping distinctions that are also sometimes labeled as unconscious-conscious; unaware-aware; direct-indirect (Greenwald and Benaji, 1995: 4)

Implicit attitudes are assumed to be more strongly influenced by unconscious processes due to their independence from conscious adjustment and evaluations (Perkins et al., 2008: 464). Greenwald and Banaji (1995: 8) defined implicit attitudes as "introspectively unidentified (or inaccurately identified) traces of past experience that mediate favorable or unfavorable feeling, thought, or action toward social objects". These attitudes are under control of automatically activated evaluations which the individual is not consciously aware of (Greenwald et al., 1998: 1464). The term "trace" represents memory traces resulting from learning while exposed to external stimuli. These memory traces can subsequently influence an individual's behavior and an evaluation without the individual being aware of it. Hence, it is an unconscious process of evaluation, which is distinct from evaluations arising from an introspective effort that is typical for explicit attitudes. (Ackermann and Mathieu, 2015: 58; Greenwald and Banaji, 1995: 7) Thus, if a consumer has an experience with an attitude object, he or she automatically activates the implicit attitude towards the attitude object outside of conscious awareness which mediates particular response, such as object-evaluative judgment.

In regard to the automatic process in implicit attitudes, Fazio et al. (1982; 1986) defined attitude as an association between an attitude object and an evaluation that varies in strength. This associative strength determines the likelihood that the attitude will be activated automatically, and also its accessibility from memory. If there is a strong association with the attitude object, it is more likely that the evaluation will be automatically activated upon mere exposure of the attitude object. (Fazio et al., 1982: 341; Fazio et al., 1986: 230) The evaluation is automatic when it does not require any effort from an individual, and is initiated spontaneously and without any conscious effort. On the contrary, when the evaluation needs a cognitive effort and individual's active attention it becomes controlled, therefore conscious. (Fazio et al., 1986: 229; Ackermann and Mathieu, 2015: 56)

However, there is a difference between Fazio's et al. (1986) general attitude construct and Greenwald's and Banaji's (1995) implicit attitude. Greenwald and Banaji (1995) treat implicit and explicit attitudes as two distinct yet related constructs (dual-process theories). Thus one is activated unconsciously and automatically, whereas the other one intentionally and consciously. Whereas Fazio et al. (1986) treat attitudes as one construct, where both automatic and explicit attitudes are an indicator of a common construct (single-process theories). (Perkins et al., 2008: 465)

Greenwald and Banaji (1995) proposed their implicit attitudes based on the previous research on implicit and explicit memory introduced by Graf and Schacter (1985). They distinguish between these two forms of memory which are defined as recollection processes of information stored in memory. Implicit memory is defined as a recollection process, where the retrieval process is unconscious and non-deliberate, whereas explicit memory is a memory process that involves and requires conscious and intentional retrieval of information. Thus, implicit memory is revealed when performance on a particular task does not require any conscious recollection of previously learned episode, while explicit memory is revealed when it requires intentional and conscious recollection. (Graf and Schacter, 1985: 501; Schacter, 1987: 501) Findings from neuroscience lead to a conclusion that automatic and controlled evaluative processes, although related, are stemming from different processing streams located in different regions of the brain (Ackermann and Mathieu, 2015: 61; Brunel et al., 2004: 387)

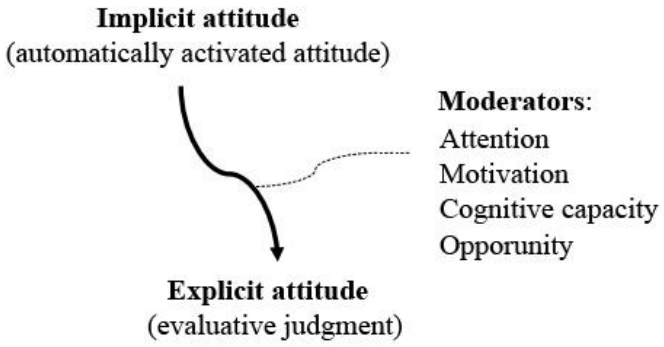
Greenwald and Banaji (1995) assume that implicit attitudes may also predict behavior, which is seen as an outcome of interaction between implicit and explicit cognition. Thence, they do not see implicit and explicit attitudes as opposed to each other, but as distinct, nonetheless, related constructs. Whereas Fazio et al. (1986) hypothesizes that there is only a single attitude construct, where the activation of an evaluation is presumed to follow a single processing stream. Here, the distinction between implicit and explicit evaluation is related to the method of measure rather than to dissociable constructs. (Ackermann and Mathieu, 2015: 59-60; Nosek, 2005: 565-566)

Implicit attitudes are not constantly activated. Factors such as attention and motivation play moderating and mediating roles in activation of explicit attitudes. (Gregg et al., 2006: 2)

Greenwald and Banaji (1995) suggest that attention, as one of the variables in the figure 5, moderates implicit attitudes. They propose that when an individual is attentionally focused on an attitude object, be it in expressing an opinion in a questionnaire, his or her efforts will interfere with spontaneous and unconscious processes that would have otherwise guided the evaluative judgment. (Greenwald and Banaji, 1995: 17)

Motivation and opportunity, as other important moderators of implicit attitudes play important role whether automatically activated attitudes will guide behavior or not. That is, when these two variables for conscious control of behavior are limited, implicit evaluation will guide the behavior. (Gibson, 2008: 179)

**Figure 5: Variables Moderating the Impact of Implicit Attitude on Explicit Attitude (Ackermann and Mathieu, 2015: 61)**




Nosek (2005) proposes an important notion that implicit and explicit attitudes vary in terms of their strength of relationship with each other and that this strength is given by one or more factors which moderate this relationship. Another important notion is that implicit and explicit attitudes can be shifted independently of one another (Gibson, 2008: 178). Gregg et al. (2006) however claim that implicit attitudes generally show a greater resistance to change than explicit attitudes (Gregg et al., 2006: 2).

Since this research is concerned with the implicit brand preferences, there is a need to adjust the first hypothesis with notion of the implicit concept, thus:

**$H_1$:** Commercials lead to change of consumer implicit preferences toward mature brands.

## 2.9 Attitude Measures

The following subchapters will be concerned with the description of explicit and implicit measures as well as their differences. This will be followed by the implicit association test as the preference measure in this study.

### 2.9.1 Explicit Measures

The majority of research focused on measuring attitudes has used traditional self-report measures, where participants are simply asked to express their attitudes towards an attitude object. Commonly, a Likert-type scale is used as a method where participants express their attitude in a questionnaire. (Gibson, 2008: 178) This represents a direct and explicit way of measuring attitudes where the participant is aware of the evaluated object he or she evaluates, after careful consideration (Ackermann and Mathieu, 2015: 61-62).

Hofmann et al. (2005) categorize self-report measures into scales (such as Likert-type scale), semantic differentials (i.e. ratings of basic evaluative dimensions toward a given attitude object), feeling thermometers (i.e. thermometer-like scales designed to measure feelings toward a given attitude object), adjective ratings, and single-item measures. (Hofmann et al., 2005: 1373)

Brunel et al. (2004) state that even though these measures satisfy important psychometric criteria such as efficiency and usefulness they also have limitations. They typically refer to the participant's personal history, and therefore assume that he or she has already formed an attitude towards an attitude object, or is able to do so on the spot. Further, and most crucially, these measures assume that the participant is aware of his or her attitude, and thus has access to it, and is willing to share it accurately with the researcher. (Brunel et al., 2004: 386-387)
Hence, this raises awareness and willingness issues. A participant, who has not yet encountered an attitude object, can still answer a question when asked to express his or her opinion towards this object in order not to be seen ignorant. Furthermore, a previously formed attitude may not be easily accessible, and therefore, the individual may be unable to report it. As Greenwald and Banaji (1995: 9) state, the respondent may provide inaccurate reports due to the unawareness of the influence of a previously recognized experience. This means, in other words, that the respondent, even though aware of a previous experience, might not be aware of its influence on his or her attitude formation. Another problem with explicit measures is represented by purposefully distorted answers of the participant due to social-desirability. These may appear as consumers are unwilling to share their true opinion in order to be seen in a different light. Moreover, participants might distort their answers in order to be polite to a researcher, since they know what the evaluated subject is and what answer the researcher might be looking for. Thus, even though explicit measures have their positive side, they cannot truly avoid the influence of the participant's intentional control, and therefore, they involve deliberate cognitive processes in evaluation. (Brunel et al., 2004: 386)

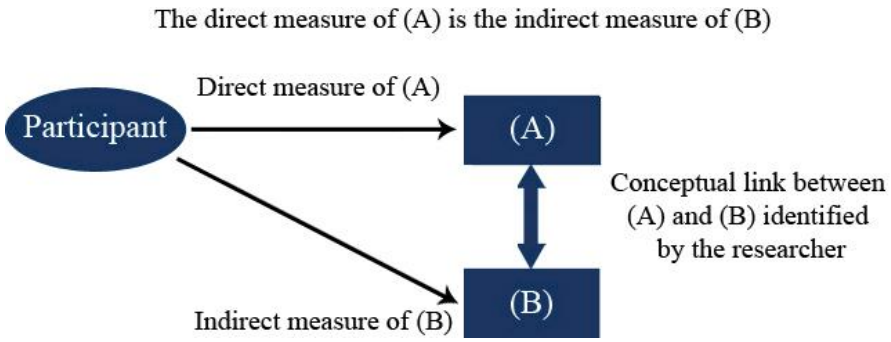
### 2.9.2 Implicit Measures

Because explicit measures are subject to conscious representations, they are not able to capture the associative and automatic character of attitude nor do they allow respondents to tap into associative memory which is not conscious. Therefore, they have limited introspective knowledge of the strength of the association. Further, consumers might be unwilling to report their attitude towards an attitude object directly because they are unable to

report it, do not want others to know about it, or because of socially sensitive attitudes and believes. Implicit measures, on the other hand, are methodologically different from the explicit measures as they capitalize on a respondent's non-declarative responses to attitude objects, which elicit automatic association which the respondent holds towards these objects. (Gregg et al., 2006: 1) Importantly, implicit measures tend to be resistant towards deliberate alteration unlike explicit measures which are vulnerable to it. (Maison et al., 2004: 406; Nosek, 2005: 566-568)

As above-mentioned, generally, researcher uses explicit measures directly to get an answer to a specific question and the respondent is aware of what is being evaluated. Implicit measures, on contrary, represent indirect measures. The difference between direct and indirect measures is whether the respondent is informed about the purpose of measure or not, and what the researcher chooses to infer from the respondent's response. (Greenwald and Banaji, 1995: 8)

**Figure 6: Difference between Direct and Indirect Measures (Ackermann and Mathieu, 2015: 63)**




Thence from the figure 6, if a participant is advised that A is being measured, but the researcher uses the response to infer something about B, then the direct measure of A becomes an indirect measure of B (Greenwald and Banaji, 1995: 8). In other words, B can be measured by a direct measure A, when there is a link between A and B in a sense that A has an influence on B (Ackermann and Mathieu, 2015: 63). Therefore, implicit measures make, unlike explicit measures, no references to objects in a participant's personal history. Instead, they require participant's attention on performing some other task which indirectly reveals the underlying construct of a participant's held attitude without any explicit link. (Brunel et al., 2004: 387)

Since the 1980s, there has been a focus on reaction times as an indication of automatic processes and automatic activation of attitudes. Fazio et al. (1982) used employed latency of response to indicate the associative strength. According to Ramsøy (2014) there is a positive relationship between preferences and reaction time. In situations when consumers have two or more choices available there may arise a conflict in decision. The closer two options are in a value, the harder the decision will be. Because the reaction times are measured in milliseconds, such a conflict is easy to detect. Although, there are as many as 17 measures of cognition, one of them – Implicit Association Test (IAT) – has been the most commonly used and debated measure in the consumer research. (Dimofte, 2010: 925; Maison et al., 2004: 406)

## 2.10 Evaluative Association Measures

The IAT was introduced in 1998 by Greenwald et al. This method has usefulness in measuring evaluative associations which underlie implicit attitudes as defined by Greenwald and Banaji (1995) (Greenwald et al., 1998: 1464). Therefore it provides an implicit measure of implicit attitudes (Brunel et al., 2004: 389). IAT is a computer-based task that measures relative strengths of automatic associations between two bipolar target concepts (e.g., two competing brands) and two contrasted attribute dimension categories (e.g., pleasant and unpleasant words). This is done through series of categorization tasks which require fast responses of the participant. (Greenwald et al., 1998: 1464; Perkins et al., 2008: 462)

The IAT is measuring the difference between implicit attitudes towards concept A (e.g., Apple) and implicit attitudes towards concept B (e.g., Samsung). The difference is usually interpreted as an indicator of the relative associative strength between the two pairs of concepts. (Ackermann and Mathieu, 2015: 64; Hofmann et al., 2005: 1371) This means that IAT measure provides indication of relative rather than absolute preferences. Hence, one can implicitly prefer Apple over Samsung, but not that they completely dislike Samsung. (Maison et al., 2004: 412)

One of the strength of the IAT is that it may be resistant towards self-representation strategies of participants. That is, IAT may reveal attitudes and other automatic associations that a participant prefers not to express. (Greenwald et al., 1998: 1465) Further, the measure is not dependent on a participant's awareness of the strength of associations that are being assessed, and therefore does not require introspection of the participant (Brunel et al., 2004: 406; Perkins et al., 2008: 462). In overall, IAT has a sufficient high reliability and validity (Gibson,

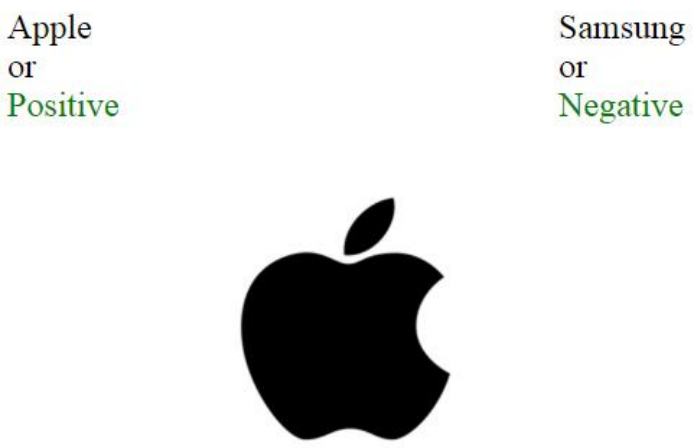
2008: 178; Hofmann et al., 2005: 1371). Further, IAT can capture consumer responses in a context where behavior is often influenced by automatic processes. Because of all previously mentioned is the reason why the IAT is an interesting measure which constantly increases on its popularity. (Ackermann and Mathieu, 2015: 64)

**Table 1: A Typical IAT Sequence (Greenwald et al., 2003: 19; Own Source)**

| Block (step) | Number of trials | Function | Task description | Items assigned to left-key response | Items assigned to right-key response |
|---|---|---|---|---|---|
| 1 | 20 | Practice | Target concept discrimination | Apple images | Samsung images |
| 2 | 20 | Practice | Attributes discrimination | Pleasant words | Unpleasant words |
| 3 | 40 | Test | Initial combined task | Apple images + pleasant words | Samsung images + unpleasant words |
| 4 | 40 | Test | | Apple images + pleasant words | Samsung images + unpleasant words |
| 5 | 20 | Practice | Reversed target concept discrimination | Samsung images | Apple images |
| 6 | 40 | Test | Reversed combined task | Samsung images + pleasant words | Apple images + unpleasant words |
| 7 | 40 | Test | | Samsung images + pleasant words | Apple images + unpleasant words |

The IAT procedure requires participants to quickly map multiple items representing four categories (two bipolar target concepts and two contrasted attribute dimension categories) with two response keys (e.g., “E” and I”) on a computer keyboard. On each side of the display screen (left and right), one target concept category, and one attribute category is presented. See figure 7 for illustration.

**Figure 7: IAT Test (Own Source)**



Participants are instructed to categorize and assign an item as quickly as possible according to its appropriate category by pressing the right key ("E" with their left or "I" with their right hand), depending where the stimulus belongs. Typically, the number of stimuli for target attribute categories is between three and six stimuli, but can be as few as two items per category. Stimuli are represented by images (Apple and Samsung; including logos) and words (pleasant and unpleasant), and appear in the middle of the screen, one at a time. The items from each category are being randomly chosen. (Perkins et al., 2008: 462; Maison 2004: 406)
Thence, as figure 7 displays the two categories on left are Apple images and pleasant words, and on the right Samsung images and unpleasant words (3rd block of Table 1). Whenever the Apple category item or a pleasant attribute appears on the screen, the participant classifies it by pressing the "E" key as quickly as possible. When the Samsung category item and unpleasant attribute item is presented, the participant would press the alternate response key (i.e. the "I" key).
As can be seen in table 1, the participant also undergoes the task where Apple is paired with unpleasant words and Samsung with pleasant words.

The IAT is based on reaction times and the main assumption behind it is that the responses to categories that are associated in memory stronger will be evaluated faster than responses to categories that have no or poor associations in memory (Gibson, 2008: 178). In other words, the more consumers like something the faster they tend to respond (Ramsøy, 2014). Thus, shorter reaction times are expected to arise when strongly associated pairings are elicited.
Hence, as Perkins et al. (2008) mention, the ease or difficulty to which a participant is able to assign the same response to distinct categories is taken as a measure of the association between them. From the task in table 1, a participant can have for example stronger association between Apple and pleasant words than between Samsung and pleasant words. If so, there should be a difference in ease of assigning pleasant words to Apple than to Samsung, which results in more positive attitude towards Apple than towards Samsung. (Perkins et al., 2008: 462; Maison et al., 2004: 406)

IAT may be perceived as an entirely cognitive measure since it is commonly used as a measure of the strength of associations among concepts stored in memory without tapping into the consumer's conscious thought. However, the differences between reaction latencies for brands paired with positively and negatively valenced words have been also used as a measure of emotional valence. Thence, IAT can be related to measuring both affect (valence)

and cognition (memory). (Ackermann and Mathieu, 2015: 72-73; Venkatraman et al., 2015: 438)

### 2.10.1 Scoring the IAT

The original IAT scoring algorithm was introduced by Greenwald et al. (1998) and was subsequently improved by Greenwald et al. (2003), which is a today's standard. It is because of its superior measure to the *conventional* algorithm introduced in 1998, as it leads to higher correlations between the IAT and explicit measures. Moreover, it increases the predictive validity of IAT scores on behavioral dependent variables. (Ackermann and Mathieu, 2015: 64; Perkins et al., 2008: 463).

As can be seen in table 1, the *improved* algorithm takes into account only the data from test blocks (steps) 3, 4, 6 and 7 which are used in the calculation, whereas steps 1, 2 and 5 serve as practice trials. Further, the calculation compares differences between the mean reaction times of blocks 3 and 4 (initial combined task) with the reaction times of blocks 6 and 7 (reversed combined task) and subsequently divides these differences by the standard deviation of the aggregate test-block latencies. (Greenwald et al., 2003: 214)

### 2.10.2 IAT in Consumer Research, and the Relationship with Explicit Measures

One of the first consumer researches with the use of IAT was conducted by Maison et al. (2001). In one of their studies they explored attitudes toward high-and low-calorie foods. Maison and colleagues hypothesized that young women hold ambivalent attitudes toward high and low calorie products, since generally on one hand media stress the concept of healthy life style, and therefore the importance of low calorie products. Yet on the other hand, marketers of high calorie food are promoting taste in their advertising. (Maison et al., 2001: 5) The hypothesis was confirmed as the results yielded from traditional explicit measures suggested that the subjects of the study preferred high calorie products in some dimensions over low calorie products. However, the IAT results suggested that the subjects have more favorable implicit attitude toward low calorie products. The IAT results was related to self-reported behavior, where the subjects who are concerned about calories when buy food and feel guilty when they eat high calorie products have also greater IAT effect than those subject who care less about calories. (Maison et al., 2001: 8)

Another research conducted by Maison et al. (2004) presented application of IAT in prediction of brand preferences. In all three of their studies, which were focused on

investigation of brand preferences between yogurt brands (Danone and Bakoma), fast food restaurants (McDonald's and Milk Bar), and soft drinks (Coca-Cola and Pepsi-Cola), they validated IAT as a measure of consumers' implicit brand preferences. Maison et al. found that those participants of the study who preferred one brand over another (explicitly) and used it more frequently also showed implicit preferences for this brand. (Maison et al., 2004: 412)

As previously mentioned in 2.8, implicit attitudes are thought to be more strongly influenced by unconscious processing. That is why it is common to observe dissociations (low correlations) between traditional self-report measures and implicit measures such as IAT. Even though the interpretation of IAT results has not yet been settled as to which theoretical position it leans – single-process or single-process theories (see 2.8) (Perkins et al., 2008: 464-465) –, Hofmann et al. suggest in their meta-analysis (2005) that the interpretation is best explained in terms of dual-process theories. Thus, explicit and implicit attitudes are two distinct yet related constructs. (Hofmann et al., 2005: 1381-1382) In regard to brands, Dimofte (2010: 932) mentions that IAT correlates well with explicit measures, particularly in the area of brand preference and choice (Dimofte, 2010: 932). Greenwald et al. (2009) add that the higher the correlation between IAT and explicit measures is, the greater the predictive validity of each is (Greenwald et al., 2009: 17).

**$H_2$:** IAT results will correlate positively with the subjects' intentional purchase behavior.

## 2.11 Cognitive and Affective Constructs from Neuroscience Perspective

As mentioned in the beginning of the literature review cognition and affect, as the most important components standing behind attitudes, play crucial part in the role of advertising effectiveness. As stated in the subchapters about cognitive and affective components, affect refers to the experience of emotions and feelings of consumers, and cognition refers to cognitive abilities such as attention, memory and learning, and so forth. There will be a focus on these named constructs in order to understand how consumers' attitudes and preferences are altered.

Traditionally, consumer and advertising researchers hold the dominant assumption that consumers make choices consciously and rationally based on their explicit attitudes, and hence that advertising influences only the rational 'part' of consumers. However, with new findings, that consumers are typically not aware of the extent to which advertising influences

their attitudes and behavior, it became clear that this assumption required modification. (Maison et al., 2001: 2)

Thus, following subchapters will be devoted primarily to the newest findings within consumer neuroscience which help to understand the mind processes behind the consumer preferences and behavior by using methods and theories from neuroscience.

## 2.12 Attention

Most of the models which were described in the beginning of the literature review by Vakratsas and Ambler (1999) suggest that attention is necessary, and therefore the importance of its understanding for marketers is factual. However, attention has not received a lot of scrutiny in the consumer research (Milosavljevic and Cerf, 2008: 382).

According to Plassmann et al., (2012) attention can be defined as the mechanism responsible for selecting the preferential information while eliminating other available information which can be distracting. What determines the relevance or importance of the preferential information of incoming stimuli is according to Taylor and Fragopanagos (2005) the emotional content of the presented stimuli. According to them, attention is connected to emotions in the way that emotions influence the direction of selective attention. That is an important notion, which will be developed further in the project. (Taylor and Fragopanagos, 2005: 354-357) Attention is a crucial cognitive process which is reflected in eye-movements and contributes to formation of consumer preferences, learning and memory, and so forth (Wedel and Pieters, 2008: 124). Further, the following concepts are fundamental to attention: (1) bottom-up attention or saliency-based attention, (2) top-down attention, (3) visual selection, and (4) working memory. (Plassmann et al., 2012: 21)

The focus will be on the first two, respectively three, components which are being used the most in the consumer neuroscience literature connected with attention (Plassmann et al., 2012; Ramsøy, 2014; Milosavljevic and Cerf, 2008)

It can be stated shortly for the reader that working memory plays a major role in attention. It is a special form of memory with extraordinary capabilities which holds a limited amount of information for periods of seconds while the information is being evaluated. (Knudsen, 2007: 58-60)

According to Wedel and Pieters (2008), only about 8% of visual field is available for detailed processing. Yet the amount of information which is available to be processed still exceeds what the brain can process. Thence, brain has attentional filters that enable individuals to

select a subset of relevant information. These are further processed. (Wedel and Pieters, 2008: 124)

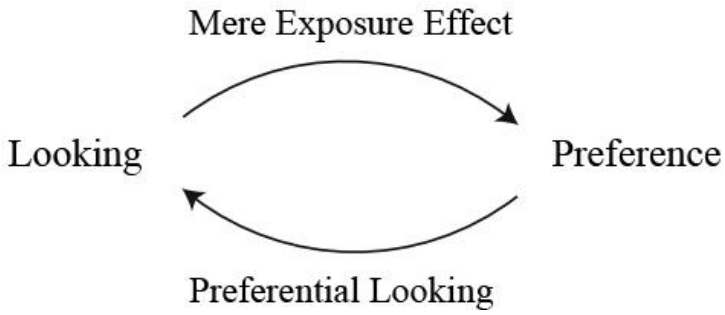
These two filters, or types of attentions, are called bottom-up and top-down, and determine whether an incoming information is processed or not (Dijksterhuis and Aarts, 2009: 470). Bottom-up attention is automatic, rapid, and involuntary (Milosavljevic and Cerf, 2008: 383). It means that bottom-up (or salient) filters automatically and immediately select the most important information out of all the information available without an individual's willful focus of mind. This selection is based on low-level factors of the visual input such as color, intensity, size, shape, movement, contrast, faces, text, novelty, etc. These salient stimuli have a strong influential effect on the initial eye movements, and thus, when presented in an advertising content, they have a profound influence on consumers' related preferences and behavior. (Plassmann et al., 2012: 21)

Top-down attention, in contrast to bottom-up attention, is controlled, slow and voluntary. According to Dijksterhuis and Aarts (2009: 471), most attentive processes are driven by top-down concerns. This means that top-down filters are not automatic, but instead require active selection and mobilization, thus they are volitional. The amount and duration of attention devoted to the information is then determined by active goals. That is, the more relevant the information is for goal, the more is attended. (Dijksterhuis and Aarts, 2009: 471; Taylor and Fragopanagos, 2005: 353) Hence, to put it in other words, top-down attention is mostly internally generated and driven and an individual focuses his or her attention on a specific item or though (Plassmann et al., 2012: 21; Ramsøy, 2014). For example, a consumer who is looking for specific brand in a store, or waiting for a specific commercial, uses the top-down filters. In some cases, top-down attention can moderate the bottom-up attention (Milosavljevic and Cerf, 2008: 384).

Lastly, visual selection is based on combined effects of top-down and the bottom-up filters (Knudsen, 2007: 69). It occurs when the most important information is chosen out of all the identified information that is potentially important for the individual. Also, together with eye movement, it enhances the quality of incoming information. Gaze bias shows that the longer consumers spend time examining (longer fixation time) objects, the higher the preferences they have towards it. (Plassmann et al., 2012: 22) Gaze fixation which represents fixed attention of consumer while looking at stimuli will be more described in the following section of eye-tracking. Glaholt and Reingold (2009) are referring to such a process (gaze bias) as the

preferential looking. Thus it can be stated that the longer consumers tend to look at a stimulus, the more they like it. Glaholt and Reingold also add that another process, which is related to looking behavior and interacts with the preferential looking in increase of preferences, is the mere exposure effect (already described in 2.6.1). (Glaholt and Reingold, 2009: 445)

**Figure 8: Feedback Loop between Looking Behavior and Preference (Glaholt and Reingold, 2009: 446)**




These two processes combine to create a positive feedback loop as demonstrated in the figure 8 (Glaholt and Reingold, 2009: 445).

### 2.12.1 Attention and (Un)Consciousness

As Dijksterhuis and Aarts (2009) assert, there is a distinction between attention and consciousness. Each human eye has about one million fibers which transfer information from the outside to a brain. That means that an individual has to deal with about one megabyte of raw data every second. This leads to the notion that one cannot process all the data consciously. As Dijksterhuis and Aarts further add, many important unconscious processes do not need any conscious guidance. (Dijksterhuis and Aarts, 2009: 470-471)

As Dijksterhuis and Aarts (2009) state, consciousness is a complex issue and scientists have struggled with it for a long time. As stated in the beginning of the project, consciousness is defined as a condition which is accompanied by awareness of having a clear and vivid experience about particular events, stimuli or thoughts. Thence, top-down attention and consciousness are correlated in real-life experience, since top-down filters are engaged when an individual is being actively attentive towards some stimulus. Unconsciousness, on the other hand, can be defined as a condition which is not accompanied by awareness of having an experience about particular events, stimuli or thoughts. Yet at some point unconscious processes can become conscious. Hence stimuli that do not reach conscious awareness can still influence various psychological processes, such as behavior, preferences and so forth.

Though, in order for these effects to occur, at least some degree of attention is necessary. (Dijksterhuis and Aarts, 2009: 471; Ramsøy, 2014)

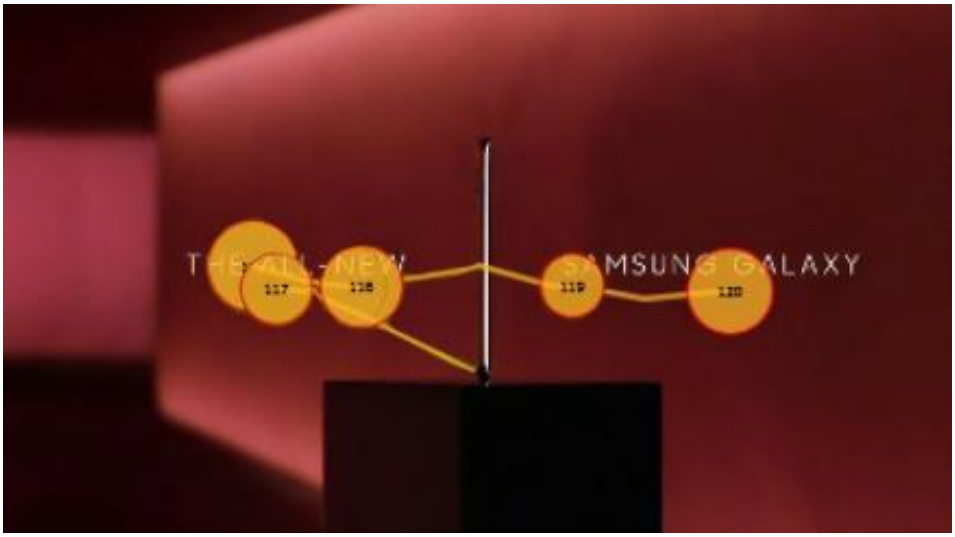
Ramsøy and Skov (2014) claim that within consumer research and advertising in general, conscious processing has advantages over unconscious processing. The advantage is that if a stimulus reaches consciousness, it is more likely to affect consumer behavior, including memory, preferences, etc. They also add that the likelihood that a stimulus reaches consciousness depends on how much it is being preferred. (Ramsøy and Skov, 2014: 2)

### 2.12.2 Measures of (Visual) Attention

In visual advertising, consumers have to move their eyes in order to process the advertising stimuli, and eye movements are tightly connected with visual attention. From the traditional point of view attention can be measured by self-reported measures of liking, excitability, informativeness, and others which require deliberate effort. (Milosavljevic and Cerf, 2008: 385) The newer direct way of how to measure attention in consumer research represents a method called eye-tracking. As Ramsøy (2014) states, in measuring attention, researchers and advertisers cannot only use the traditional self-report measures in order to understand what caught consumers' attention. This is because for the consumers, it is an impossible task to answer what caught their attention due to the amount of information they are processing. Thence, only the eye-tracking method will be further developed, since in this project, the main interest is revolving around the contribution of neuroscience in the concept of consumer preference. Eye-tracking serves as one of the most accessible methods for capturing consumer responses towards advertisements. (Ramsøy, 2014; Venkatraman et al., 2015: 438)

It reflects both bottom-up and top-down mechanisms. The eye-tracking data are composed of gaze fixations and saccades. Gaze fixations represent the time periods during which the eyes are relatively still while fixed at some specific stimulus. This typically lasts between 200 - 500 milliseconds. Saccades, on the other hand, represent rapid eye movements between two fixations. As can be seen in the figure 9, gaze fixations result in numbered circles which represent each fixation, and saccades mark the scan path in between the gaze fixations, which is represented by lines. These two together reveal the consumer's engagement to the ad elements across the advertisement. (Ramsøy, 2014; Wedel and Pieters, 2008: 123-124)

**Figure 9: Gaze Fixations and Scan Path in Samsung Commercial (Own Source)**




Eye-tracking provides a moment-to-moment measure of attention of a consumer exposed to visual stimuli as it has a high temporal resolution[5]. Optical cameras identify the exact position of the pupil and cornea of a participant, and track the gaze direction while the participant is examining the stimuli. Eye-tracking has been often used to measure consumer attention in television advertising, print advertising, online advertising and others, and is perceived as a well validated tool. (Venkatraman et al., 2015: 439; Wedel and Pieters, 2008: 126; Wang and Minor, 2008: 212)

There are two types of eye-tracking: stationary and mobile eye-tracking. Since the mobile eye-tracking is mostly used in the in-store environments, where participants are allowed to stroll around the shelves and stands, it will not be further examined in this literature review. Stationary eye-tracking, on the other hand, takes the place in the majority of eye-tracking researches. As mentioned, eye-tracking involves the use of optical cameras which in case of stationary eye-tracking are placed below the computer screen. (Ramsøy, 2014)

As mentioned, some elements (motion, salient objects, emotional stimuli, and so forth) have higher likelihood to capture the attention of a participant's eye movement than others. By tracking the gaze, researchers and advertisers can capture which information of stimuli was processed as well as the duration of these processes. Also, it shows the hierarchy of perceptions of the stimuli, thus, which stimulus was perceived earlier, later, or not perceived at all. This helps researchers and advertisers to investigate what the points of fixations are, the

[5] The ability to see changes across time

duration of fixations and the scan path in order to see what the regions caught the interest and what regions or information were missed by the participants. Thus, the eye-tracking method can identify the flow of visual attention and its strongest attractors. The visual flow is represented by the scan path and gazes fixations (figure 9). (Ohme et al., 2011: 64; Venkatraman et al., 2015: 439)

In relation to the analysis, Venkatraman et al. (2015) claim that the percentage of valid gaze fixations suggests an index of an overall attention to the ad relative to distractions. Further, the number (or frequency) of fixations and their dwell times provide a measure of depth of which the information is processed. Moreover, the longer the dwell times of the gaze fixations along with fewer fixations represent more detailed processing. (Venkatraman et al., 2015: 439; Wedel and Pieters, 2008: 136) The duration of fixations depend on stimulus features such as information type, complexity, etc. (Wedel and Pieters, 2008: 136).

It was stated before that the longer the fixation an individual has towards a stimulus, the higher the preference he or she has towards it. This heuristic is strongly supported by the majority of researchers. However, Ohme et al. (2011) does not fully agree with this statement. Ohme and colleagues (2011) frequently found that the most visually attended objects (mostly emotional objects) do not trigger only positive reactions, but instead they can cause neutral or negative reactions. Hence, the more attentional focus an object receives does not necessarily mean that it leads to positive reaction and therefore to higher preferences. This suggestion advocates that both negative and positive stimuli can capture and hold participants' attention. (Ohme et al., 2011: 64-65) Also, this suggestion goes in hand with the previous notion from 2.12, that emotions and attention are connected, and that emotional objects (be it positive, neutral or negative) influence the direction of selective attention. (Taylor and Fragopanagos, 2005: 354-357)

Even though attention is connected to emotions, eye-tracking cannot determine what emotional experience is associated with the stimuli the participant is observing. Thus, when eye-tracking is used alone researchers and advertisers cannot proclaim that a particular object or a region, which is being visually attended the most, positively influence the preferences of consumers. (Ohme et al., 2011: 65)

On the other hand, eye-tracking can measure pupil dilation which is associated with emotional reaction known as arousal. Arousal is next to valence another dimension of emotions (this will be described more in the subchapter of emotions; 2.14). Ramsøy (2014) acknowledges that

pupil dilation can be caused by many factors: changes in illumination, cognitive load, and as stated arousal, he suggests that if these factors are controlled, pupil dilation is reliable index of arousal. (Ramsøy, 2014) Ohme et al. (2011), however, point out that pupil dilation is questionable and cannot be considered as an indicator of affective states while standalone (Ohme et al., 2011: 65).

In order to summarize above-stated, eye-tracking, more specifically gaze fixation count and its dwell times are measures of attention, while the pupil size can measure affect, respectively arousal as a one dimension of emotions (Venkatraman et al., 2015: 440).
As eye-tracking represents one of the applied methods in this research, another hypothesis can be proposed:

**$H_{3a}$:** Change in the implicit brand preference can be explained by the number of gaze fixations and dwell time obtained from the eye-tracker.

## 2.13 Learning and Memory

Learning and memory represent other closely related cognitive abilities (Pluzinski and Qualls, 1986: 233), which are crucial in consumer research and in the study of preferences which is the core of this project.
The definition of learning and memory in this project is following: Learning refers to the acquisition and containment of information; Memory refers to the mechanisms which contain previously obtained information or past experiences that subsequently influence behavior (Ramsøy, 2014; Venkatraman et al., 2015: 438). These two concepts are therefore tightly interconnected. Further, consumers' memory is associated with encoding, consolidation, storage and retrieval processes. Encoding is the first step of creating a new memory which occurs during the event and enables the perceived stimulus to be stored into a memory. Consolidation, which occurs during the intervening period, is a process of stabilization of the memory trace. Storage is a process of retaining information in the brain, more specifically in a specific memory (sensory memory, short-term or long-term memory). Finally, the retrieval process refers to re-accessing of the memory of the perceived stimulus from the past, which occurs at a future time, thus after the memory is created. (LaBar and Cabeza, 2006: 55; Venkatraman et al., 2015: 438)
In the subchapter about implicit attitudes (2.9), it was mentioned about implicit and explicit memory proposed by Graf and Schacter (1985). These two concepts will be further developed

as Plassmann et al. (2012) suggest that the previously mentioned processes (encoding, consolidation, and retrieval) also happen on an unconscious level. Thus, conscious (explicit) and unconscious (implicit) memory represent the dominant model for understanding of memory function. Plassmann and colleagues also add that there is a strong connection between memory and preferences. (Plassmann et al., 2012: 27)

Explicit memories, also labeled as declarative memories, are those which can be explicitly stated by a consumer, and therefore, he or she is consciously aware of existence of such a memory. Thence, in other words, explicit memory is indicated when a consumer consciously and intentionally tries to access the information from memory. On contrary implicit memories, also known as non-declarative memories, are those that consumers cannot utter consciously, even though there is still evidence that some kind of information has been retained in the memory. (Ramsøy, 2014)

The latter type of memory contains different memory functions which are important in marketing and advertising in general, and serve as means of how consumers can create and alter their preferences toward brands. These functions are represented by priming effects and evaluative conditioning. Priming effect represents a crucial function for branding effects to occur. (Ibid.) It refers to the process by which a prior exposure to a stimulus increases the general accessibility of the stimulus which subsequently influences a response to a later stimulus (Finlay et al., 2005: 443). This means, in other words, that if a consumer was exposed to a positively valenced stimulus or an information attribute, he or she will imbue this acquired experience into the later stimulus, object, or brand. Hence, for example, consumers tend to have higher preferences toward products they believe are of high-quality or high-valued brands. (Ramsøy, 2014)

Another function of implicit memory is evaluative conditioning, which was described in the subchapter 2.6.2. Here will be just a summarization for the reader. Evaluative conditioning stands for a transfer of affect, either positive or negative, from one stimulus to another. More specifically, when an object or stimulus (the conditioned stimulus) is paired with a positively or negatively valenced object or stimulus (the unconditioned stimulus), the conditioned stimulus take on the valence of the object it is paired with. (Dijksterhuis and Aarts, 2009: 478) Moreover, evaluative conditioning results in the formation and change of preferences (De Houwer, 2012: 1179). Ramsøy (2014) suggests that this learning mechanism is truly powerful in marketing and advertising in general as consumers can learn to associate brands with a positive or negative outcome, and thus distinguish brands from one another. (Ramsøy, 2014)

Attention plays a crucial role in learning and memory. Attention selects important information for further selection and evaluation, which is subsequently encoded. (Fitzsimons et al., 2002: 271) Dijksterhuis and Aarts (2009) claim that the principle of implicit learning follows the assumption that learning mechanisms rely either on bottom-up or top-down processes. In case of bottom-up processes, those learning mechanisms are able to operate unconsciously, whereas top-down processes are assumed to require conscious awareness. Therefore, consumers can learn brand associations automatically and without conscious awareness. (Dijksterhuis and Aarts, 2009: 476-477)

Interestingly, it was assumed that information that is being consolidated in consumer's memory is stable and only the information which is being encoded is somewhat unsteady. However, recent findings in neuroscience challenged this notion showing that there is a dynamic nature of memories, and even powerful memories with associative network can be altered or possibly even eliminated. This notion suggests that the retrieval stage is an active and dynamic relearning process, and that advertising which evokes affective reactions can lead to change of consumers' preferences. (Plassmann et al., 2012: 28)

### 2.13.1 Measures of Memory

#### 2.13.1.1 Traditional Measures

Consumer research has primarily focused on the retrieval aspects in the evaluation of ad quality in order to assess whether the content of a message has been successfully recalled, and/or whether there has been a change in attitude toward the object of communication. Particularly two traditional self-reported measures have been used the most in this matter, i.e., recall and recognition, both of which tap into explicit memory and represent direct measures. Thus, these are used to measure the retention of information which is processed explicitly. In recall task, the participant generates the target with limited or no cues, and in recognition, he or she distinguishes between the target and distractors. (Finlay et al., 2005: 443; Venkatraman et al., 2015: 438) Since this project is revolving around implicit memory, these two measures will not be further developed.

#### 2.13.1.2 Consumer Neuroscience Methods

##### Functional Magnetic Resonance Imaging (fMRI)

Another method that is being used in consumer neuroscience for measuring memory, as it can directly measure the strength of encoding during the exposure of advertisement, is the

functional magnetic resonance imaging (or fMRI). fMRI is the most popularized method out of all neuroimaging methods. (Ramsøy, 2014)

fMRI is a non-invasive brain mapping method which is based on using a functional MRI scanner in order to detect and visualize the changes in blood oxygenation flow in the brain produced by neural activity during cognitive tasks. Neural activity triggered by a specific cognitive task (such as processing an ad) consumes more oxygen within particular brain regions that are being activated than in others. This leads to changes in magnetic properties as there appear distortions in concentration of hemoglobin which leads to rise of the signal that can be subsequently measured by fMRI. Hemoglobin has different magnetic properties which depend on its oxygenation state. This means that the higher the oxygen consumption in a particular brain (due to neural activity), the higher the decrease of hemoglobin which gives rise to the fMRI signal. (Ramsøy, 2014; Venkatraman et al., 2015: 440)

In comparison with other neuroimaging methods, such as EEG, which is going to be listed further on, fMRI has a very high spatial resolution[6] at below 1mm resolution. Thus is able to measure subtle changes in brain activity, including the activity in the regions which are hidden deep under the skull. (Ramsøy, 2014)

Although, as mentioned, fMRI can be used to measure memory (regions), this does not inhibit the researchers to measure other regions, or see what regions are being activated during different tasks. By measuring differences in the blood flow fMRI actually allows to see the activation in other brain regions, which are responsible for emotions or attention. Hence, fMRI can be used to measure both cognition and affect. (Venkatraman et al., 2015: 441) Further, findings from neuroscience suggest that a particular brain region is active in implicit valuation and processes of preference independent of conscious awareness, which suggest that fMRI is also able to directly detect consumer preferences (Boksem and Smidts, 2015: 483).

While fMRI is a powerful measure it also has its downsides. One of them is a low temporal resolution (approximately 2-5 seconds). Secondly, perhaps a major downside is its high cost and requirement of great knowledge revolving data analysis. (Venkatraman et al., 2015: 441; Ramsøy, 2014) Even though fMRI provides the highest predictive value among other neuroscience measures, it does not provide the most natural environment. It is because fMRI requires that participants lie in a narrow tube, which is commonly uncomfortable. Lastly, fMRI is very noisy as the level of noise typically exceeds 90 decibels. Boksem and Smidts

[6] How effectively the brain regions can be differentiated

(2015) state that there is evidence that these effects may have substantial negative impact on participants, possibly distorting the relationship between brain and behavior. (Boksem and Smidts, 2015: 483)

## 2.14 Emotions and Feelings

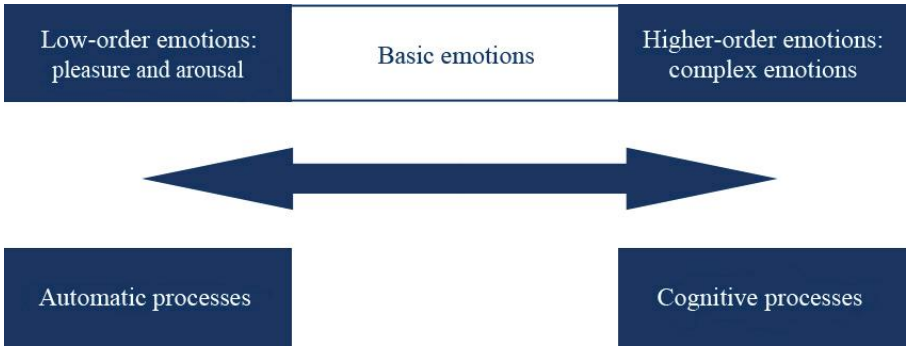
Finally, two constructs of affective component – emotions and feelings – are going to be presented as the last major parts which stand behind the formation and change of consumer attitudes.

It was stated before that the majority of researchers assumed that affective reactions, if any, occur as post-cognitive. Therefore, cognition processes mediate necessary conditions for emotions. (Lazarus, 1981: 222) Zajonc (1980) challenged this view by the notion that "in fact, it is entirely possible that the very first stage of the organism's or individual's reaction to stimuli and the very first elements in retrieval are affective." Thus emotions precede cognition and affective processes are in fact independent of the cognitive ones. Moreover they can mutually influence each other in the development and alteration of preferences. (Zajonc, 1980: 151, 154)

This notion led to rise of two different paths of emotions in literature, as can be seen on the emotional continuum in figure 10. One path, on the right side of the continuum, represents complex emotions that depend on cognitive processing (Lazarus, 1981) of the stimulus and need to be consciously processed. The other path, on the left side of the continuum, represents low-order emotions (Zajonc, 1982; Zajonc and Markus, 1982) that are unconscious and automatic and do not require any cognitive processes. According to Poels and Dewitte, these kinds of emotions mainly involve pleasure (valence) and arousal reactions. (Poels and Dewitte, 2006: 5)

Thirdly, Poels and Dewitte suggest that there is another type of emotions, so called basic emotions, which represent a mixture between two previously mentioned emotions (Poels and Dewitte, 2006: 6).

**Figure 10: The Emotional Continuum (Poels and Dewitte, 2006: 6; Own illustration)**




The influential work by the neuroscientist Damasio (1994) brought more progress in the study of emotions as he presented his somatic marker concept. Damasio's conception and evidence showed that emotions are essential for cognitive processes and subsequent behavior, which they either guide or bias. (Damasio, 1994: 167-201) This led to the notion that emotions play one of the most crucial factors in advertising process (Poels and Dewitte, 2006: 3).

Since emotions play such an important role, it is also important to define what exactly the term emotion stands for. Emotions represent an individual's bodily or inner expressions toward a stimulus that are typically occurring without and/or before consciousness. They are patterned collections of chemical and neural responses produced by the brain. This process happens when the brain detects emotional stimuli toward which it responds with certain repertory of action. While the processing of the stimulus can be conscious, though it is not required, the emotional responses are triggered automatically and unconsciously. (Ramsøy, 2014)

Further, most of the emotional responses are outwardly directed and publicly observable either with the naked eye, or with neuroscientific methods. So, the main target of the emotional response is the body, resulting in the changes such as visible bodily or facial expression, change in sweating, pulse, respiration and so forth, which creates a particular emotional state. As Damasio (2001) states, although the main target of the emotional responses is the body, there are also targets within the brain itself. These types of brain-targeting responses might have consequences resulting in the change of attention, and others. To summarize, emotions are not subjective, private, elusive or unaccountable, but can be investigated objectively. (Ramsøy, 2014; Damasio, 2001: 781) Therefore, this modern definition of emotions from neuroscientific perspective goes hand in hand with the previously

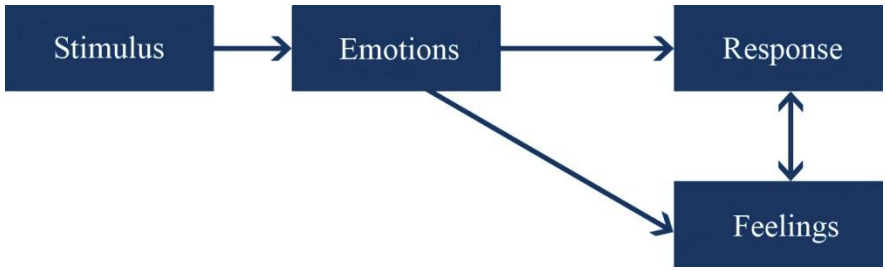
mentioned left path (low-order emotions) of the emotional continuum as presented in the figure 10.

Even though they rise from emotions and are closely related, but separable concepts, Ramsøy (2014), Damasio (1999, 2001) and other neuroscientists are referring to higher-order emotions as to feelings.

Ramsøy (2014) defines feelings as an individual's direct consequence of being in a certain emotional state which is always accompanied with consciousness. Damasio (2001) adds that feelings symbolize mental representation of the physiological changes which characterize emotions. Unlike unconscious emotions, conscious feelings are not scientifically public but instead are private and hidden to public, thence subjective in a nature. Because of this, feelings are sometimes difficult to analyze. (Damasion, 1999: 36, 42; Damasio, 2001: 781; Ramsøy, 2014)

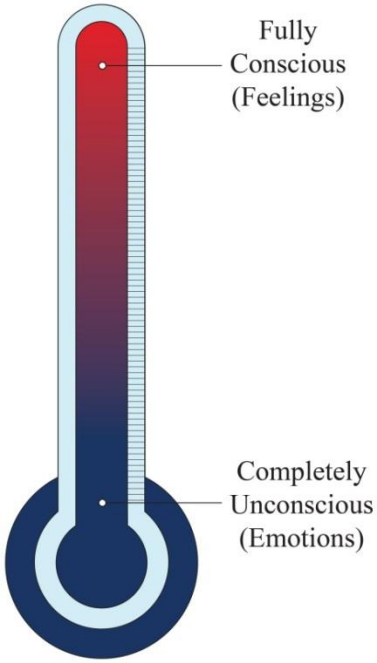
Since feelings symbolize mental representation of emotions, it is of the importance to highlight the fact that emotions precede feelings and can in fact occur without feelings. Thus on the contrary, feelings cannot occur without emotions. Therefore, unconscious emotions appear first when an individual is exposed to a stimulus and then, if a stimulus elicits strong emotions enough to elicit feelings, they are followed by conscious feelings. (Damasion, 1999: 43; Ramsøy, 2014)

**Figure 11: A Tentative Model between Emotions and Feelings (Ramsøy, 2014; Own illustration)**




It was previously stated by Maison et al. (2001: 2) and other researchers that consumers are not always conscious in what extent advertising stimuli influences their responses. This notion is represented by figure 11. One can see that a stimulus leads to an immediate emotional reaction, which can (directly or indirectly) initiate a consumer response, such as a particular choice, change in preference, etc., unconsciously. Feelings, on the other hand, typically occur after emotions have already led to a particular consumer response. But they can also occur after emotional reaction and subsequently lead to a consumer response. (Ramsøy, 2014)

**Figure 12: Emotional Thermometer (Ramsøy, 2014; Own illustration)**




The reason why feelings cannot occur without emotions is because feelings are primary based on strong emotions. This means that the stronger the emotion is, the higher the chance is that this emotion will emerge into a subjective feeling and therefore becomes conscious. (Ibid.)

However, there is no specific point of transition where an emotion become conscious, and therefore emerges into a feeling which an individual can refer to. Instead, Ramsøy (2014) suggests that there is a smooth transition.

### 2.14.1 Dimensions of Emotions and Feelings

Poels and Dewitte (2006) in the emotional continuum mention that low-order emotions mainly involve pleasure and arousal reaction toward a particular stimulus. Thus they are dealing with those two concepts as only if they occur in the unconsciousness (Poels and Dewitte, 2006: 6). That is, however, not the case of nowadays well accepted findings which suggest that affect, which covers both emotions and feelings, can be classified into two dimensions, i.e., valence (which is similar to pleasure) and arousal (Venkatraman et al., 2015: 438). Hence, even higher-order emotions in the emotional continuum and/or feelings have these two dimensions as well, which pertain to the strength and direction of unconscious emotional responses (Ramsøy, 2014).

The definition of these two dimensions is following: arousal represents bodily or physiological (in terms of emotions) and subjective (in terms of feelings) response intensity of general excitement, which is ranging from low to high. However, even though arousal can suggest the amplitude or strength of an emotional response, and hence it can be seen as a relevancy response, it cannot determine the direction or valence of an emotional reaction. Arousal is bivalent, therefore, can be both low and high to positive or negative stimuli. Nevertheless, Ramsøy (2014) claims that high arousal scores are found for highly appealing or negative stimuli, whereas low arousal scores are associated to boredom. Valence represents consumer emotional response which indicates the relative evaluation (pleasantness or unpleasantness) of a stimulus. Valence therefore ranges from negative to positive. Henceforth, these two dimensions together compose emotions and subsequent feelings. (Ohme et al. 2011: 62; Ramsøy, 2014; Venkatraman et al., 2015: 438)

### 2.14.2 Emotions in Relation to Other Concepts

As above stated, emotions are either directly or indirectly connected to consumer responses. This means that when consumers are exposed to a stimulus that triggers either positive or negative emotional response, it will subsequently lead to some kind of consumer response such as approach or avoidance behavior. (Ramsøy, 2014)

Further, emotions stand behind alteration in cognition, and hence are tightly related to other brain activities such as attention, learning and memory, which they influence and/or regulate. It was mentioned in the section about attention that emotional stimuli influence selective attention in a way that it drives its direction. This means that when a stimulus evokes emotions an individual's attention processes are triggered while other non-emotional stimuli are ignored (Taylor and Fragopanagos, 2005: 357). Ramsøy and Skov (2014) add that positively valenced emotions regulate and alter attention, which subsequently lead to operant and evaluative conditioning effects, and therefore lead to changes in consumer preferences (Ramsøy and Skov, 2014: 2).

Emotions also play crucial role in learning and memory. More specifically arousal and valence have an impact on different forms of memory – both explicit (declarative) and implicit (non-declarative). LaBar and Cabeza (2006) further suggest that emotions have immediate effect on memory processing, especially encoding and consolidation. (LaBar and Cabeza, 2006: 54-55) Evaluative conditioning as a process of non-declarative memory is influenced by emotions, as one of the regions which stand behind processing positive and

negative emotional responses is directly linked to this function (Ramsøy, 2014). Plassman et al. (2012) suggest that memories have a dynamic nature and affective stimuli, such as advertising, can unconsciously or consciously alter memories (Plassman et al., 2012: 28-29).

### 2.14.3 Measures of Emotions

#### 2.14.3.1 Traditional Measures

Even though Poels and Dewitte (2006) highlighted the distinction between the lower- and high-order emotions in their emotional continuum, they are still treated as the same concept. (Poels and Dewitte, 2006: 6-7) Since now there is a clear distinction between lower- and higher-order emotions based on the definition of emotions and feelings. Emotions, due to their unconscious nature, cannot be assessed by researchers and marketers by the traditional self-report measures as Poels and Dewitte (2006:7) suggest. It is simply because an individual cannot access his/her unconsciousness (Ramsøy, 2014). Thus, only feelings (or higher-order emotions) can be assessed with verbal and visual self-report measures. These include measures such as PAD and EPI in verbal self-report measures, and AdSAM and Premo in visual self-report measures (Poels and Dewitte, 2006: 7-12). Those will not be further described here, since the investigation of the project is to analyze consumer neuroscience methods. Therefore, only autonomic and neuroimaging measures will be subsequently listed in the upcoming subchapters.

#### 2.14.3.2 Consumer Neuroscience Methods

##### Electroencephalography

Electroencephalography (EEG) is perhaps the most commonly used method in consumer neuroscience research (Venkatraman et al., 2015: 439) as it represents, next to fMRI, another neuroimaging method. EEG uses electrodes, which are applied on the scalp of an individual to register continuous changes in brain activity, which are represented by brain waves, produced by cortex. The variations of brain activity are closely correlated with different physiological phenomena – cognitive, affective, and behavioral. (Ohme et al. 2011: 61) It is non-invasive and silent method which allows for relatively natural testing conditions. Further, EEG provides high temporal resolution, which enables to measure cognitive and affective consumer responses toward advertising content in a real-time. It means that the brain activity can be recorded every 1 to 3 milliseconds. Another advantage of EEG is its cost, which is approximately .5% of an fMRI machine and its cost per hour is also significantly lower. However, it is extremely difficult to analyze the source of EEG activity as its spatial

resolution is low because it is measuring only cortical brain activity, whereas fMRI has excellent spatial resolution. (Boksem and Smidts, 2015: 483-484).

Hence EEG has been mostly used in investigating the memorability of commercial messages, consumers' attention while exposed to commercials, and recently in the research of preferences executed by Boksem and Smidts (2015) (Boksem and Smidts, 2015: 483). EEG is also capable of measuring frontal asymmetry, which has a relationship with affect. Here, greater relative left frontal activity is associated with positive emotional reactions, whereas right frontal activity with negative emotional reactions. Thence, EEG can be a direct measure of cognition (attention and memory), affect (emotional valence) (Ohme et al. 2011: 62; Venkatraman et al., 2015: 439), and preference (Boksem and Smidts, 2015: 490).

### Facial Expressions

Facial expressions serve as an indicator of an individual's emotional state (Poels and Dewitte, 2006: 16), and thus, mediate positive or negative valence. Although there are some expressions which can be controlled consciously by the individual, there are many of facial expressions which are driven by unconscious emotions, and can be therefore measured. Thus, an index of facial expression serves as a tool for understanding consumers' emotions and responses toward stimuli, such as advertising content. (Ramsøy, 2014)

There are two types of facial expression measures: Facial Action Coding System (FACS) and Facial electromyography (EMG). These have been applied in advertising research by Texeira et al. (2012; Automated Facial Coding) and Ohme et al. (2009; EMG) to test the effect of commercials. FACS was developed by Ekman and Friesen (1978) and represents coding systems through which can researchers analyze visible facial expressions manually from a video footage. However, manual coding is prone to error and is laborious. (Texeira et al., 2012: 145)

Its relatively novel version which is called automated facial coding is one of the fastest increasing and most discussed methods. It is primarily due to its advantages over its older version, which primarily lie in price, ease of use (it is automatic and does not require time consuming manual coding), and potential scalability. (Ramsøy, 2014) The FACS requires experts to analyze micro-expressions in consumers' emotional changes, while the automated facial coding only requires a PC camera. Thus, algorithms used in automated coding outperform expert coders and are approximately as accurate as them. Further, automated facial coding has high temporal resolution as it can detect emotions at a rate of 4Hz (every

250 milliseconds), which is much faster than in manual coding. (Texeira et al., 2012: 145) However, according to Ramsøy (2014) this method has certain issues primarily in terms of its validity, which needs to be address more before it can be fully used in consumer neuroscience research. Nevertheless, this method is still valid for measuring emotional valence. (Ramsøy, 2014)

However, FACS and automated facial coding can only measure those facial expressions which are visible enough so the PC camera or the manual FACS coder can capture them. (Kodra et al., 2013: 1-2; Poels and Dewitte, 2006: 16-17) EMG represents a more precise measure of facial expressions as it can identify facial muscle activity which is not visible, and therefore cannot be registered by FACS or automated facial coding method. (Poels and Dewitte, 2006: 17) EMG evaluates the physiological properties of three facial muscles, which are responsible for frowning and smiling. Even though it is a very precise measure of emotional reactions, it also has its limitations. It is an invasive method as it requires application of electrodes which measure the facial muscle activity. (Ohme et al. 2009: 23) This is a limitation which can lead to change in consumers' awareness to become more conscious of their facial expressions while being tested, and subsequently reduce the validity of this method. Other limitation is that facial EMG has to be completed in unnatural lab settings, hence the problem of ecological validity is arising. (Poels and Dewitte, 2006: 18) However, the measure is valid and reliable in measuring the direction of affective responses, thus valence (Wang and Minor, 2008: 207).

Automated facial coding represents the second applied method in this research, and thus another hypothesis can be proposed:

**$H_{3b}$:** Change in the implicit brand preference can be explained by the positive and negative valence values obtained from the automated facial coding.

### Skin Conductance

Skin Conductance (SC), as another measure of neurophysiological reactions, is a frequently used as a measure of the autonomic nervous system (ANS), which is responsible for arousal; higher activity of ANS leads to increase in skin conductivity (Poels and Dewitte, 2006: 18).
Ohme et al. (2011) state that the application of SC in advertising and consumer neuroscience research has been scarce, however, in recent years this measure has become more popular as

there are more than 20 studies using this method. SC is defined as a monetary change in electrical conductivity of the skin in a response to the secretion of sweat in the sweat glands followed by exposure to certain stimuli (Lajante et al., 2012: 238-239). The greatest density of these glands is at the palmar surface of the hands – from which is SC typically measured – and at the feet. SC is a non-invasive method which uses two electrodes which are typically placed on two fingers of the same hand and measures the relative change in electrical conductivity between them. (Poels and Dewitte, 2006: 18; Ramsøy, 2014)

SC includes a tonic activity (slow) and phasic activities (fast). These two components has to be evaluated separately as the tonic activity gives the basic level of conductance (skin level conductance; SCL), and the phasic activity symbolizes activation of ANS by the presentation of a stimulus (skin conductance response; SCR). SCL and SCR activities together represent the level of overall conductance. The most common applied technique in consumer neuroscience is based on the sum of SCR amplitude values. (Lajante et al., 2012: 239, 242) In overall, SC provides reliable and valid direct measure of arousal (Wang and Minor, 2008: 205) which is being used in advertising (Venkatraman et al., 2015: 439).

However, this measure also has its limitations as it cannot determine the direction (valence) of an emotional reaction, since arousal can be both high and low for both positive and negative advertising stimuli (Ohme et al., 2009: 24). Further, it has a low temporal resolution as the differences in electrical conductivity occur between 1-3 s to 1-5 s after onset of a stimulus (Lajante et al., 2012: 240).

Skin conductance as the last method in this research figures in the last hypothesis:

**$H_{3c}$:** Change in the implicit brand preference can be explained by the sum of SCR amplitude peaks obtained from skin conductance.

## 2.15 Summary of Consumer Neuroscience Measures

The table below summarizes above stated as it features each measure which has been listed throughout the literature review in order to highlight the concept/s it measures. This serves as an aid for the reader for the subsequent list of hypotheses and data analysis.

**Table 2: Methods and the Constructs They Measure (Venkatraman et al., 2015: 440; Own Source)**

| | Cognition | | Affect (emotions) | | Preference |
|---|---|---|---|---|---|
| | Attention | Memory | Valence | Arousal | |
| EEG | x | x | x | | x |
| Eye-tracking (Pupil dilation) | x | | | (x) | |
| Facial Expressions | | | x | | |
| fMRI | x | x | x | x | x |
| IAT | | x | x | | x |
| Skin Conductance | | | | x | |

## 2.16 Summary of Literature Review

Within the literature chapter, the main emphasis was put on the formation and alteration of attitudes, as well as the difference between implicit and explicit attitudes, along with the newest findings within consumer neuroscience.

Throughout the beginning of the literature review, affect and cognition were identified as two primary independent components standing behind attitude and preference alteration and formation. Various theoretical explanations were highlighted within the affective component as there was a notion that affective reactions are prior to cognitive ones. Newest findings within consumer neuroscience follow the same notion as emotions influence and alter cognition and guide the subsequent consumer responses.

Further, the distinction between implicit and explicit attitudes was described due to a notion from social psychology. This notion has started to shift the approach within advertising research as it suggests that consumers are not always consciously aware of how advertising influences their responses. Implicit association test was presented as the main measure of implicit attitudes.

Lastly, consumer neuroscience literature has contributed to the last part of this literature review with its focus on affective and cognitive components as well as on unconsciousness consumer processes. Three main concepts – emotions (affect), memory and learning (cognition), and attention (cognition) – were closely described and linked to the concepts of attitudes and preferences. Subsequently, chosen consumer neuroscience measures of these three concepts were presented. This gives the reader an overview of methods which are applied nowadays in collaboration with the traditional self-report measures in order to provide more accurate answers to researchers' questions.

# 3 Methodology and Research Methods

## 3.1 Pre-conceptions and Purpose of the Research

This research has been guided by an immense interest in consumer neuroscience which is a combination of the study of consumer psychology and consumer behavior is applying neuroscience to marketing. Thus, the interest lies in the understanding of how consumers respond toward specific stimuli, particularly ads, and how this influence their latter preferences.

Theoretical findings as well as methods used in consumer neuroscience provide means of objective and reliable predictors of consumer responses and behavior, which is why this science is gaining on its popularity in the academic literature as well as the practical world. (Boksem and Smidts, 2015: 482, Venkatraman et al., 2015: 437)

This research addresses the question of *"How Can Consumer Neuroscience Contribute to Analyze the Change of Implicit Brand Preferences toward Mature Brands as a Response to Commercials?"* which is exploratory in its nature. Further, the form of this research is an experiment which investigates causal links between variables. Thus, application of various neuroscientific methods serve as intermediaries of the theoretical concepts, which have been highlighted in the literature review, in order to explain the change of consumer preferences after being exposed to a visual stimulus. So, the emphasis is put on the exploration of relationships between the independent (measures) and dependent (preference) variables. (Saunders et al., 2009: 139, 142)

## 3.2 Methodological Viewpoint

In the beginning of every project, it is important to define the viewpoint of the researcher that is underlined by the philosophical assumptions. These guide the further investigation of the research from the epistemological and ontological point of view. (Saunders et al., 2009: 106)

The researcher himself holds the assumptions which are reflected in the further-stated subchapters. Thus, that the reality can be observed objectively and independently of participants (consumers) in order to understand the researched phenomena by obtaining credible data without personal and deliberate bias.

### 3.2.1 Epistemological Perspective

Epistemology describes the nature of knowledge, thence the question "how we know what we know" or "what is the truth?" It is therefore about the observation and understanding of the reality, either as an observer who seeks to know the truth from external point of view, or as an observer who studies the reality intersubjectively. (Kuada, 2012: 59) Two main positions in epistemology are positivism and interpretivism, or according to Burrell and Morgan positivism and anti-positivism (Burrell and Morgan, 1979: 5), but those represent the same stance.

This study has been conducted from the positivist epistemological position. Traditionally, positivism represents the common approach within consumer neuroscience as it has an assumption that the understanding of neural and physiological processes can explain the human behavior.

Positivism is an approach which stems from the natural science and advocates adopting scientific stance and methods in order to obtain true knowledge of the world (Bryman and Bell, 2011: 15). It is applicable if a researcher works with an observable social reality, where the output of a research would be law-like generalization (Kuada, 2012: 73). In consumer neuroscience research the result of the data analysis are being often interpreted in a way that they relate to consumers as a whole.

Positivist researcher is concerned with facts rather than impressions, is independent of the subject of the research, and is neither affected nor affects the subject of research. Positivism seeks to explain and predict what happens in the social world with the emphasis on causal relationship and essential elements. (Ibid.) That is crucial as the consumer neuroscience researcher investigates the causal relationship independent variables have on the dependent ones. Within this study, such an investigation will help to understand whether the data from the measures of the concepts from the literature review – emotions, attention – influence consumer preferences.

Another essential component of the positivist approach is that the research is undertaken in a value-free way. Furthermore, the emphasis is on quantifiable observations which are being used for statistical analyses. The methods which are being applied by a positivist researcher consist of experiments, survey techniques and observations (Saunders et al., 2009: 113-114). In consumer neuroscience research, experiments are the most applied form of research. The purpose of the application of experiments within this research is to study casual links between variables. (Saunders et al., 2009: 142)

Hence, the output of this research helps to understand how consumers' preferences are altered and how consumers response toward stimuli by applying positivistic approach. This helps to study these observable phenomena by providing credible data.

### 3.2.2 Ontological Perspective

The term ontology is concerned with how the researcher perceives the nature of reality and how it can be understood. It raises questions of how the world operates. That is, whether social entities exist in reality external to social actors, or whether the reality is constructed by social actors and their actions. (Saunders et al., 2009: 110)

Even though titles for the two opposing approaches differ among researcher as there is objectivism and subjectivism (Ibid.), realism and nominalism (Burrell and Morgan, 1979: 3), objectivism and constructionism (Bryman and Bell, 2011: 20). The beliefs represented by each pairing are basically the same.

Objectivism has guided this study from an ontological viewpoint. It is because the positivistic epistemological approach has been chosen for this study which requires an objectivist view (Saunders et al., 2009: 119). Thus, the subsequent focus will be given to the positivistic objectivism as the underlying ontological approach of this research.

Objectivism represents the positions that social entities exist in reality external to social actors, therefore, beyond the reach or influence (Bryman and Bell, 2011: 21; Saunders et al., 2009: 110). This means that there exists single, tangible, objective reality. The reality exists independently on individual's appreciation of it and individual might not even be aware of certain structure of it. (Burrell and Morgan, 1979: 5) Hence, the reality forms the individuals who inhabit it.

In connection to the research question this therefore means that the objectivistic view guides the researcher to observe the reality externally and independently of the participants in the sense that their subjective and socially constructed interpretations are omitted (Saunders et al., 2009: 119).

## 3.3 Data Collection Methods

There are two different types of methods applied in consumer behavior researches; quantitative and qualitative data collection methods (Schiffman et al., 2012: 19-20). However, since the positivistic approach has been chosen, the quantitative data collection methods are going to be applied as its inherent component (Saunders et al., 2009: 119).

Quantitative methods are descriptive in nature and they help researchers who use these kinds of methods in the consumer research to predict consumer behavior (Schiffman et al., 2012: 20). These methods are suitable for testing specific hypotheses derived from theories and working with numerical data. They are frequently depicted as presenting statistical image of the social reality with the emphasis on causal relationships between specified variables. Hence, quantitative data collection techniques and/or data analysis procedures generate or use numerical data in order to provide the answer to a research question. (Bryman and Bell, 2011: 410; Kuada, 2012: 103; Saunders et al., 2009: 151) This goes in hand with positivism, as previously mentioned, which emphasizes on description of the causal relationship in order to predict what happens in the social world. Further, quantitative research typically tests theoretical concepts because theories precede the actual collection of data and are highly structured (Bryman and Bell, 2011: 410-411).

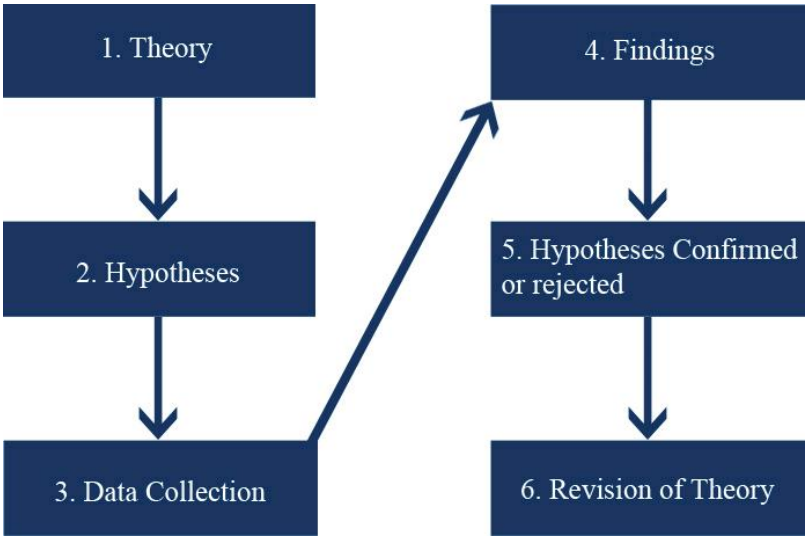
In consumer neuroscience research neuroscientific methods are applied while participants are responding to the same stimuli. This helps the researcher to analyze the causal relationships between variables. Thus, the quantitative measures are systematically created and standardized (Kuada, 2012: 68).

Specific measures used in this research will be described in the subchapter 3.5.4.

## 3.4 Research Approach

There are two major research approaches – deductive and inductive (Greener, 2008: 15). However, this study is using the deductive approach, which is characterized by *"data follows theory"* pattern, as it is concerned with the testing of theories of existing knowledge. It is the dominant research approach in natural sciences, which begins by looking at the theory and deducing a hypothesis (or hypotheses) from it. This has been done so far throughout the literature review as there has been highlighted the concept of attitude and preference, and the components which stand behind its formation and change. Further steps involve the process of gathering quantitative data through the chosen consumer neuroscience methods; examining the specific outcome of the investigation, and therefore applying appropriate statistical tests; and testing whether the hypotheses from the literature review are confirmed or rejected. The final step involves an infer approach, which is opposite to deduction, and researcher modifies the theory driven through the whole project according to the findings. (Bryman and Bell, 2011: 11; Greener, 2008: 16; Saunders et al., 2009: 124-125)

**Figure 13: The Process of Deduction (Bryman & Bell, 2011: 11)**




There are several important characteristics of the deductive approach. First, the researcher searches to explain causal relationships between variables. This means that in this research, the researcher seeks to explain whether changes in independent variables (which are direct measures of the listed components) cause change in the dependent variable, thus, preference. Secondly, the researcher should be independent of what is being observed (Saunders et al., 2009: 125), which is done since the researcher is being guided by the positivistic approach.

## 3.5 Method

### 3.5.1 Research Strategy

It was mentioned in the beginning of the methodological chapter that the form of this research is an experiment. Commonly, most neuroscience studies involve within-subject experiment designs (repeated measures design) (Plassmann et al., 2015: 431). It means that every single participant is subjected to every single treatment. However, even though all subjects participated in the experimental task entirely, and thus were exposed to both commercials, crossover design has been applied for this research. So, the subjects were randomly assigned into two groups. That is, one group was exposed to the Apple commercial first followed by Samsung commercial, while the other group was exposed to the Samsung commercial first followed by Apple commercial, respectively.

### 3.5.2 Sampling

In this research, the convenience sampling technique was used which represents a non-probability sampling technique. It means that the sample was not selected by a random

selection method as some segments in the population have a higher chance to be selected. Rather, this sample was chosen for its convenience and as the most accessible one from whom to obtain the data due to the insufficient time and resources extent of the research. (Bryman and Bell, 2011: 176; Greener, 2008: 48; Schiffman et al., 2012: 35-36) In terms of a traditional consumer neuroscience research, small samples are sufficient enough as the results from the obtained data can be generalized for the entire population (Boksem and Smidts, 2015: 483). However, the convenience sampling technique might not be sufficient enough to generalize the findings to the population as whole, but rather as a representative of the population (Saunders et al., 2009: 241).

The sample consisted of 23 international students (12 females) between 19 and 36 years of age ($M$ = 24.5 years, $SD$ = 4) of different study backgrounds at the Aalborg University. These students never participated in a similar study, nor had any personal experience with applied consumer neuroscience methods. The study was presented as a passive viewing task of commercials. After the presentation of the instructions, the subjects were told they could withdraw from the experiment at any time. After a complete description of the study, an informed consent form was obtained from each participant. The participants in this research received refreshment in form of a homemade muffin for their participation

### 3.5.3 Stimuli

Two commercials of two major smartphone brands, Apple and Samsung, have been projected to the whole experimental sample formed by 23 subjects. The commercials can be observed at the following links:

| | |
|---|---|
| Apple commercial: | https://www.youtube.com/watch?v=jZGzXEExZcc |
| Samsung commercial: | https://www.youtube.com/watch?v=KuaOGF8tPfA |

Both of the commercials have been segmented to define the following scenes: Information – both written and oral, Brand, and Product as it is illustrated in the figures 13 and 14. Each of the commercial has a length of 60 seconds and a single frame represents 5 seconds of the commercial. Thus, if the brand visualization occurred in a particular time of a commercial at least once, it has been highlighted on the timeline.

**Figure 14: Apple Commercial (Own Source)**

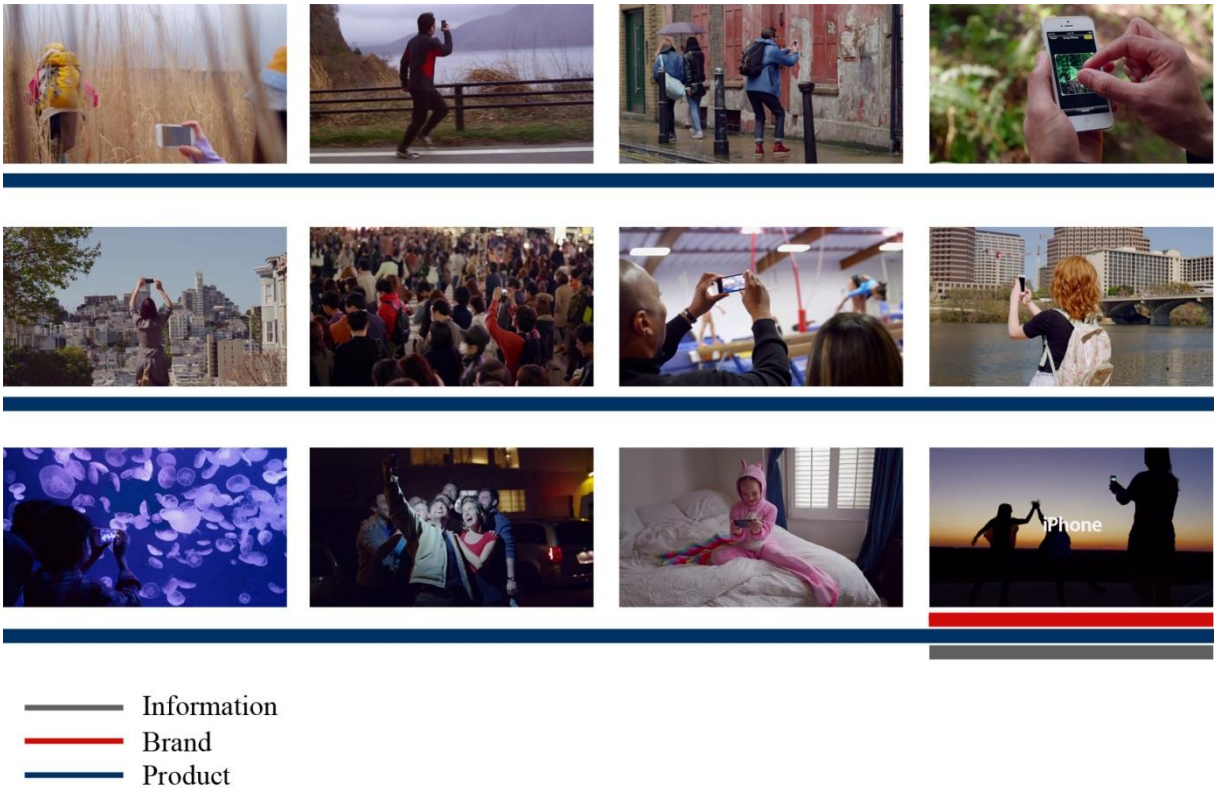
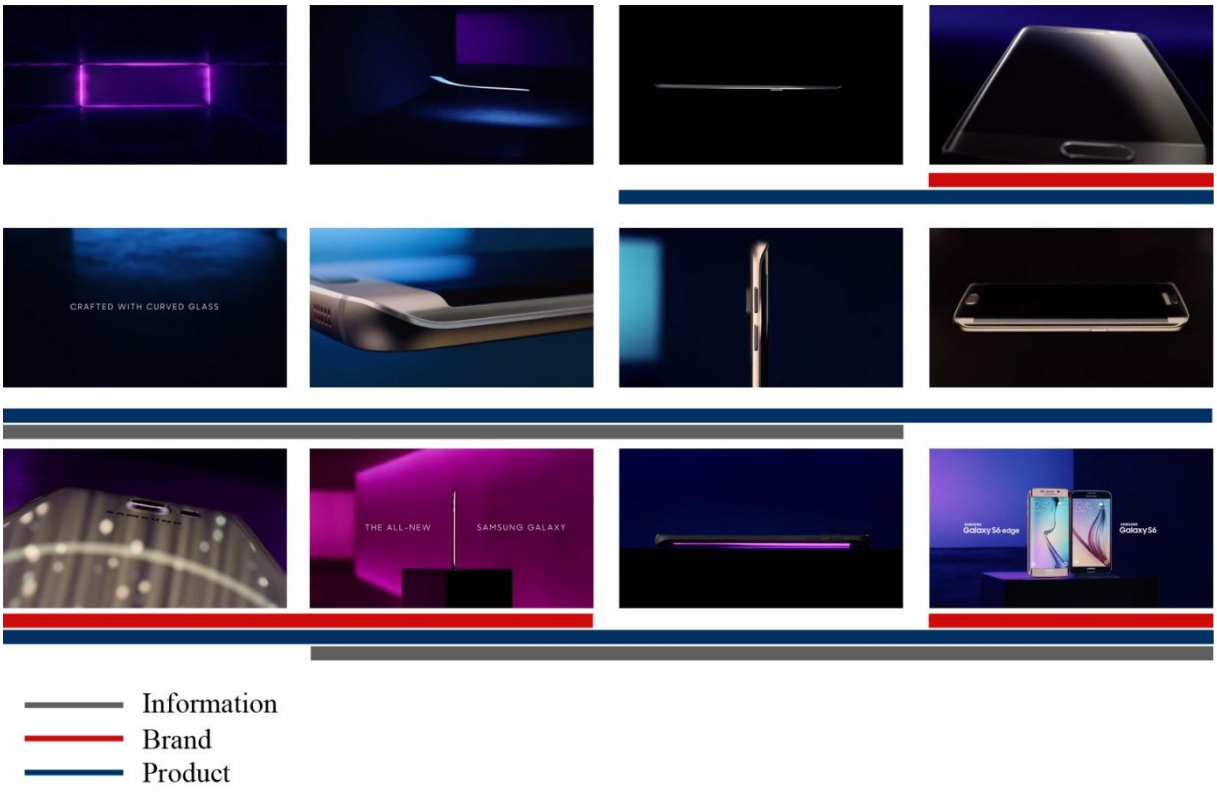



**Figure 15: Samsung Commercial (Own Source)**



### 3.5.4 Equipment and Data Acquisition

The experiment was conducted in a neutral room with a constant brightness (artificial lighting). The stimuli were projected on a 19”flat screen monitor with resolution 1024 x 768 pixels, 60 Hz, in a distance of 60 cm for commercials, and without distance-limitation for the IAT. Skin Conductance, Eye-tracking, and Automatic facial coding measures were used, while fMRI and EEG measures were not conducted due to the scope of this project. The iMotions Platform 6 was used for this experiment as it enables to integrate various measures and provide their output data. The data were subsequently analyzed in SPSS.

#### 3.5.4.1 IAT

The design of the IAT contained 5 images for both brands including both logos and products, as can be seen in the figure 16. The pleasant words used in this study were: Innovative, Creative, Exciting, Successful, Imaginative, Stylish, Unique, and Reliable. On the contrary, unpleasant words were antonyms of pleasant words, hence, Old-fashioned, Uncreative, Boring, Unsuccessful, Ordinary, Dull, Regular, and Unreliable. For the typical sequence of the IAT see the table 1 in subchapter 2.10.

**Figure 16: Images Used to Represent the Brands Apple and Samsung (Own Source)**


#### 3.5.4.2 Skin Conductance

Shimmer 3 skin conductance measure was used for this study. Two Ag-AgCl collection electrodes were placed on the first phalanges of the index and middle fingers of the non-dominant hand. These electrodes were prepared with conducting gel before applied on the fingers. The electrodes were connected to a wireless preamplifier, and thus, freedom of movement was provided the participants. The sampling rate was set to 10 Hz which is the

common sample rate within consumer neuroscience literature and represents sufficient enough quality for the recorded data (Lajante et al., 2012: 240).

#### 3.5.4.3 Automated Facial Coding

For the facial analysis, standard PC camera with a resolution of 640 x 480 pixels, 100 Hz, was used. The Analysis was conducted by Emotient FACET, which tracks 7 basic emotions with 20 action units. However, in this experiment, only valence dimension of emotions (positive/negative) were analyzed. Thus, Emotient FACET provides its own calculations of valence by using results of some of the 7 basic emotions. (iMotions, 2016: 21)

#### 3.5.4.4 Eye-tracking

Finally, Tobii X120 model was used for the eye-tracking analysis with its frequency of 60 Hz. The participants kept distance of approximately 60 cm from the sensor. Before the projection of the two commercials, the participants had to undergo a 9 point-focus calibration in order to scan their eye-movement correctly.

#### 3.5.4.5 Questionnaires

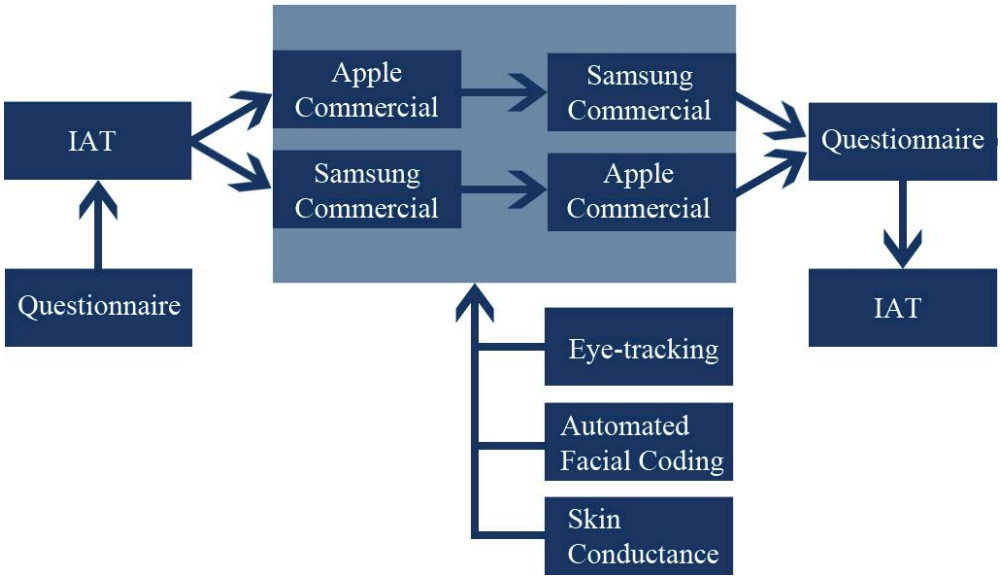
Two short questionnaires were used prior and post to the exposure of the two commercials. Participants were first asked to fill demographic questions and answer whether they own any of the investigated smartphone brands. Second questionnaire was filled right after the projection of the commercials. Here, the participants were asked whether they would buy a product of the listed brands, if any, which was analyzing their intentional purchase behavior. Both questionnaires can be seen in the appendix.

### 3.5.5 Procedure

The participants were placed in a comfortable chair where they filled a short questionnaire and were familiarized with the procedure of the IAT. After they performed the first IAT, collecting electrodes were placed on their non-dominant hand. Subsequently, they were familiarized with the upcoming procedure of the eye-tracking calibration, and instructed to find a suitable position and to avoid later unnecessary movements. The projection of the two randomized commercials started after a successful calibration of the eye-tracker. Before the first commercial, facial expression measure was automatically calibrated while the participants were advised to have natural facial expressions during the initial 10 s neutral (grey) screen. Second neutral screen was used before the second random commercial

exposure as well. After the second commercial projection, the participant filled the second short questionnaire. Finally, they underwent another IAT with the same procedure as in the first step. The whole procedure took 20 minutes on average. The experimenter reminded out of the participants' sight during the recording of the data.

**Figure 17: Experimental Design (Own Source)**




### 3.5.6 Reliability and Validity

To produce a strong research design, it is of the utmost importance to pay attention reliability and validity of the quantitative research findings in order to reduce the possibility of getting the wrong and biased data. (Saunders et al., 2009: 156)

#### 3.5.6.1 Reliability

The term reliability refers to the consistency of a measure of a concept over time yielded from the data collection and analytical process, and is required in the research studies. It is important to design a research which is transparent, so the reader clearly understands what method and procedures were used. Because of the transparency, the reader can then either undertake the same procedure in order to produce the same results or at least see that the results are consistent and stable, not fabricated in any way, and possibly replicate the findings. (Bryman and Bell, 2011: 41, 158; Greener, 2008: 37; Saunders et al., 2009: 156) The experimental research design was built on controlled conditions and standardized procedure, which would allow others to replicate this study and thus obtain the same results.

The quantitative research is likely to be concerned with the question of whether a measure is stable or not. Stability is an aspect which takes into consideration whether a measure is stable over time or not, and therefore, if the researcher can be confident in the results obtained from the observation. (Bryman and Bell, 2011: 158) Consumers are however very complex. Due to participants' deviations in psychological as well as mood states, could lead to inconsistent measures.

#### 3.5.6.2 Validity

The term validity is concerned with the question of whether methods, concepts, indicators are measuring what they are supposed to claim to measure. Therefore, there is a concern for causal relationships and the use and nature of the measures which are applied. There are main characteristics of the validity which are construct validity, internal, external and ecological validity. (Bryman and Bell, 2011: 159, 280; Greener, 2008: 37)

The construct validity of a measure reflects whether the chosen measure used in a research is valid and actually measures what the researcher wants to investigate (Greener, 2008: 37). The consumer neuroscience methods used in this research have been based on the literature review where it also has been supported by empirical evidence. Hence, they represent measures which are valid for measuring the listed concepts of emotions, attention, memory, and preferences.

Internal validity is a form of validity which relates to causality, therefore, whether factor (independent variable) X causes a factor (dependent variable) Y to happen. (Bryman and Bell, 2011: 42-43; Greener, 2008: 37)

Quantitative researches often aim for results which could be generalized to a larger context, which is beyond the research sample itself. External validity is concerned with this issue and questions whether the results yielded of the research can be generalized beyond the specific research context or not. (Ibid.) In relation to this research, the external validity is considered to be difficult to achieve due to the limitation of chosen methods, and the laboratory settings.

Finally, ecological validity has considerable relevance to the quantitative research as it relates to the environment in which the research is conducted. That is whether these conditions have any effect on the findings. (Bryman and Bell, 2011: 43) Since this experiment was conducted

in the laboratory settings the participants unconscious awareness might had been altered due to the fact that they knew they are being tested.

## 3.6 Summary of Methodology and Research Methods

A positivistic epistemological position was adopted for this research as it represents the most frequently embraced position within consumer neuroscience research. Further, objectivistic ontological perspective guided this research as it follows positivistic position. The approach to this research is group-centered perspective with the use of controlled environment to establish general laws. Thus, for this matter, use of quantitative data methods is appropriate in order to identify casual relationships between variables. The data are obtained by eye-tracking, facial expressions measure, implicit association test, and skin conductance which represent consumer neuroscience methods. Convenience sampling technique was used due to the insufficient time and resources extent of the research. These data then help to confirm or reject the listed hypotheses drawn out from the literature review as the deductive research approach was applied. Lastly, this research takes into account reliability and validity as it is concerned with designing and performing a transparent research followed by the utilization of validated consumer neuroscience measures.

# 4 List of Hypotheses

This research is investigating a question of *"How Can Consumer Neuroscience Contribute to Analyze the Change of Implicit Brand Preferences toward Mature Brands as a Response to Commercials?"* where mature brands are represented by Apple and Samsung. These two major competing smartphone brands were chosen primarily because of their familiarity.

The literature review has revealed that the forming and alteration of consumer preferences is influenced primarily by cognitive and affective components, where attention, emotions, and memory play the most crucial roles in this matter. Further, because consumers cannot process completely consciously all the information they are being exposed to during commercials, unconsciousness still influences their preferences and behavior. That is why this study seeks to investigate whether chosen consumer neuroscience methods that are capable of measuring previously mentioned unconscious concepts can explain variations in consumers' preferences. Because of the scope of this project, the following methods were applied: Automated facial coding, eye-tracking, IAT, and skin conductance. Hence, the following list of hypotheses:

**$H_1$:** Commercials lead to change of consumer implicit preferences toward mature brands.

**$H_2$:** IAT results will correlate positively with the subjects' intentional purchase behavior.

**$H_3$:** Variations in results obtained from the applied methods during the commercials' exposure stand behind the change in preferences**.**

> **$H_{3a\ (Attention)}$:** Change in the implicit brand preference can be explained by the number of gaze fixations and dwell time obtained from the eye-tracker.
>
> **$H_{3b\ (Emotions)}$:** Change in the implicit brand preference can be explained by the positive and negative valence values obtained from the automated facial coding.
>
> **$H_{3c\ (Emotions)}$:** Change in the implicit brand preference can be explained by the sum of SCR amplitude peaks obtained from skin conductance.

# 5 Data Analysis and Results

The objective of this chapter is to present the statistical results and findings generated from the analytical part of the experiment. The aim of this experiment was to explore whether variations in results of consumer neuroscience methods, as direct measures of affect and cognition, can be used to explain the changes in consumer preferences toward mature brands.

The following subchapters will present the hypotheses' findings.

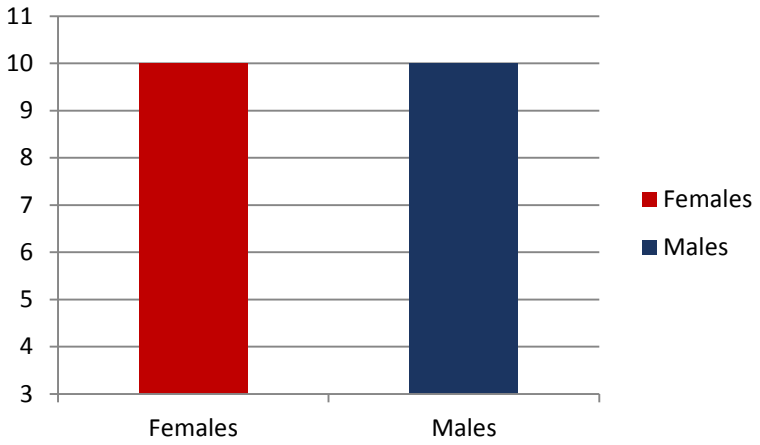
## 5.1 Results for $H_1$

The Implicit Association Test (IAT) was applied to investigate the subjects' implicit preferences toward Apple and Samsung brand as two competing brands. The use of competing brands is a requirement as IAT measures relative strengths of automatic associations between two bipolar target concepts (Greenwald et al., 1998: 1464). As Maison and colleagues (2004: 412) stated, IAT results provide indication of relative rather than absolute consumer preferences. This means that the results obtained through the improved algorithm by Greenwald et al. (2003) suggests whether the subjects prefer one brand over the other, hence for example Apple over the Samsung. Thus, even though they prefer Apple does not mean they completely dislike Samsung. However, in this analysis, there will also be focus on changes in the preferences toward the same brand, thus, if the commercials influence reaction times toward the same brand, i.e., before and after the commercial exposure.

The IAT measure of implicit preferences for the two brands included the previously stated (3.5.4.1) stimuli in form of pleasant and unpleasant words and the images representing both logos and products of the two brands. Three participants were excluded from the study by using the methodology of outlier analysis by Tukey (1977) as they significantly changed their preferences. This goes in hand with the assumption that it is unlikely to significantly alter the overall direction of associative network of one brand over the other after one commercial exposure (Gibson, 2008: 179).

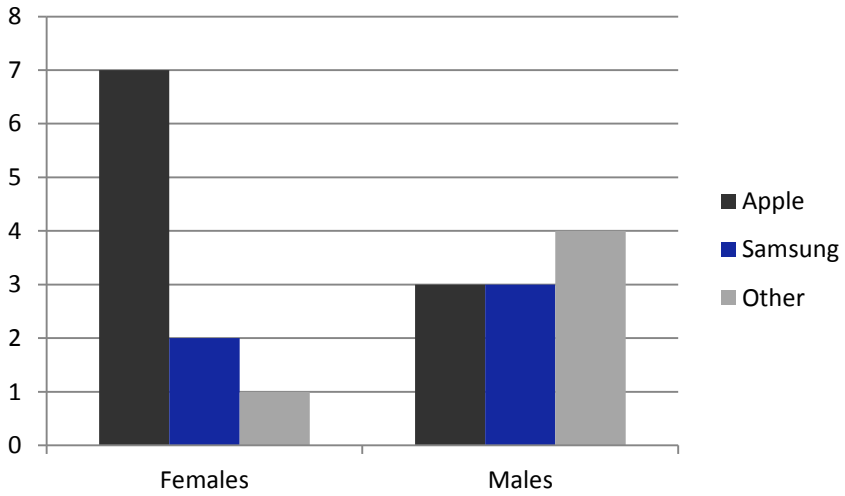
The improved scoring algorithm (Greenwald et al. 2003) was used for this experiment as its procedure was described in the subchapter 2.10. All analyses reported in this project involve the remaining 20 participants. The following figure represents the distribution of the remaining subjects according to their sex.

**Figure 18: Demographics (Own Source)**




Out of these 20 participants 50% own Apple smartphones, 25% Samsung, and 25% some other brand, as can be seen in the figure 19.

**Figure 19: Brand Ownership (Own Source)**




There was a positive correlation at the 10% *Eta* = .496, *p* = .09 between brand ownership and the first IAT results. This follows suggestion from some studies that preferences are stronger for one brand over other when they are based on direct experience than when they are based on indirect experience (Maison et al., 2004: 410).

**Table 3: Eta Correlation for IAT_1 Results and Brand Ownership (Own Source)**

**ANOVA Table**

| | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| IAT_1 * | Between Groups | 1,062 | 2 | ,531 | 2,779 | ,090 |

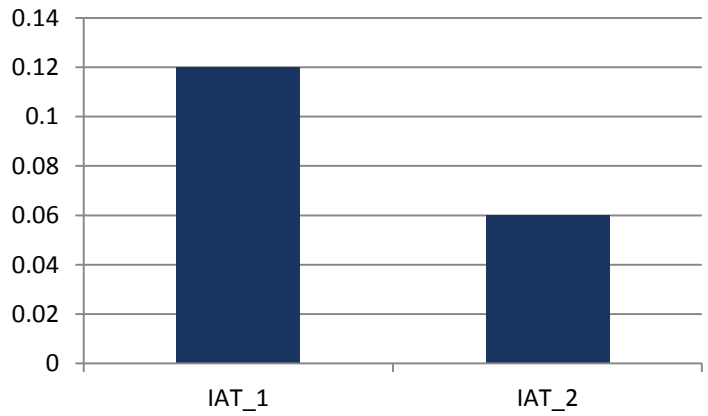
| | | | | | | |
|---|---|---|---|---|---|---|
| Brand_Ownership | Within Groups | 3,249 | 17 | ,191 | | |
| | Total | 4,312 | 19 | | | |

**Measures of Association**

| | Eta | Eta Squared |
|---|---|---|
| IAT 1 * Brand_Own | ,496 | ,246 |

The figure 20 represents the mean results of all participants for both IAT results before and after the projection of the two commercials. In both IAT_1 (before exposure) and IAT_2 (after exposure) was comparison of two tasks where both brands were paired with pleasant and unpleasant words. Faster reactions for a brand which is paired with pleasant words than when paired with unpleasant words, suggest stronger preference for one brand than for the alternative. An individual IAT result ranges between +2 and -2, where on the positive side of the scale on has a stronger preference for one brand (e.g. Apple) over the other (e.g. Samsung) and vice versa. Thus, the following figure suggests that in overall, the subjects prefer Apple slightly more than Samsung as the first IAT results has mean $M$ = .12 with standard deviation $SD$ = .48 and the IAT_2 has $M$ = .06 with $SD$ = .36.

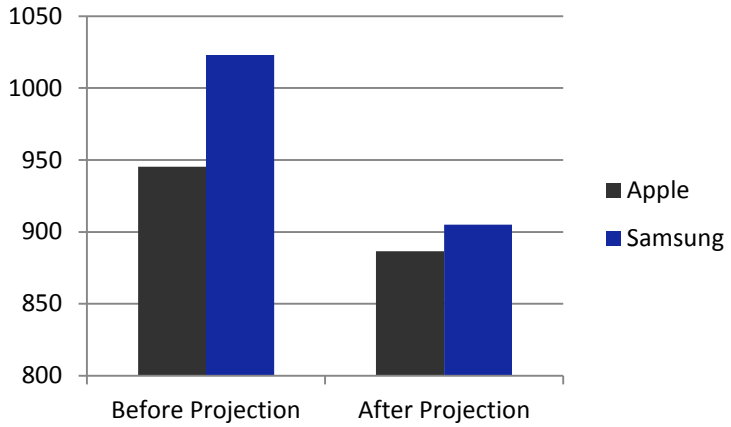
**Figure 20: IAT Results (Own Source)**




However, there is no significant change in the results after the exposure of the commercials as $t(19) = 1.26$, $p = .239$. This suggests that the commercials did not significantly alter preferences for one brand over the other.

This result nevertheless does not reject the hypothesis. The comparison of the reaction times before and after the commercials projection on the other hand provides the mean of change in the subjects' preferences toward the same brand.

**Figure 21: Reaction Times in ms before and after Commercials (Own Source)**




In the figure 21 one can therefore see the proportional change in reaction times (in milliseconds; ms) for both brands before and after the exposure without cross comparison as highlighted in the figure 19. These values represent the mean reaction times when Apple was paired with pleasant words and Samsung with unpleasant words (A+/S-) for Apple values, and vice versa (S+/A-) for Samsung. Therefore, the differences in the reaction times of the same concept (before and after) are significant as $t(19) = 3.31$, $p < .05$ for Apple and $t(19) = 3.39$, $p < .05$ for Samsung.

**Table 4: Comparison of Differences in Reaction Times before and after the Exposure (Own Source)**

**Paired Samples Test**

| | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | | | | 95% Confidence Interval of the Difference | | | | |
| | Mean | SD | Std. Error Mean | Lower | Upper | | | |
| apple_pos_1 - apple_pos_2 | 58,61 | 79,29 | 17,73 | 21,50 | 95,72 | 3,305 | 19 | ,004 |
| samsung_pos_1 - samsung_pos_2 | 117,76 | 155,35 | 34,74 | 45,10 | 190,47 | 3,390 | 19 | ,003 |

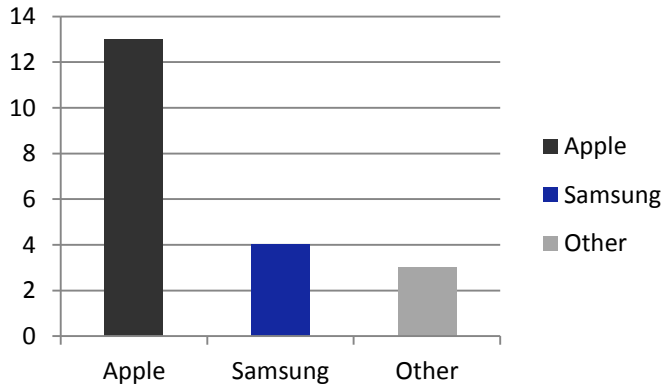
Thence, the comparison between A+/S- before and after the projection, and S+/A- respectively, confirms the first hypothesis as there is significant change in the reaction times at the 5%. Thus commercials lead to change in implicit consumer preferences toward mature brands.

## 5.2 Results for $H_2$

The second hypothesis examines whether there is a positive correlation between the IAT_2 results, as the results of the subjects' implicit preferences after the commercials exposure, and the results from questionnaire concerning the subjects' intentional purchase behavior.

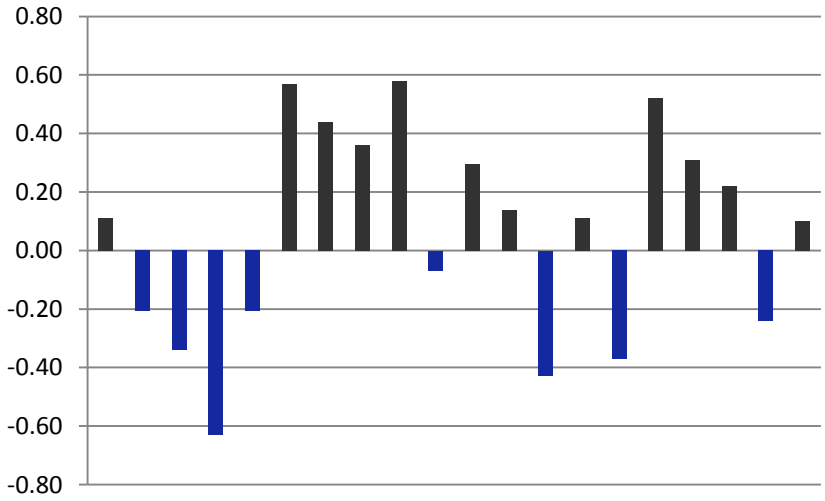
The results from the questionnaire presented after the commercials exposure are displayed in the figure 22, where 13 (65%) of the respondents expressed intention to buy Apple smartphone, 4 (20%) Samsung smartphone, and 3 (15%) would buy other smartphone brand.

**Figure 22: Choice of Brand (Purchase Intention Behavior Questionnaire) (Own Source)**




The following figure represents results from IAT_2, therefore relative implicit preferences of each participant after the commercials exposure. Positive values are in favor of Apple and vice versa. The further the values are from zero, the stronger the preferences are for one brand over the other.

**Figure 23: IAT_2 Results (Own Source)**



In order to investigate the relationship between implicit preferences (IAT_2) and the subjects' purchase intention (choice of brand) an Eta correlation was run.

**Table 5: Eta Correlation for IAT_2 Results and Choice of Brand (Own Source)**

| | | Choice_of_Brand | | | |
|---|---|---|---|---|---|
| | | Apple | Samsung | Other | Total |
| IAT_2 | -,630 | 0 | 0 | 1 | 1 |
| | -,427 | 0 | 0 | 1 | 1 |
| | -,370 | 0 | 1 | 0 | 1 |
| | -,340 | 0 | 1 | 0 | 1 |
| | -,240 | 0 | 1 | 0 | 1 |
| | -,207 | 1 | 1 | 0 | 2 |
| | -,068 | 0 | 0 | 1 | 1 |
| | ,100 | 1 | 0 | 0 | 1 |
| | ,110 | 1 | 0 | 0 | 1 |
| | ,111 | 1 | 0 | 0 | 1 |
| | ,140 | 1 | 0 | 0 | 1 |
| | ,220 | 1 | 0 | 0 | 1 |
| | ,296 | 1 | 0 | 0 | 1 |
| | ,310 | 1 | 0 | 0 | 1 |
| | ,360 | 1 | 0 | 0 | 1 |
| | ,440 | 1 | 0 | 0 | 1 |
| | ,520 | 1 | 0 | 0 | 1 |
| | ,570 | 1 | 0 | 0 | 1 |
| | ,580 | 1 | 0 | 0 | 1 |
| Total | | 13 | 4 | 3 | 20 |

**ANOVA Table**

| | | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|---|
| IAT_2 * Choice_of_Brand | Between Groups | (Combined) | 1,646 | 2 | ,823 | 17,600 | ,000 |
| | Within Groups | | ,795 | 17 | ,047 | | |
| | Total | | 2,440 | 19 | | | |

**Measures of Association**

| | Eta | Eta Squared |
|---|---|---|
| IAT_2 * Choice_of_Brand | ,821 | ,674 |

The results from Eta procedure show that there is a significantly positive correlation between IAT_2 and choice of brand as correlation coefficient *Eta* = .821, $p < .001$. Among those participants who prefer Apple over Samsung 100% would choose Apple smartphone over Samsung. However, those subjects who prefer Samsung over Apple would choose Samsung smartphone in 50% of the cases, other smartphone brand in 37.5%, and Apple in 12.5%.

The correlation of IAT_1 and intentional purchase behavior is less strong, *Eta* = .77, $p < .001$, than in the case of IAT_2 as can be seen in the following table 6. This suggests that the advertisement messages had a positive effect on the correlation.

**Table 6: Eta Correlation for IAT_1 Results and Choice of Brand (Own Source)**

**ANOVA Table**

| | | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|---|
| IAT_1 * Choice_of_Brand | Between Groups | (Combined) | 2,557 | 2 | 1,279 | 12,386 | ,000 |
| | Within Groups | | 1,755 | 17 | ,103 | | |
| | Total | | 4,312 | 19 | | | |

**Measures of Association**

| | Eta | Eta Squared |
|---|---|---|
| IAT_2 * Choice_of_Brand | ,770 | ,593 |

Thus, based on the results it arises that the hypothesis $H_2$ is confirmed. Thus IAT results are positively correlated with the participants' intentional purchase behavior, therefore, their choice of brand.

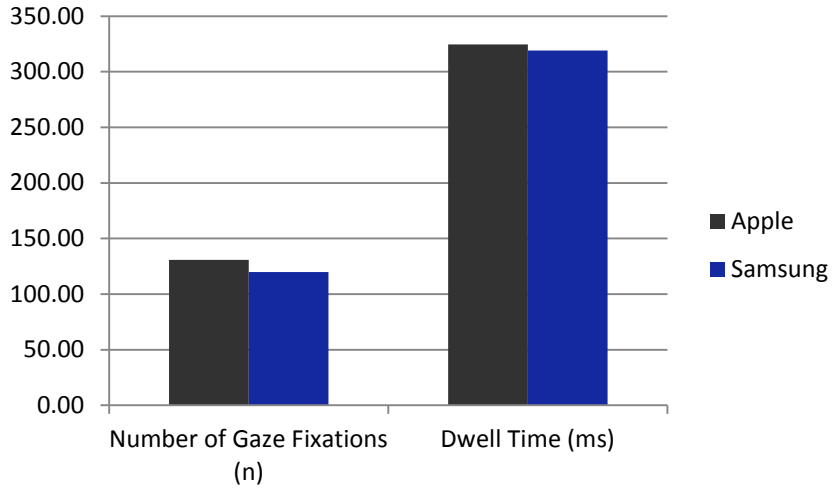
## 5.3 Results for $H_3$

For the third hypothesis, 3 methods (eye-tracking, automated facial coding, and skin conductance) were used in order to explain the change in the subjects' preferences, thus the difference between IAT_1 and IAT_2.

### 5.3.1 Results for $H_{3a}$

One of the methods which has been used for the analytical part is eye-tracking. In the literature review, it was mentioned that eye-tracking measures attention in form of frequency of gaze fixations and their dwell times.

**Figure 24: Eye-tracking Data (Own Source)**




These are presented in the figure 24, where average number of gaze fixations for Apple commercial is *M* = 136.4 fixations, *SD* = 31.2, and for Samsung commercial *M* = 122.5 *SD* = 38.2. The average dwell times of these fixations for Apple commercial *M* = 318.1, *SD* = 72.4, while for Samsung commercial *M* = 313.9, *SD* = 47.4. According to Tukey (1977) one outlier was identified and dropped out.

A multiple regression analysis was run to predict the change in preferences. Neither the number of gaze fixations nor their dwell times provided an explanation of the variance in preferences as $F(4, 14) = 1{,}569$, $p = .237$, $R^2 = .309$. None of the variables added statistically significantly to the prediction.

**Table 7: Summary of Coefficients for $H_{3a}$ (Own Source)**

**Coefficients[a]**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -,437 | ,474 | | -,921 | ,373 |
| gaze_fix_freq_apple | -,001 | ,003 | -,171 | -,373 | ,715 |
| gaze_fix_freq_samsung | ,000 | ,002 | -,078 | -,197 | ,847 |
| dwell_time_apple | ,001 | ,001 | ,245 | ,668 | ,515 |
| dwell_time_samsung | ,001 | ,002 | ,244 | ,725 | ,480 |

a. Dependent Variable: diff_IAT_1_and_2

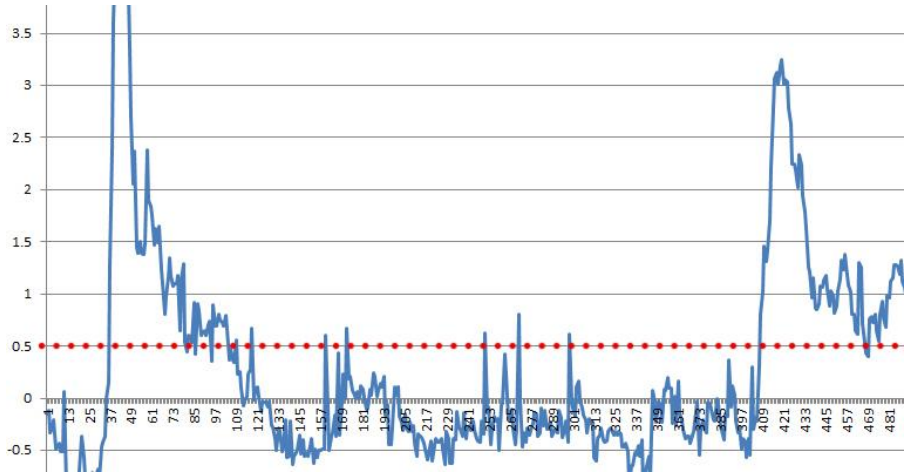
Based on these results, the hypothesis $H_{3a}$ is not confirmed, and thus, changes in the implicit preferences are not explained by the variations in results obtained through eye-tracking.

### 5.3.2 Results for $H_{3b}$

Another method which was used in the experiment was automated facial coding, which measures valence of the emotional reaction, thence, whether the emotion a subject experiences is positive or negative.

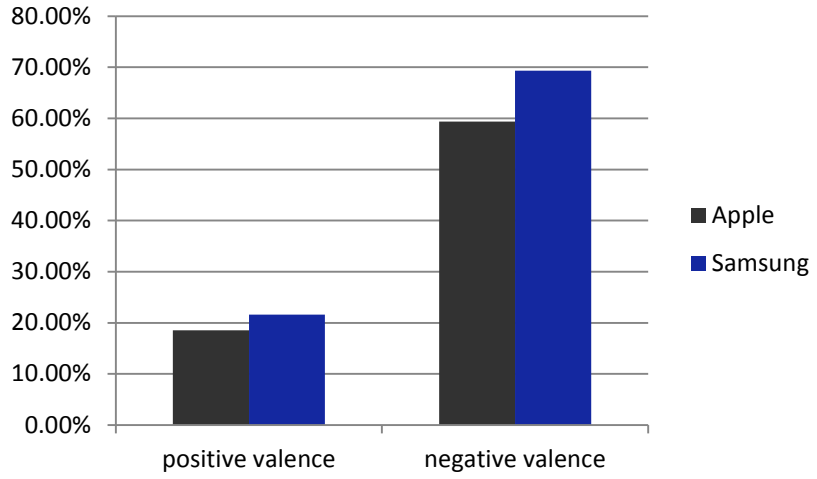
As there was set a threshold for SCR data, facial expression data had amplitude-based threshold as well with a value of .5 as can be seen in the figure 25. This means that whenever amplitude exceeds a value of .5 the subject has experienced either positive or negative experience. Thus, the valence metric represents how much of the time (in %) was the subject experiencing either positive or negative emotions during the commercial exposure. (iMotions, 2016: 32)

**Figure 25: Example of Valence Amplitude and its Threshold (Own Source)**




The following figure represents the average positive and negative valence results from automated facial coding applied in the two tested commercials. For Apple commercial $M_{(positive\ valence)}$ = 18.51%, $SD$ = 29.13, $M_{(negative\ valence)}$ = 59.37%, $SD$ = 36.38; for Samsung commercial $M_{(positive\ valence)}$ = 21.62%, $SD$ = 30.71, $M_{(negative\ valence)}$ = 69.30%, $SD$ = 30.30. According to Tukey (1977) there were no outliers in the independent data.

**Figure 26: Facial Expression Results (Own Source)**




A multiple linear regression was run to predict the change in preferences (diff_IAT_1_and_2) from positive and negative valence values obtained through facial expressions (automated facial coding). These independent variables did not statistically significantly predicted diff_IAT_1_and_2 as $F(4, 15) = 1{,}514$, $p = .248$, $R^2 = .288$.

**Table 8: Summary of Coefficients for $H_{3b}$ (Own Source)**

**Coefficients**[a]

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -,088 | ,133 | | -,664 | ,517 |
| positive_valence_apple | -,005 | ,005 | -,482 | -,872 | ,397 |
| positive_valence_samsung | ,000 | ,004 | -,064 | -,117 | ,909 |
| negative_valence_apple1 | ,003 | ,002 | ,482 | 1,887 | ,079 |
| negative_valence_samsung1 | -,001 | ,002 | -,108 | -,457 | ,654 |

a. Dependent Variable: diff_IAT_1_and_2

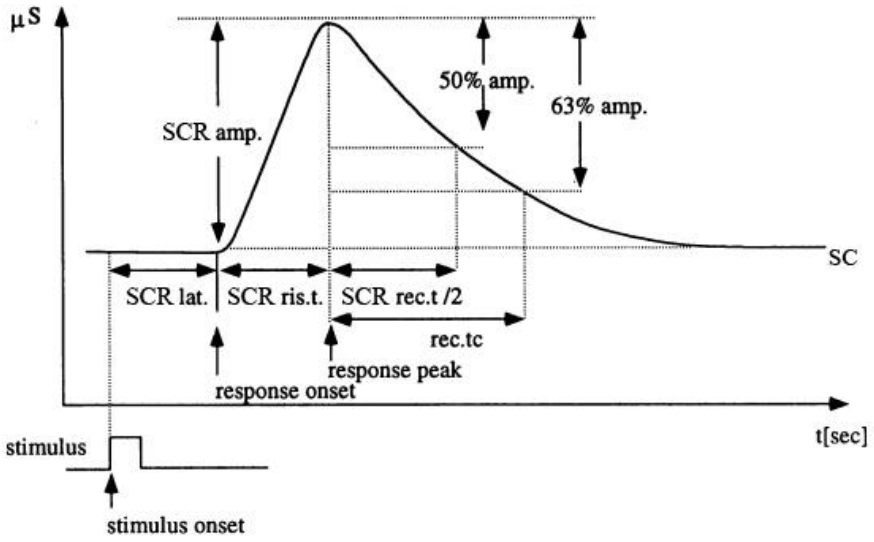
These results do not confirm the hypothesis $H_{3b}$. Thus, changes in implicit preferences are not explained by the positive and negative valence values obtained from the automated facial coding.

### 5.3.3 Results for $H_{3c}$

Skin Conductance (SC) method was used to measure arousal in form of the sum of SCR amplitude peaks. Figure 27 presents how ideal SCR amplitude looks like. It is of importance

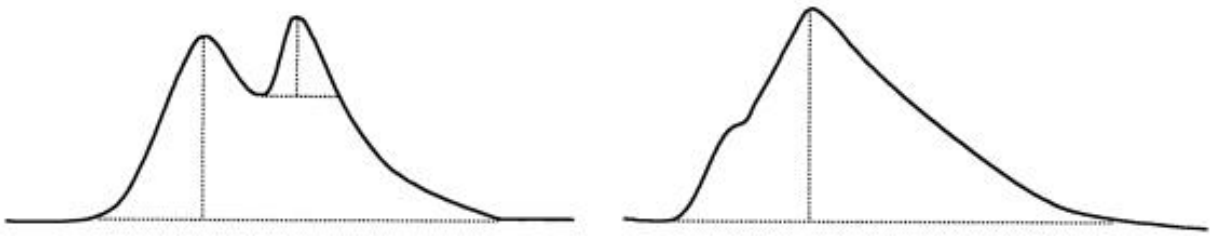
to determine the critical threshold value of the onset of the SCR amplitude peak. Typically, the value is set between 0.01 to 0.05 µS (microsiemens). (Lajante et al., 2012: 240) For this research, the minimum value of the onset of SCR signal is set to 0.01 µS, as it follows the criteria set by Boucsein (2012: 156).

**Figure 27: The Description of SCR Amplitude (Boucsein, 2012: 154)**




Another essentiality is to take into account the overlapping phenomenon of SCR, which is related to temporal properties of phasic activity of SC (Lajante et al., 2012: 241). Overlapping of SCR typically happens when an individual is highly aroused. The SCR amplitude has a steep rise to its peak, but a slowly decreasing recovery phase. Thus, when an individual is highly aroused, another peak might occur while the previous amplitude already hit its peak and is in its recovery phase. (Boucsein, 2012: 156) The figure 28 shows examples of overlapping SCR amplitudes and the researcher's approach of their evaluation.

**Figure 28: Overlapping Phenomenon and the Evaluation (Boucsein, 2012: 155)**



The following figures 29 and 30 highlights the number of SCR peaks the subjects had during the commercials. In total, Apple commercial evoked 122 SCR peaks, while the Samsung commercial 145.

**Figure 29: Number of SCR Peaks for Apple Commercial (Own Source)**

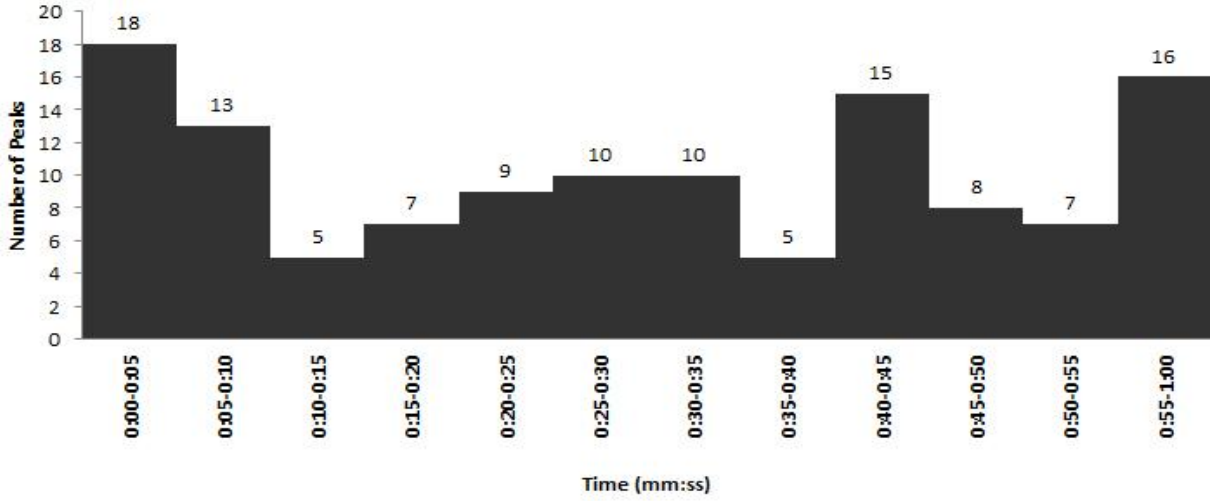
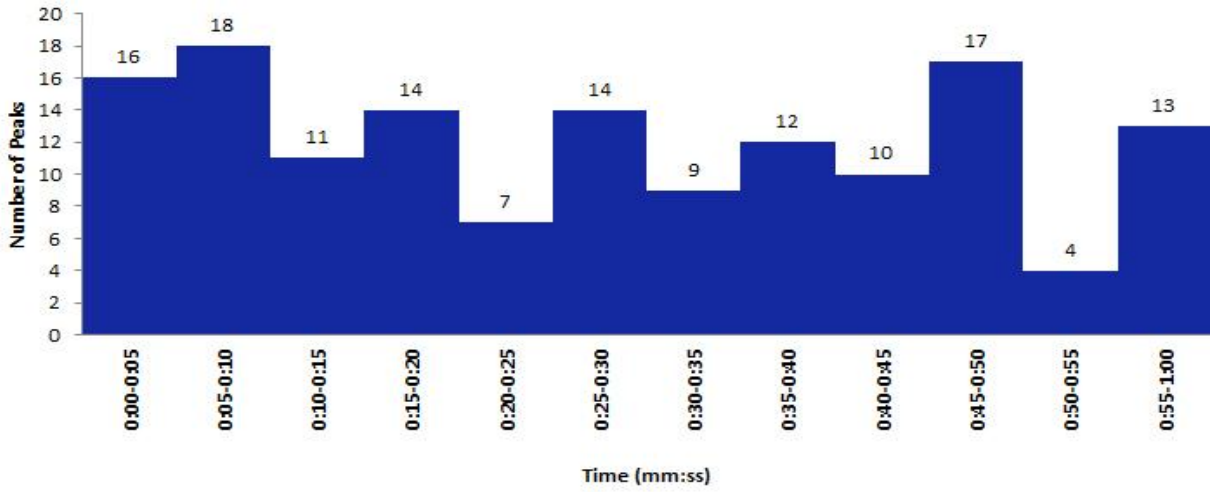



**Figure 30: Number of SCR Peaks for Samsung Commercial (Own Source)**




However, these peaks differ in a range of their amplitude values, thus do not indicate how much the subjects were aroused during the commercials exposure.

Further, these SCR peaks need to be standardized as suggested by Lajante et al. (2012: 243) in order to reduce between-subjects differences in response magnitude. Data normalization was performed by applying the following formula: SCR = log (1 + |SC|). The following figure 31 symbolizes the results of skin conductance.

**Figure 31: Sum of Amplitude Peaks (AmpSum) in µS (Own Source)**

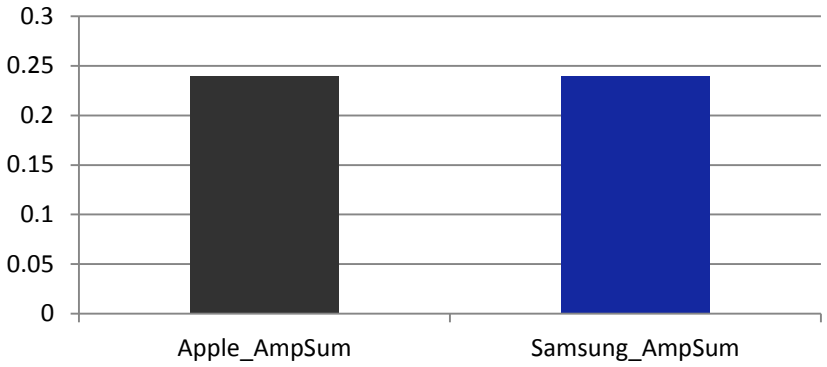
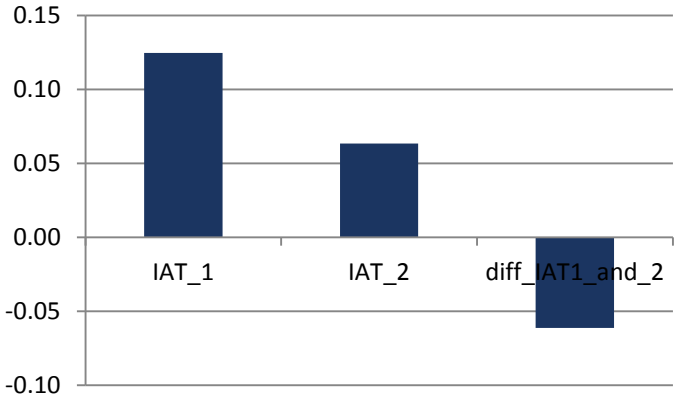



Figure 31 represents the mean of sum of SCR amplitude value across all the subjects. For Apple commercial *M* = .24, *SD* = .17, for Samsung *M* = .24, *SD* = .19. There were no outliers in the independent data (Tukey, 1977). It can be said that during both commercials the subjects experienced more or less the same level of emotional intensity as there was no significant difference between them.

Figure 32 presents difference between IAT_1 and IAT_2 (diff_IAT_1_and_2) *M* = -.06, *SD* = .23. The result suggests that the subjects' implicit preferences were slightly shifted in favor of Samsung after the commercial projection.

**Figure 32: Difference between IAT_1 and IAT_2 (Own Source)**




In order to investigate the relationship between preferences and the sums of SCR amplitudes, a multiple linear regression analysis was performed to predict the change in preferences from SC values. Two previously analyzed sums of SCR amplitudes represent independent variables and the difference between IAT_1 and IAT_2 represent the dependent variable.

**Table 9: Summary of Coefficients for $H_{3c}$ (Own Source)**

**Coefficients[a]**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | ,023 | ,082 | | ,284 | ,780 |
| Apple_AmpSum | -1,659 | ,686 | -1,222 | -2,418 | ,027 |
| Samsung_AmpSum | 1,303 | ,609 | 1,082 | 2,141 | ,047 |

a. Dependent Variable: diff_IAT_1_and_2

The multiple regression model with two predictors produced $R^2 = .257$, which means that the variance in the dependent variable is explained from 25.7% by the independent variables. These variables together statistically significantly predicted the change in preferences at the 10% level as $F(2, 17) = 2.935$, $p = .08$. Both the sums of SCR amplitude peaks for Apple and Samsung commercial added statistically significantly to the prediction, $p < .05$.

The data show that there is a positive linear relationship between diff_ IAT_1_and_2 and Samsung_AmpSum as the coefficient estimates suggest that when arousal level increases by .1 the difference in IAT results increase by .13 in favor of Samsung over Apple. However, the linear relationship between diff_ IAT_1_and_2 and Apple_AmpSum is negative as with every increase of arousal level by .1 the preferences decreases by 1.66.

These results nevertheless confirm the hypothesis $H_{3c}$. Thus, changes in consumer implicit preferences can be explained by the sum of SCR amplitude peaks obtained from skin conductance.

# 6 Discussion

The aim of this research was to examine whether variations in results of chosen consumer neuroscience methods can explain the change of consumer implicit preferences toward two mature brands after commercial exposure. Four consumer neuroscience methods – IAT, eye-tracking, skin conductance, and facial expression measure – were applied in this research to investigate consumers' unconscious responses toward stimuli and their implicit preferences. IAT served as a mean of implicit preferences before and after the commercial exposure. It provided valuable data which suggest that implicit preferences are affected by advertising stimuli. These preference changes are, according to the results, best explained by variations in skin conductance data.

In the discussion chapter, first, the analyzed data will be presented and put into a context with the literature review. Subsequently, implications of this research will be highlighted, following by limitations and suggestions for the further research.

## 6.1 Discussion of $H_1$ Results

The first hypothesis was investigating whether commercials, as advertising stimuli, of two selected mature brands, can alter consumer implicit preferences. Implicit association test was applied to measure reaction times before and after the commercials exposure to see if the automatic associative network was strengthened.

The results suggest that prior to a stimulus exposure consumers have stronger attitude towards brands and object they have a direct experience with than when they are based on indirect experience. This follows the same suggestion alleged by Maison and colleagues (2004: 410). However, when exposed to an advertising stimulus, consumers tend to alter their preferences toward attitude objects. Implicit preferences obtained through the IAT suggest that even though one commercial exposure is not enough to shift consumers' preferences from one brand to another, it still can lead to a change in preferences. Thence, when consumers have a direct experience with an attitude object it subsequently leads to alteration in their network of association in memory. Nevertheless, it seems unlikely, and proves what Gibson hypothesized (2008: 179), that few positive or negative associations within a short period of time could significantly alter the overall direction of the associative network. Reaction times, which are the primary component of IAT measuring consumers' automatic and unconscious associative

memory, nonetheless provide a mean to analyze the change in the strength of associative memory. The IAT results show that advertising stimuli alter reaction times and consumers can indeed allocate positive words and images significantly faster to concepts and brands. Thus, the consumer associative memory becomes strengthened after advertising exposure.

## 6.2 Discussion of $H_2$ Results

The second hypothesis was investigating whether IAT results correlate with self-reported measure which was analyzing the subjects' intentional purchase behavior.

In the beginning of the literature review, the Vakratsas's and Ambler's (1999) framework of how advertising works was mentioned. The main assumption of the framework is that advertising has an effect on consumer preferences and attitudes, and these are subsequently reflected in the subsequent consumer behavior. (Vakratsas and Ambler, 1999: 26) IAT results follow this assumption as both IAT before and after commercials exposure strongly positively correlate with the consumers' intentional purchase behavior. However, the results after the projection strengthened this correlation and suggest that advertising stimuli leads to alteration of reaction times and thus changes of consumer preferences. The fact that IAT results strongly correlate with choice of brand follows Dimofte's statement (2010: 932) that IAT correlates well with explicit measures in the area of brand preference and choice. Moreover, as Greenwald et al. (2009: 17) add, the higher the correlation between these two measures, the higher the predictive validity of each. Thus, in a case of this experiment, both measures probably highly predict the subsequent consumers' behavior.

## 6.3 Discussion of $H_3$ Results

For the third and last hypothesis three additional consumer neuroscience methods were applied in order to investigate whether changes in the subjects' preferences could be explained by variations in the obtained data. From the results it is evident that only variations in skin conductance, next to eye-tracking and automated facial coding, could explain the changes in consumers' preferences. The following subchapters will discuss and evaluate explanations of the findings.

### 6.3.1 Discussion of $H_{3a}$ Results

The hypothesis $H_{3a}$ investigated whether the eye-tracking method, more specifically variations in gaze fixations and their dwell time can explain the changes in IAT results.

The variations in results obtained by the eye-tracking method, thus the number of gaze fixations and their dwell time, however do not explain the change in the IAT results. These results do not follow the pattern from the literature review, where Plassmann et al., (2012: 22) and other researchers follow the heuristic that the longer an individual pays attention to an object, the higher the preferences they have towards it. In fact, the results suggest that even though consumers spend longer time investigating a stimulus does not mean that the attentional focus lead to positive reaction and thus higher preferences. Since emotions and attention are tightly linked together, positive as well as negative or neutral stimulus can affect the attentional bias and influence preferences. This result thus satisfies the claim of Ohme et al. (2011: 64-65), and thus, consumers are not attentionally biased only by positively valenced stimuli, but also by negatively and/or neutrally valenced stimuli.

Nevertheless, eye-tracking has its limitation which could possibly lead to change of the results in favor of the notion of Plassman et al. (2012) and others. The individual dwell times were not standardized as many factors stand behind their length. One of them is individuals' eye conditions (Wang and Minor, 2008: 212). Other factor is that both of the commercials have different time frame of attention-capturing objects. This means that some stimuli keep attention for short time of period, while other longer. Lastly and most importantly, the used eye-tracker itself could have distorted the data as the quality of gaze calibration was not always *excellent*, but *good* respectively. It was primarily due to the participants' convenience in order not to put them under pressure to subsequently negatively influence results from all the applied methods. This could however lead to bias of the data as some dwell time values exceeded the typical duration (between 200 - 500 ms; Ramsøy, 2014) several times. Hence, the eye-tracker was not able to correctly analyze the eye path, and thus neither the number of fixations nor their dwell times.

### 6.3.2 Discussion of $H_{3b}$ Results

For the hypothesis $H_{3b}$, the automated facial coding as the measure of emotional valence, was applied in order to investigate whether its variations can explain the changes in the consumers' implicit preferences.

Facial expressions, next to eye-tracking method, were not able to explain the change in the preference after the commercials exposure as well. Interestingly in overall, according to the results, the participants had more negative than positive experience during the commercials exposure. This is an unexpected finding since the reaction times (in IAT) toward both brands were faster after the stimuli exposure as the automatic associative network was strengthened. However, there is an assumption that the automated facial coding is prone to negative results as even an ordinary blinking is rated negatively. Other explanation is that some of the participants, while being calibrated, were not completely neutral, and thus, influenced the analysis.

Although facial expressions measure have not yielded a satisfactory results, there is still an assumption that consumers who have a positive emotional experience with an attitude object will increase preferences toward this object and/or brand.

In overall, the analysis shows that the automated facial expressions measure still needs to be validated more as a measure of emotional valence as suggested by Ramsøy (2014) in order to be fully used in consumer research to explain changes in preferences.

### 6.3.3 Discussion of $H_{3c}$ Results

Lastly, skin conductance as another emotional measure was applied in order to explain the change in consumers' implicit preferences by the variations in its data.

Based on the results obtained from Samsung commercial it can be said that there is a positive linear relationship where the subjects who experienced higher emotional intensity also tended to change their preferences in favor of Samsung over Apple. However in general, the results do not suggest that consumers who experience higher emotional response intensity toward an attitude object also alter their preferences more positively toward this object. It is due to the fact that those subjects who had higher arousal toward Apple commercial still preferred Samsung over Apple. The primary reason behind this is that arousal as one of the emotional dimensions can only explain whether a consumer has low, neutral, or high response intensity, but not whether experience was positive or negative. The reason why the linear relationship is negative might be due to the fact that Apple commercial evokes somehow less positive emotions which could explain this result.

Nevertheless, skin conductance method and its sum of amplitude peaks measure best explain the variations in the consumers' implicit preferences.

## 6.4 Implications

The pioneering nature of this research makes a contribution to the consumer neuroscience literature as it investigates the relationship between the variations in IAT, as a measure of implicit preferences, and other consumer neuroscience methods which directly measure affect and cognition. According to a literature search, there has not been done any experiment alike, and the use of the methods is still quite scarce. Moreover, this study contributes to advertising literature as it comprehensively summarizes theoretical consideration of attitudes and preferences, their formation and alteration, and the impact of consumer neuroscience to advertising. This might help advertisers to understand how their audience response toward marketing stimuli, and therefore possibly deliver more suitable messages.

The IAT findings of this experiment are consistent with those of Greenwald et al. (2009) who argues that IAT represents a measure which correlates positively with prediction of behavior. This finding suggests that IAT should be applied more in consumer and advertising research as it can analyze unconscious consumer processes and preference changes. These unconscious processes and preferences cannot be traced by the traditional self-report measures due to their nature. Nevertheless, consumers rely mostly on these. Thus, IAT can provide a mean of understanding of how various stimuli shape consumers' attitudes without conscious interference.

Further, other consumer neuroscience methods and their variations represent means of a real-time analysis of advertising stimuli, which in contrast to the traditional self-reported measures can provide valuable data during a commercial exposure. By applying these methods, advertisers can see how exactly specific stimulus shape the reaction of their audience. Thus, if necessary, this can help them to adjust the message so it does not lead to any negative reactions which would influence preferences and possibly harm the advertised brand. Nevertheless, consumer neuroscience methods should not be seen as opposite to the traditional self-report measures but instead as their complement in understanding consumers' responses toward advertising stimuli and their subsequent behavior.

## 6.5 Limitations

Besides making contributions to the extant research, the present study has some limitations. First, the experimental settings could have influenced the results of applied consumer neuroscience methods, especially the facial expressions method. It might be due to the fact that the subjects were told to express their neutral facial expressions prior to the exposure.

This could have, due to very small number of ads, influenced them in such an extent that they suppressed their natural facial expressions as they were more aware of being tested. More non-target ads could help to resolve this problem as the subjects would *lose their boundaries* and the target commercials would yield different results. Further, the eye-tracking's calibration limitations as mentioned in previous discussion of the results of $H_{3a}$ could have negatively influenced the results. It is primarily due to the fact that the calibration was not *excellent* for all the participants. This might have led to bias data in form of incorrect gaze fixations frequency and their dwell time as some values exceeded the typical duration several times.

Secondly, all the analyses of the applied methods for the commercials exposure in this study were limited because of the data aggregation. In other words, this means that the data obtained by eye-tracking, automated facial coding, and skin conductance were aggregated across both commercials without focusing on variations within portions of the two investigated commercials. Thus, the subtle variations may have been lost when all the methods across the two commercials were aggregated.

Lastly, the lower *p*-values could also raise concerns about false positives.

## 6.6 Suggestions for Further Research

Since facial expressions method has not yielded satisfactory results as a measure of emotional valence and still needs more validation, EEG could be used for future research in conjunction with skin conductance method. By analyzing brain activity directly from the scalp in form of variations in frontal asymmetry could help to justify whether the increased arousal rate is related to positive or negative emotions. Thus, this could explain the changes in preferences.

Further, based on the second notion in limitations, future research should focus on identifying interesting temporal variations within portions of investigated ads as the consumer neuroscience methods have the advantage of high temporal resolution. By focusing on portions of ads could possibly lead to understanding how certain aspects of ads are related to alteration and formation of preferences and relate them to advertising success as mentioned in the first part of the literature review.

# 7 Conclusion

The purpose of this research has been to investigate whether consumer neuroscience methods and variations in their data can contribute in explanation of how consumers shape their preferences toward mature brands after advertising stimuli exposure.

Advertising stimuli trigger affective and cognitive reactions which are associated with advertising success. These can be measured both by traditional self-report measures and consumer neuroscience methods. However, newest findings suggest that consumers are not typically aware of the extent to which advertising stimuli influence their preferences as there are unconscious processes involved in the shape of preferences. Thus, chosen neuroscience methods – eye-tracking, automated facial coding and skin conductance – has been chosen as direct measures of affect and cognition in order to explain the changes in preferences by the variations in the obtained data. Further, the implicit association test (IAT) was chosen as a direct measure of consumers' preferences.

The findings suggest that IAT was able to detect the changes in preferences after the subjects were exposed to two commercials of chosen mature brands by significant changes in reaction times for each brand. However, none of the commercials led to a significant change of preferences for one over the other. Nevertheless, IAT confirmed the first hypothesis as it proved that commercials lead to changes in consumers' preferences. Further, the IAT results correlated positively with intentional purchase behavior which supports the second hypothesis which was investigating this relationship.

Other consumer neuroscience methods were used directly during the commercials exposure as they are able to capture affective and cognitive reactions to stimuli in a real-time. Nonetheless, only skin conductance was able to explain the changes in implicit preferences by its sum of amplitude peaks measure. Thus data obtained through skin conductance method confirmed the hypothesis that sums of SCR amplitude peaks can explain the changes in consumers' implicit preferences. Those subjects who had increased level of arousal for Samsung commercial altered their preferences in favor of Samsung over Apple. Interestingly, those who had increased level of arousal for Apple commercial altered their preferences also toward Samsung over Apple, thus increased arousal had a negative impact on preferences. However, arousal only explains whether a consumer has low, neutral, or high response intensity, but not whether the emotional experience is positive or negative. Since variations in

the automated facial coding results did not provide a mean of explanation of preference changes due to its bias, the increased arousal level for the Apple commercial can be connected to less positive emotional experience. In other words, the increased level of arousal during the Apple commercial is related to less positive emotional experience in comparison to the Samsung commercial. Nevertheless, a future research is necessary in order to support this notion.

The findings demonstrate that consumer neuroscience methods have a potential in improving the understanding of consumers' preferences, and predicting advertising success based on their results. It is due to the fact that consumer neuroscience methods are able to record variations in consumers' affective and cognitive responses during commercial exposure unlike traditional self-report measures. Further, these methods are able to detect reactions which consumers' are not aware of due to their unconscious nature. Because consumer preferences and behavior are guided by both consciousness and unconsciousness, consumer neuroscience methods represent highly valid tools to complement traditional self-report measures.

Lastly, it is important to state that this research contributes to the consumer neuroscience literature as it investigates the casual relationship between IAT and other previously mentioned consumer neuroscience methods. The application of neuroscientific methods in the investigation of preferences is still scarce, and according to the literature search, there has not been done any experiment alike. Further, this research contributes also to the advertising literature as it comprehensively summarizes important theoretical consideration and the impact of consumer neuroscience to advertising. Thus, this research could be of the interest for practitioners as it becomes apparent that the current understanding of consumers' mindsets must be reconsidered. So far, there has been a dominant assumption that consumers make choices consciously and rationally based on their explicit attitudes, although research proves otherwise. There is therefore an importance to adopt the current knowledge based on the newest findings in consumer neuroscience research. Further, the application of consumer neuroscience methods as complementary to the traditional self-report measures is crucial in order create more effective commercials and achieve advertising success.

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# 9 Appendix

## 9.1 First Questionnaire Prior to the Commercials Exposure

**1) Sex**

○ Female

○ Male

**2) Age group**

○ 19 – 24

○ 25 – 30

○ 31 – 36

**3) What smartphone brand do you own? (Multiple choice)**

□ Apple

□ Samsung

□ Other

## 9.2 Second Questionnaire after the Commercials Exposure

**1) What smartphone brand would you consider buying**

○ Apple

○ Samsung

○ Other