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# Less Arousal, More Recall

**Testing the applicability of the Excitation Transfer Effect on recall and recognition of commercials**

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Abstract English

This study examined the impact of moderate arousal on memory for commercials. Sixty-one participants, aged 16 to 62 years, watched either a moderate arousing video or a neutral video. The level of arousal was measured twice, prior and after the video, using the Self Assessment Manikin ([SAM], Bradley & Lang, 1995). The SAM is a self-reported, non-verbal pictorial assessment technique. They had to watch five different older and less popular commercials. The participants then completed free recall and recognition questionnaires testing their memory of the commercials, as well as demographic questions, and questions regarding usage of pornographic material and their sexual orientation. Overall, subjects in the arousing condition memorized (in free recall) the commercials significantly better than subjects in the non-arousing condition, except for the first commercial which may be due to a primacy effect. Participants were found to remember (in recognition) not significantly more commercials in the arousing condition than in the non-arousing condition. The lack of improvement in recognition memory in the arousing condition may be due to a ceiling effect. In conclusion, it was confirmed that moderate levels of arousal significantly improved free recall memory for commercials as opposed to normal levels of arousal. Implications and limitations of the study are discussed.

Samenvatting Nederlands

In het kader van deze opdracht werd de invloed van een matig opwindend filmpje (“moderate arousal”) op de herinnering en herkenning van reclame boodschappen onderzocht. 61 proefpersonen, leeftijd vanaf 16 tot en met 62, moesten of een matig opwindende of een neutrale video kijken. Het niveau van arousal werd op twee termijnen gemeten, voor en na de video, door middel van de Self Assessment Manikin ([SAM], Bradley & Lang, 1995). De SAM is een zelfgerapporteerde, non-verbale geïllustreerd evaluatie techniek (“self-reported, non-verbal pictorial assessment technique). Ze moesten vijf oudere en minder populaire reclamefilmpjes kijken. Daarna moesten de proefpersonen een “free recall” en “recognition” toets doen om hun herinnering aan de reclameboodschappen te toetsen. Vervolgens werden de ze nog demografische vragen en vragen over hun gebruik van pornografische materialen en hun seksuele geaardheid gevraagd. Het kwam naar voren dat matig opgewonden proefpersonen in “free recall” zich aan significant meer reclameboodschappen konden herinneren, behalve van het eerste reclamefilmpje waar geen verschillen gevonden werden wat aan het primacy effect zou kunnen liggen. Voor herkenning (“recognition”) werden geen significante verschillen tussen de conditie verkregen. Dit zou aan het ceiling effect kunnen liggen. In totaal werd bevestigd dat matig opwindende filmpjes wel een significante invloed op de herinnering (“recall”) maar niet op de herkenning (“recognition”) van reclamefilmpjes hebben. Conclusies en beperkingen van het onderzoek werden beschreven.

# 1 Introduction

The excitation transfer effect (Zillmann, 1971) has often been researched in a negative context. Studies on the effects of sexually explicit media (Seto, Maric & Barbaree, 2001; Preiss et al., 2007), the relationship between sexual arousal and aggression in men (Baron & Bell, 1977) or on violent video games (Preiss et al., 2007) serve as examples. However, there are also a few studies which tried to use and exemplify the effect in more positive areas as its effects and impacts for commercials and advertisements (Gorn, Pham & Sin, 2001) or regarding pro-social behavior (Mueller & Donnerstein, 1981). Concerning the lack of research on its positive effects and area of applications, there is not much knowledge about its possible advantages and potential in the marketing field. But the understanding on how different types of advertisements are remembered and learned by consumers can provide valuable insights to improve the effectiveness and memorability of advertisements (Janiszewski, Noel & Sawyer, 2003). The purpose of this study was to show if moderately arousing films can increase the actual short-term remembering (recall and/or recognition) of commercials.

# 2 Theoretical Framework

## 2.1 Pornography - Sexually Explicit (Internet) Material

There are several definitions of pornography. An approved and in this context applicable definition was formulated by Malamuth (2001, p. 11817), in which pornography is defined as 'sexually explicit media that are primarily intended to sexually arouse the audience'.

The use of pornographic material has been and will always be controversial. Since the upcoming of the Internet, both the possible options for distribution and availability as well as the long lasting discussion about the use and implications raised up to a new dimension (for a broad overview and review of past studies see: Huston, Wartella & Donnerstein, 1998; Kingston, Malamuth, Fedoroff & Marshall, 2009; or: Goodson, McCormick, & Evans, 2001). There has been a positive shift of the image of pornography by its increased use in contemporary culture and also the trend in popular culture and art, called *porno-chic* (McNair, 2002). Pornography has become part of advertisements, art, youth culture, music videos and fashion in western societies and seems to be ubiquitous (Traeen, Sørheim-Nilsen & Stigum, 2006). According to Attwood

(2002), the diversity of the pornography industry has become much bigger in the last 20 years by trying to please and serve every niche of the market. This diversity makes it also very difficult to find or determine a common taste of a population or even a subgroup of a society (Paul, 2009). In most studies, more men than women reported the use of pornography (Flood, 2007; Goodson et al., 2001; Lo & Wei, 2002; Paul, 2009; Peter & Valkenburg, 2010b) as well as homosexuals reported more overall and frequent usage than heterosexuals (Traeen et al., 2006; Peter & Valkenburg, 2010b). Men also found sexually explicit material more arousing and entertaining than women (Goodson et al., 2001; Lo & Wei, 2002; Paul, 2009; Greenfield, 2004). In the study of Traeen et al. (2006), the difference between homosexual/bisexual women and heterosexual women regarding the use of pornography was particularly noticeable. Prolonged or frequent use of pornography can lead to habituation and/or satiation, which may provoke the need to search for novel and maybe more bizarre material to get a comparable level of arousal (Zillmann, 2000; Goodson et al., 2001; Peter & Valkenburg, 2010a; Kingston et al., 2009). In contrast, Julien and Over (1984) found out that participants did neither produce a significant decrement in penile circumference nor in their subjective ratings after several times of exposure to erotic stimulating material. It is important to mention that their study took place in a laboratory setting and they suggested that it would be advantageous to replicate their results in a more natural setting.

### 2.2 Arousal

According to Humphreys and Revelle (1984, p. 153), arousal is "the state of the organism that in everyday terms means alertness [..] and activation. Arousal may be thought of as a conceptual dimension ranging from extreme drowsiness at the one end to extreme excitement at the other". Furthermore, the level of arousal results from internal and external stimulation. Low levels of sensory input are associated with low levels of arousal, whereas high levels of sensory input are associated with high levels of arousal (Humphreys & Revelle, 1984). Humphreys and Revelle (1984) also emphasize the difference between *within-subject* and *between-subject* effects in arousal, for it is a subjective experience and each person reacts and perceives arousal differently. This fact supports the use of *within-subject* comparisons where a prior and post measurement to the stimulus is used to determine the difference. Also, moderate levels of arousal seem to be most pleasurable, hence, subjects often actively seek to regulate their actual arousal level to the most preferred one (Matthews, Davies & Lees, 1990).

The article of Levine and Pizarro (2004) gives a detailed overview of the different facets of emotions, in which arousal is included. However, their recommendation is to not solely use the expression of emotional arousal, because subjects' emotions are much more differentiated than just arousal, but it is not applicable in this context. It is advisable to refer just to the term and measurement of arousal than to specify the emotions, because this is neither relevant nor necessary for this research, although the additional measurement of valence or pleasure is both applicable and also advisable here (Peter & Valkenburg, 2010). Despite this, Levine and Pizarro (2004) gained some valuable insights on the influence of emotions on information processing and memory. According to Levine and Pizarro (2004), emotions almost always are capable to increase the salience of information and making memory better. Thus, arousal, as a component of emotion, certainly affects memory.

Regarding arousal to sexually explicit material, males typically report higher subjective arousal than women (Goodson et al., 2001), which can also be due to biased reports of either men or/and women (Jannsen, Carpenter & Graham, 2003). According to Chivers, Rieger, Latty and Bailey (2004), self-declared heterosexual women did also get as physiologically aroused as homosexual women in their research by watching a female-female sexually explicit film, but both experienced the highest subjective and genital arousal to male-female films. Chivers et al. (2004) advise to use videos of individuals to gain more inside in the arousal level and pattern of the participants.

### 2.3 Effects of Arousal on Memory, Recall & Recognition

Several studies did research on the effect of arousal on memory, recall and/or recognition. According to Cahill and McGaugh (1995), their results provide evidence that long-term memory is either directly or indirectly influenced by emotional arousal in normal human subjects. In particular, the degree to which emotional event memories (especially long-term) are accessible to conscious free recall is altered by emotional arousal. Bradley, Greenwald, Petry and Lang (1992), found out that verbal items associated with higher arousal during encoding were better remembered than associated with lower arousal, especially for long-term memory. Further, valence or pleasantness of pictures did not play any significant role in their research, because arousal was the overall determining factor of memory. However, for some categories of pictures gender was rather the determining factor than the level of arousal. In general, superior memory

performance was obtained (for both immediate and delayed free recall) for pictures rated high in arousal as opposed to pictures rated low in arousal. Humphrey and Revelle (1984) studied the relationship between individual differences (e.g., arousal and effort) and information processing. Their results imply that in tasks in which 'sustained information processing' is essential, heightened arousal had a beneficial effect on the performance. Especially, heightened arousal increased the number of available resources to accomplish various attentional tasks successfully. Matthews et al. (1990) replicated and confirmed the obtained results. However, Humphrey and Revelle (1984) also gained valuable insights into the relationship between arousal, effort and short-term memory, because the short-term memory ability decreased by heightened arousal but not by increases in effort. Humphrey and Revelle (1984) also stated that the relationship between arousal and performance is an "inverted-U" if the task requires both sustained information processing and the short-term memory. Therefore, moderate arousal seems to be the optimal level for good performance. The most important finding of Matthews et al. (1990) was that perceptual sensitivity was significantly enhanced by energetic arousal. According to Buchanan and Lovallo (2001), emotionally arousing information was better memorized than neutral information, and arousal had a significant effect on recall. In contrast, there were no significant results between men and women in recall performance. Sharot and Phelps (2004) found out that, whereas the recognition of arousing words remained the same or even showed improvement, neutral words recognition became worse over time and arousing words were also better recognized than the neutral words at delay. Thus, arousal supports memory and slower forgetting, but for the immediate recognition test, no significant difference was found between recognition rates for arousing and non-arousing words (Sharot & Phelps, 2004). Furthermore, the results of Doerksen and Shimamura (2001) imply that the lack of enhancement in memory by arousal at immediate test may be specific to recognition tests and cued recall tests (Richardson, Strange & Dolan, 2004) rather than to free recall (Strange, Henson, Friston & Dolan, 2000).

Several studies have been conducted to investigate the effects of violence and sex on memory for commercials, either within the commercial itself or the specific context wherein the commercial was embedded. The common results were that subjects had better memory of advertisements during a neutral television program than during a sexual or violent television program, regardless the advertisement content (Bushman & Bonacci, 2002; Bushman, 2007; Furnham & Mainaud, 2011). Bushman and Bonacci (2002) even measured memory performance

24 hours after exposure and still the commercials embedded in a neutral program were better remembered. The memory performances were regardless of the gender of the participants (Bushman & Bonacci, 2002; Bushman, 2007; Furnham & Mainaud, 2011; Buchanan & Lovallo, 2001). Violent advertisements were the least memorable commercials as compared to sexual and neutral ones (Bushman, 2007). But according to Furnham and Mainaud (2011), sexual commercials were better remembered (in free recall) than non-sexual commercials within both sexual and non-sexual television programs. However, there was no congruity effect obtained. Thus, there was no interaction between the content of the television program (i.e., violent program) and content of the commercials on memory (i.e., violent commercial) of the commercial (Bushman, 2007; Furnham & Mainaud, 2011). According to Bushman (2007), this might be due to the high involvement of the viewer in the sexual and violent programs, whereby no cognitive resources were available for the processing of advertisements. This phenomenon will be discussed in more detail in the next section about the excitation transfer effect. However, in non-sexual programs, a contrast effect might work, as found in the research of Furnham and Mainaud (2011), because the sexual commercials contrast the content of the program and seem more interesting and noticeable, hence more memorable. But attention-getting stimuli (i.e., sexual commercials) might backfire because the attention could solely result from the sexual stimulus and not or hardly from the rest of the commercial (Pechmann & Stewart, 1990). Thus, a separation of the sexual stimulus and the actual advertisement might be a useful solution. Another explanation for the lack of memory performance on commercials stems from the state-dependent memory theory (Bushman, 2007), or also called context-dependent memory theory (Furnham & Mainaud, 2011). According to the theory, variations in mood (i.e., level of arousal) during the encoding and the retrieval of the information may be accountable. Thus, a match of, in this case, both levels of arousal would then help to improve the memory of the commercial.

### 2.4 The Excitation Transfer Effect

The excitation transfer effect occurs during a transfer of emotions and physiological arousal (Zillman, 1971; Heuvelman & Fennis, 2006). If the experienced emotions are unknown or unfamiliar and thus not attributable, most people try to explain them by relying on physiological feelings and perceptions in order to understand them (Bunce, Larsen & Cruz, 1993; Anderson, Deuser & DeNeve, 1995). Arousal does not seem to be completely related to a particular

stimulus, thus, arousal does not vanish if the stimulus (e.g. an arousing video) does so. It can be transferred to a subsequent event (e.g. commercial on television) and increases its affective reaction on this subsequent stimulus (Zillman, 1971; Heuvelman & Fennis, 2006). This particular affective reaction can be either positive or negative. Research of Walster and Berscheid (1974, in Cohen, Waugh & Place, 2001) showed a relationship between physiological arousal and attraction. A meta-analysis regarding the influence of the internet on sexuality showed that, similar to the studies regarding the excitation effect, so far most research focused on the negative effects (Döring, 2009). Although further confirmation is desirable, earlier studies expected that the excitation transfer will function best in cases of decrease in perceived arousal and increase of physiological arousal (Anderson et al., 1995).

Erotic or pornographic films are suited to get people (moderately) aroused (Seto et al., 2001), and, thus, are perfect to bring people into an adequate emotional state to study the possible positive effects of the excitation transfer effect, in a way as Mueller and Donnerstein (1981) have done earlier. This match between arousing films and the given effect is both profoundly interesting and delicate. The research of Seto et al. (2001) showed that subjects can discover feelings of anger or rage when watching pornographic or erotic films, if preceded by irritation, annoyance or negative stimulation. As discussed earlier, arousal is not related to a stimulus and therefore, does not disappear together with the arousing stimulus (Heuvelman & Fennis, 2006). In stimulating subjects to get into a particular mood before watching a short video, a positive effect, reaction or response can result from the arousal and being transferred to the short video (Mueller & Donnerstein, 2001). However, Anderson et al. (1995) pointed out that the excitation transfer can increase the negative reaction to a negative event as it can increase the positive reaction to a positive event, but it cannot create a positive reaction (i.e., liking) to a negative event or vice versa. Therefore, the stimulus has to be unambiguously positive, because later the direction of the response cannot be changed. In the study of Gorn et al. (2001), moderate manipulations of arousal had a significant influence on advertising responses and such effects may be pervasive in real life settings. Furthermore, just the moderate level of arousal may be the reason why they found support for the excitation transfer effect, because intense feelings of arousal are likely to be very salient and therefore unlikely to be misattributed to the subsequent events or stimuli. This polarization of moderate and high levels of arousal has theoretical significance for this study and the influence of arousal in general. For example, Bushman (1998)

studied the effect of violence on memory for commercial messages. The results imply that the angry mood, caused by the prior violent film clip, might activate hostility-related ideas and interfere with the information processing and transfer and ultimately memory of the commercials. Again, high levels of arousal led to poorer memory of commercials, which recommends the use of moderate levels of arousal. In other words, the more attention is paid to sex and violence in television programs, the less attention is available to process and focus to the commercials embedded in the programs (Bushman, 1998; Bushman & Bonacci, 2002; Bushman, 2007; Furnham & Mainaud, 2011).

From the obtained data this research question results:

*"Can moderate arousing erotic films facilitate the recognition and recall of advertisements opposed to not arousing films?"*

# 3 Methods

## 3.1 Participants

The participants have been contacted via various social media communities as Twitter, Facebook and via e-mail. For the sake of comparability, only heterosexual men and homo- and bisexual women were allowed to participate. According to Wiederman (1999), in this kind of sexually research, men were more interested in participating in video studies, whereas women preferred interview studies. The potential as well as the actual participants were told to forward the link to other potential participants (www.thesistools.com/ProgramContexts) and to ask them kindly to participate. It was explicitly pointed out to not give away anything about the content, intention or other kinds of information, as this would jeopardize the results, except that regarding sexual orientation they should prefer or being attracted to women. As a matter of fact, total anonymity has been guaranteed and the (potential) participants have been informed about it before and during the participation. Of the originally contacted potential participants of approximately 400 people, 115 men and women ultimately participated. They were randomly assigned to either the experimental condition ($n$ = 69) or the control condition ($n$ = 46). Due to some randomizing problems of the used survey site (named above), which can, among others, also be due to subjects

who accessed the site and finally did not participate at all, the two groups were not evenly balanced. After controlling for incomplete questionnaires and not matching preferences, a total number of 61 participants filled in the whole questionnaire. The experimental condition consisted of 35 participants, with 26 males and 9 females and an average age of 29 years. The control condition consisted of 26 participants, with 17 males and 9 females and an average age of 26 years. Regarding sexual orientation, all men except for one ("predominantly heterosexual") declared to be heterosexual, as for the women were 5 homosexual, 9 predominantly homosexual and 4 bisexual.

### 3.2 Self-Reported Arousal

Preceding the video and after the video, the participants filled in the Self Assessment Manikin ([SAM], Bradley & Lang, 1995) to measure their subjective level of arousal prior and right after the stimulus on a 9-point scale. The SAM is a non-verbal pictorial assessment technique (Bradley & Lang, 1995). Although the SAM is a subjective measure technique, earlier studies showed that it seems to highly correlate with physiological arousal measurements as skin conductance measures or other measurement methods (Lang, Bolls, Potter, & Kawahara, 1999; Matthews et al., 1990). In the past, the SAM has been applied to several arousal and memory related studies (e.g. Buchanan & Lovallo, 2001; Bradley et al., 1992). The SAM also asks the participants to fill in their subjective level of valence or to use a more commonly used term emotion or pleasure, as well as their subjective level of dominance on a 9-point scale. Although especially the results of the dominance scale were not of important, letting the participants fill in all three categories does help to prevent that participants might guess the actual purpose of the study. Another advantage of the SAM is that it is culturally and language independent (Bradley & Lang, 1995), thus widely applicable, which is perfect for the use of an online experiment, for participants may come from Germany, the Netherlands or the United Kingdom. Furthermore, neither is much time nor effort required to complete the SAM.

The ultimate changes in arousal were determined as the differences between the first and the second measurement. Hence, the subjective character of self-reported arousal, the differences between the two measurements prior and after the stimuli are used for being able to detect the individual differences *within* the participants as well as the overall difference *between* the participants. This is superior to a single measurement of a *between-subjects* level of arousal,

which would not provide a reliable indication of the obtained differences (Humphreys & Revelle, 1984; Matthews et al., 1990).

### 3.3 Stimulus Materials

The search for and the ultimate selection of two videos which resemble each other regarding quality, duration and sound was a rather difficult and crucial challenge. Hence, the control video has been adjusted to the experimental video. The experimental video is a music video of the French DJ-Duo called Galleon with their song "So I Begin" with an actual duration of 3:50 min. In the experimental video, a woman is in her hotel room getting dressed and undressed. She is styling herself for a performance as a DJane and dancing and moving around in a mildly arousing way. The control video is an extract of the nature documentary by BBC called "Planet Earth" with an actual duration of 3:52 min. The control video only consists of beautiful landscapes (i.e., growler, mountains) filmed from a bird's eye perspective to provide a non-sexual and neutral comparison for the self-reported arousal measures. This kind of neutral video was already successfully used by Chivers et al. (2004) to detect differences in arousal in participants. Furthermore, Quigg and Want (2011) also successfully used "Planet Earth" as neutral stimulus, because of the absence of any humans in the video. The audio track of both videos has been cut out to exclude undesired influences others than the visual stimuli of the videos. According to Burke, Heuer and Reisberg (1992), the differences between the emotions, or in this case arousal, of the experimental and neutral group regarding memories of the to-be-remembered material are often due to the so-called "story effects". Thus, the used stimulus consists of novelty elements or is easier memorable than the neutral, instead of the actual desired "emotional effects" which are being researched. To cope with this problem, the stimulus that is used to arouse the participants differs among the two conditions, but the stimulus that has to be remembered, consisting of five commercials, will be the same for both.

The five commercials used in this research are all equally long (0:30min), all stem from the year 1995 and broadcasted America. The five commercial videos have been merged into one video to prevent delay or other confounding effects. The first video is a commercial of an American orange juice brand called Sunny Delight, the second video is a commercial of an Internet provider called AOL (also known in Europe), the third video is a commercial of a home tool, a grinder, called Dremel Multi-Pro, the fourth video is a commercial of a beer called Red

Dog Beer and the fifth video is a commercial of Wrigley's Winterfresh Chewing gum (also known in Europe). To account for attention of the commercials, older and less popular commercial have been chosen because novel stimuli are known to be better at capturing attention than familiar stimuli (Berlyne, 1970).

### 3.4 Pre-Test

To verify the influences of the videos on self-reported arousal, a pre-test has been conducted. The confirmation of the effects of the used stimulation material on arousal prior to the research has also been recommended by Baron and Bell (1977), Paul (2009) and Jannsen et al. (2003). The pre-test was a shorter version of the actual online experiment to reduce the differences between the two tests to a minimum and to guarantee valid results and deliver a significant forecast of the arousal measures. One adjustment of the actual experiment compared to the pre-test was the use of a 9-point scale for the SAM (Bradley & Lang, 1995) instead of a 5-point scale, for it provides a more precise indication of the arousal, valence and dominance level of the participants.

For the pre-test, 20 participants, drawn from the same population as the participants in the actual online experiment, were contacted via various social media communities as www.Facebook.com and www.Twitter.com on the internet. The pre-test was completely filled in by 14 subjects in total, with 8 subjects in the experimental condition and 6 subjects in the control condition, with in total 13 heterosexual men and one predominantly homosexual woman. The woman was in the experimental condition.

A paired-sample t-test was done to test the difference of arousal prior and after the video. High values stand for a low level of arousal, as low values stand for a high level of arousal. The experimental condition with the arousing video showed significant difference between mean scores of the prior arousal scores ($M$ = 4.0, $SD$ = 0.76) and the arousal scores afterwards [$M$ = 3.25, $SD$ = 0.71; $t(7) = -4.58$, $p = .003$]. The control condition with the non-arousing video also showed significant difference in mean scores of prior arousal scores ($M$ = 3.33, $SD$ = 1.03) and the arousal scores afterwards [$M$ = 4.00, $SD$ = 0.63; $t(5) = 3.16$, $p = .025$]. However, the participants in the control condition were even less aroused after the video than before. The experimental condition also showed significant difference between mean scores of the prior valence scores ($M$ = 2.75, $SD$ = 0.71) and the valence scores afterwards [$M$ = 2.13, $SD$ = 0.35;

$t(7) = -3.42$, $p = .011$]. For the control condition no significant differences in valence were obtained.

An independent-sample t-test has been done to test the difference of arousal and valence levels between the two conditions. The dependent variables are respectively the differences between the two obtained data for level of arousal and valence. The experimental condition showed a significant different mean score of arousal ($M = -0.75$, $SD = 0.46$) than the control condition [$M = 0.67$, $SD = 0.52$; $t(12) = -5.40$, $p < .005$]. The experimental condition showed a significant different mean score of valence ($M = -0.63$, $SD = 0.52$) than the control condition [$M = 0.50$, $SD = 1.22$; $t(12) = -2.36$, $p = .036$]. Thus, the arousal score differences are significantly higher in the experimental condition for both between and within subjects than in the control condition. The valence score differences are also higher in the experimental condition for both between and within subjects than in the control condition. Thereby, the data confirmed the use of the videos.

### 3.5 Procedure

An online experiment was chosen because, according to Mustanski (2001), online studies belong to the best methods of interviewing when sensitive issues are studied. In this context an online study is also well suited because it resembles the natural context in which the participants usually would encounter a comparable situation. It is therefore comparable to a field experiment. Julien and Over (1984) also recommended studying sexual-related issues in a real life setting because of its natural context and absence of social isolation as in a laboratory setting.

After the participants opened the link (www.thesistools.com/ProgramContexts) everything was thoroughly explained to prevent questions and ambiguities (for the whole questionnaire, see the appendix). Nevertheless, a comment field was added at the end to give the participants the possibility to express their thoughts, report problems or misunderstandings. No participant had serious complaints or problems filling in the questionnaire.

After having read the introduction page, the participants filled in the SAM for the first time, then they watched the stimulus material (arousing or non-arousing video) without sound, then they filled in the SAM again. After the second SAM, they watched the commercials and answered the recall questions. After the recall questions, they answered the recognition questions, followed by the questions about “liking” and already knowing the commercials. At the end, they

answered demographic questions about their gender, age, occupation, sexual material usage frequency and sexual orientation. The experiment took approximately 12-15 minutes.

### 3.6 Recall Test

After the participants saw the commercials, they completed a free recall test. They filled in the name of the five products and brands into five text blocks ranged from 1 to 5. Although the answers were asked in the right order of appearance of the commercials, it was ultimately not important if it was accomplished because the pure recall of the commercials was of interest here. Initially, the color of the brand and logo were also asked but were not included in the final examination due to an insignificant number of answers.

The answers of the recall test were transformed into a 4-point scale. The answers got the following points: 1 = nothing right or written at all; 2 = right product category (e.g. beer); 3 = at least one part right (e.g. Sunny of Sunny Delight or Wrigley's of Wrigley's Winterfresh); 4 = completely right (e.g. Red Dog Beer). Each right answer also implied that the participant processed the advertisements consciously and actually saw them.

### 3.7 Recognition Test

After the free recall test, subjects were given a recognition test consisting of five-choice multiple choice questions. For the five commercials, the actual name, respectively the right answer was mixed among four wrong names. For example, Sunny Delight was among Sunrise Delight, Sunny Be Light, Sandy Alright and Sunny feel right. Red Dog Beer was among Red Donkey, Red Horn, Red Giraffe and Red Mouse. AOL was placed among other American Internet Providers as MSN, Juno, NetZero and Earthlink. The Winterfresh Chewing gum of Wrigley's was placed among other Chewing gums of Wrigley's as Doublemint, Big Red, Spearmint and Juicy Fruit. For the Dremel Multi-Pro, the other options were modifications of the original name with only changing the first letter as Cremel, Fremel, Tremel and Bremel.

### 3.8 Liking and Familiarity Test

After the recall and recognition tests, the participants answered 15 dichotomous (yes or no) questions. The participants answered the five questions, if they liked the respective product. Due to the age, chosen products or brands, origin and non-entertainment of the commercials, it was unlikely that the participants already knew them in advance. The participants were additionally asked 10 questions if they were familiar with the commercial and the brand afterwards.

### 3.9 Sexual Orientation and Demographic Variables

At the end of the questionnaire, the participants filled in the questions about their demographic variables as age, gender, occupation, usage frequency of pornographic material (magazines, soft-porn and hardcore porn) and sexual orientation. The usage frequency of pornographic material was measured on a 4-point Likert scale ranging from ‘never’, ‘almost never’, ‘sometimes’ to ‘often’ with an extra button for ‘no answer’, in case participants preferred not to share this information. The sexual orientation was measured on a 5-point Likert scale ranging from homosexual, predominantly homosexual, bisexual, predominantly heterosexual and heterosexual. Paul (2009) wrote in his implications that it is advisable to not only ask for solely homo-, bi- and heterosexuality because people might be attracted to their own gender but never would see themselves as bisexual or as completely homosexual.

## 4 Results

### 4.1 Arousal Measures - SAM

A paired-sample t-test was done to test the difference of arousal prior and after the videos have been seen. Low values stand for a high level of arousal, as high values stand for a low level of arousal. In the experimental condition with the arousing video, there was a significant difference between mean scores of the prior arousal scores ($M$ = 5.74, $SD$ = 1.98) and the arousal scores afterwards [$M$ = 5.03, $SD$ = 1.79; $t(34) = 2.28$, $p$ = .029]. The control condition with the non-arousing video showed no significant difference in mean scores of prior arousal scores ($M$ = 6.07, $SD$ = 1.88) and the arousal scores afterwards [$M$ = 6.42, $SD$ = 1.82; $t(25) = -0.93$, $p$ = ns]. Thus, the experimental and the control group confirmed the desired effect of the videos. In the

experimental condition, there was also a significant difference between mean scores of the prior valence scores ($M$ = 4.37, $SD$ = 1.71) and the valence scores afterwards [$M$ = 3.86, $SD$ = 1.68; $t(34) = 2.08$, $p = .045$]. The control condition showed no significant differences in valence. That means that the participants in the experimental group experienced higher levels of pleasure watching the arousing video than the participants in the control video watching the non-arousing video. The dominance scores differed also significantly for the experimental condition prior ($M$ = 4.60, $SD$ = 1.24) and after [$M$ = 5.14, $SD$ = 1.50; $t(34) = -3.38$, $p = .002$], but not for the control condition. According to the results, the participants in the experimental condition scored higher on dominance, but the participants in the control condition did not significantly feel different regarding dominance after they saw the video. The obtained results regarding the level of dominance have not been used further in this study.

An independent-sample t-test has been done to test the difference of arousal, valence and dominance level between the two conditions. The dependent variables are the differences between the two obtained data for level of arousal, valence and dominance. The experimental condition differed significantly on arousal ($M$ = -0.71, $SD$ = 1.86) from the control condition [$M$ = 0.35, $SD$ = 1.90; $t(59) = -2.19$, $p = .033$]. The experimental condition also differed significantly on valence ($M$ = -0.51, $SD$ = 1.46) from the control condition [$M$ = 0.27, $SD$ = 1.54; $t(59) = -2.02$, $p = .047$]. And, the experimental condition differed significantly on dominance ($M$ = 0.54, $SD$ = 0.95) from the control condition [$M$ = -0.50, $SD$ = 1.39; $t(59) = 3.48$, $p = .001$]. Thus, the arousal score differences are significantly higher in the experimental condition for both between and within subjects than in the control condition. The valence score differences are also higher in the experimental condition for both between and within subjects than in the control condition. And, the dominance score is also significantly higher in the experimental condition for both between and within subjects. Thus, participants in the experimental condition were more aroused, had more pleasure and had a higher feeling of dominance than the participants in the control condition. Again, the obtained results regarding the level of dominance have not been used further in this study.

### 4.2 Recall Scores

To examine the differences in the recall test, an univariate analysis of variance [ANOVA] was done. For all the mean scores and standard deviations of the five recall tests per condition and the

overall mean score and standard deviation, see table 1. The recall score of all five commercials failed to reach a statistical significant difference between the experimental condition ($M$ = 2.56, $SD$ = .96) and the control condition ($M$ = 2.08, $SD$ = 1.10; $F$ (1, 59) = 3.361, $p$ = .072). By studying the mean scores of the five recall tests, the first recall test seemed to be the reason for the lack of statistical significance. Therefore, the ANOVA has been carried out again with the mean scores of the recall tests except of the first recall test. The mean score of the recall tests *2*, *3*, *4* and *5* showed a statistical significant difference between the experimental condition ($M$ = 2.66; $SD$ = .97) and the control condition ($M$ = 2.02, $SD$ = 1.08; $F$ (1, 59) = 5.969, $p$ = .018). Thus, by neglecting the first recall score, which may be due to the primacy effect (Jahnke, 1965), the participants in the condition with the arousing video had a significantly higher recall score than the participants in the condition with the non-arousing video.

*Table 1: Mean scores and standard deviation of the recall scores per condition*

| Condition | | N | M | SD |
|---|---|---|---|---|
| Experimental | Recall1 | 35 | 2.14 | 1.26 |
| | Recall2 | 35 | 2.37 | 1.40 |
| | Recall3 | 35 | 2.46 | 1.52 |
| | Recall4 | 35 | 2.77 | 1.42 |
| | Recall5 | 35 | 3.06 | 1.30 |
| Control | Recall1 | 26 | 2.31 | 1.35 |
| | Recall2 | 26 | 1.85 | 1.29 |
| | Recall3 | 26 | 1.88 | 1.34 |
| | Recall4 | 26 | 2.23 | 1.39 |
| | Recall5 | 26 | 2.12 | 1.24 |

### 4.3 Recognition Scores

To examine the differences between the conditions for the recognition test, an univariate analysis of variance [ANOVA] was done. For all the mean scores and standard deviations of the five recognition tests per condition and the overall mean score and standard deviation, see table 2. The recall score of all five commercial failed to reach a statistical significant difference between the experimental condition ($M$ = 1.29, $SD$ = 0.28) and the control condition ($M$ = 1.30, $SD$ = 0.33; $F$ (1, 59) = 0.913, $p$ = .913). Thus, no significant differences were obtained between the arousing and the non-arousing video condition for the recognition test.

Also a MANOVA to detect significant differences between the single questions between the conditions or neglecting the first or even the first two scores failed to deliver significant results for the recognition scores.

### 4.4 Liking and Familiarity Scores

To compare the effects of liking the commercials and already knowing them, an independent sample t-test has been carried out. The only two questions reaching significant differences between the two conditions regarded AOL. The question if the AOL commercial was already known before participating was answered with ‘yes’ by significant more participants in the control condition ($M$ = 1.85, $SD$ = .46) than in the experimental condition [$M$ = 1.94, $SD$ = .24; $t$(59) = 1.064, $p$ = .032]. The question if the participants liked the brand AOL was answered with ‘yes’ by more participants in the control condition ($M$ = 1.77, $SD$ = .51) than in the experimental condition [$M$ = 1.91, $SD$ = .28; $t$(59) = 1.407, $p$ = .005].

### 4.5 Usage and frequency of pornographic material

To compare the frequency of pornographic material, multivariate analysis of variance has been carried out. The four dependent variables were the usage of erotic magazines, erotic pictures, soft pornographic films and hardcore pornographic films and the factor was the condition, thus either arousing or non-arousing film. The results failed to reach any statistical significance between the two conditions in usage and frequency of pornographic material.

*Table 2: Mean scores and standard deviation of the recognition scores per condition*

| Condition | | N | M | SD |
|---|---|---|---|---|
| Experimental | Recognition1 | 35 | 1.43 | .50 |
| | Recognition2 | 35 | 1.48 | .51 |
| | Recognition3 | 35 | 1.14 | .36 |
| | Recognition4 | 35 | 1.20 | .41 |
| | Recognition5 | 35 | 1.23 | .43 |
| | RecognitionAll | 35 | 1.29 | .28 |
| Control | Recognition1 | 26 | 1.27 | .45 |
| | Recognition2 | 26 | 1.38 | .50 |
| | Recognition3 | 26 | 1.27 | .45 |
| | Recognition4 | 26 | 1.31 | .47 |
| | Recognition5 | 26 | 1.27 | .45 |
| | RecognitionAll | 26 | 1.30 | .33 |

# 5 Discussion

The results of this study imply that moderate arousing videos can improve the information transfer and commercial recall, provided that the lack of significant results for the first commercial can be seen as a result of the primacy effect (Jahnke, 1965). Further research should focus on randomizing the order of the commercials to rule out rival explanations such that a particular commercial produced the effect rather than the primacy effect itself. The obtained results prove the contention of Humphrey and Revelle (1984) that arousal increases the availability of sustained information processing resources, but disproves the contention that arousal reduces the availability of short-term memory resources. However, in this study,

moderate arousing videos failed to improve recognition of the commercials. This might be due to a couple of reasons. Firstly, the temporarily arousing effect of the stimulus video could have sustained during the recall but not during the recognition task. Thus, no further improvement due to the arousal was possible. One reason for the fast dilution of the arousal, besides that the video consciously chosen to be only moderately arousing, could be the image size of the videos. The videos had to be watched on www.youtube.com on a private channel, the participants were able to watch the video either full-screen or in the standard format of Youtube. Verleur (2006) found out that image size does not affect the reported emotional arousal levels measured by the SAM, but could not rule out that a larger screen might cause an increase in arousal, even for calm videos. Opposed to the findings of Verleur (2008), and Zillmann, Knobloch and Yu (2001) found out that the attraction increases with image size. For future researches in this field, it might be advisable to control the image size, either by restricting options to only one size or asking afterwards in which size the participant watched the video. Furthermore, to control image size on the influence of arousal is advisable, because higher levels of arousal are not desirable and might work counterproductive to the memorizing of commercials (e.g., Gorn et al., 2001). Secondly, the recognition task might have been too simple for the participants, independent of the condition and hence stimulus video. Arousal could thereby show no significant effect on recognition, thereby resulting in ceiling effects. Further research should concentrate on improving the recognition task to study the effects of moderate arousal on recognition.

Due to the significant differences between the arousal scores of the arousing and non-arousing video and no significant differences in the usage of pornographic material, the stimulus proved to be a useful and appropriate manner to moderately arouse subjects, independent of usual use. However, the results of the sexual material questions should be considered with caution. The participants had to answer private questions about their use of sexual material. Thereby, a social desirability effect could have taken place, so that the results may not represent the reality (Paul, 2009). Nevertheless, the obtained arousal scores were optimal and resulted to some extent in memory improvement. However, a demand effect (Seto et al., 2001), thus awareness of the purpose of the study among the participants, cannot completely be precluded regarding the arousal scores but not the memory scores. The participants might suspect the desired manipulation and, thereby, might consciously or unconsciously produce the expected effect. Nevertheless, the influence of arousal on memory was significant for the recall scores and proved

that the video truly changed the level of arousal significantly in the experimental condition but not in the control condition. Furthermore, the implications of Paul (2009) and others, to pre-test and verify the selection of the stimulus materials by comparable subjects, proved to be right and beneficial for the reliability and validity of the experiment.

Another implication is due to the omnipresence of pornography and sexually explicit or implicit materials (Attwood, 2002), because implementation of the obtained results into a real life context prove to be difficult. The participants watched the video attentively because they were kindly asked to, but while watching television or going online, most people skip or ignore introduction videos or commercials. Thus, the process of selective exposure might come into play in "real life situations" (Furnham & Mainaud, 2011).

Although the video was only moderately arousing, it is a difficult task to implement this kind of videos into the everyday life because of either advertisement restrictions, cultural norms, legal constraints or ethical reasons (Furnham & Mainaud, 2011). Children and adolescents are easily influenced and their attitudes and opinions are equally influenced by the media, and thereby receptive to different kinds of sexual material (Flood, 2007).

A shortcoming of this research is that a self-selection bias cannot be precluded (Peter & Valkenburg, 2010a). Due to the fact that the data came from a convenience sample, the obtained results do lack generalizability, though, the results confirm earlier studies in this context (Paul, 2009). Participation was optional and anonymous, whereby approximately half of the participants stopped after the first video. Volunteers for sexually related studies were typically more sexually interested and experienced (Wiederman, 1999). Maybe this effect could be explained by the uses and gratification perspective (Finn, 1997), because the participants were interested in watching sexualized media but motivation and interest depleted right after the entertaining video. Thus, opposed to the number of approached subjects, only a fraction initially completed the whole online experiment.

Another implication which is twofold regards the possible lack of effort of the participants during the experiment (e.g., Bushman, 2007). Humphrey and Revelle (1984) defined effort as "the motivational state commonly understood to mean trying hard or being involved in a task" (p. 158). For effort is related to arousal (Humphrey and Revelle, 1984) the results could have been different if also the level of effort was obtained and included in the research. On the other hand, to resemble as much as possible a real life setting, it is more probable and useful to

study the behavior as it takes place when subjects are exposed to commercials and advertisements in a normal way. Thereby, effort might give insights in the consciousness of processing of the commercials. Further research might study the effect of effort on arousal and memory. The causal relationship would be of interest to gain further insights in the interplay between memory, arousal and effort. The question of the role of effort is comparable to the approach of Janiszewski et al. (2003) by comparing intentional and incidental learning. If intentional or incidental learning is rather unimportant when considering that the goal of advertising is to increase the likelihood of product or service purchases, wherefore advertisements are a crucial factor to determine the effectiveness of the commercials (Bushmann, 2007). Thus, the main purpose is to improve memory, regardless how it takes place as long as it is positively associated.

It is desirable that future research should try to replicate the obtained results and apply the questionnaire to a bigger, more balanced, heterogeneous and more representative sample. By measuring other personality traits as extraversion and introversion, as for example Matthews et al. (1990) did, could give further insights into the interface between level of arousal and personality traits and their influence on memory. However, Carrol, Zuckerman and Vogel (1982) failed to detect an optimal level of arousal related to the personality trait sensation seeking. Measuring physiological and self-reported arousal would be worth investigating to gain further insights into the relation between the two and their influences on memory (Anderson et al., 1995), but would interfere with the real life setting and context. However, Anderson et al. (1995) proposed that for the excitation transfer effect the discrepancy between perceived and physiological arousal is crucial, because physiological arousal has to be high as opposed to perceived arousal, which has to be low. Thus, if moderately arousal videos are truly just as moderately arousing perceived, but physiologically more or less arousing, would be of interest. It was confirmed that the SAM correlates with physiological measure methods of arousal (Lang et al., 1999; Matthews et al., 1990).

It should be noted that the experiment in this article did not directly measured the effect of the stimuli on purchasing behavior and delayed recall and recognition of the commercials. Moreover, no attempt was made to manipulate consistency between the commercials and stimuli. Further research should focus on the effects of moderately arousing videos on the actual purchase behavior after being exposed to commercials and on delayed memory of the commercials.

For further research, the context- or state-dependent memory theories (Furnham & Mainaud, 2011; Bushman, 2007) could also be of interest, because the mood of commercials could be primed in retail settings to increase the purchase behavior. Future studies should investigate the relation between moderate arousal and state-dependent memories.

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# 7 Appendix

## 7.1 Questionnaire

The format of the online questionnaire has been adjusted to the size of this paper and hence is not similar to the original format. Especially the format of the SAM and its scale are different to the actual questionnaire. Regarding the content, the questionnaire is still in its original form and no changes have been applied.

**Program Context Effects**

*Page: 1*

Welcome.

First of all, thank you very much for participating in this short research about evaluations of video segments.

In the next section, you will see a short video. Before and after that, you have to answer some questions regarding the video, demographic questions and other ones. Later you have to watch another video and answer some questions about it. Both videos are approximately 3 minutes long. The answers will be kept totally private and anonymous and will not be distributed to any other people or organizations.
Furthermore, no one except me will see or has access to the results and the information are kept in a statistical numerical form so that I cannot draw any conclusion of the answers back to the respondents.
It will not take more than approximately 10-12 minutes of your time! The answer may be given in English, German or Dutch, whatever you prefer!

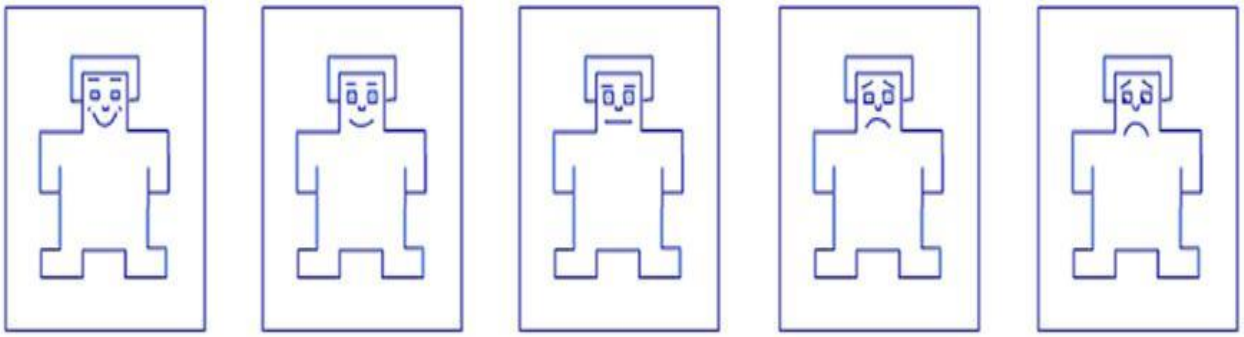
*Page: 2*

**Program Context Effects**

**Please fill in the following three scales on how you are feeling right now.**
Use the pictures right under the scale as an expression of your state of being. (From left (1) to right (9), every uneven number stands for a picture, every even number if it is between too pictures).

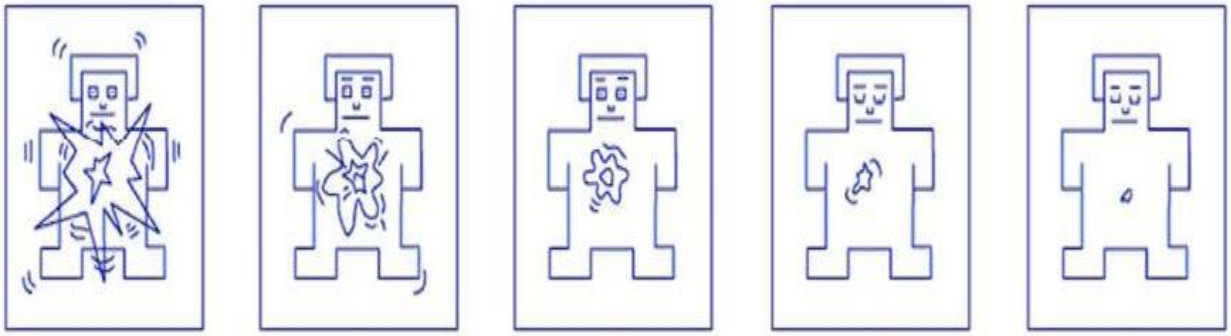
**Valence / Emotion**

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|
| Valence / Emotion | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |



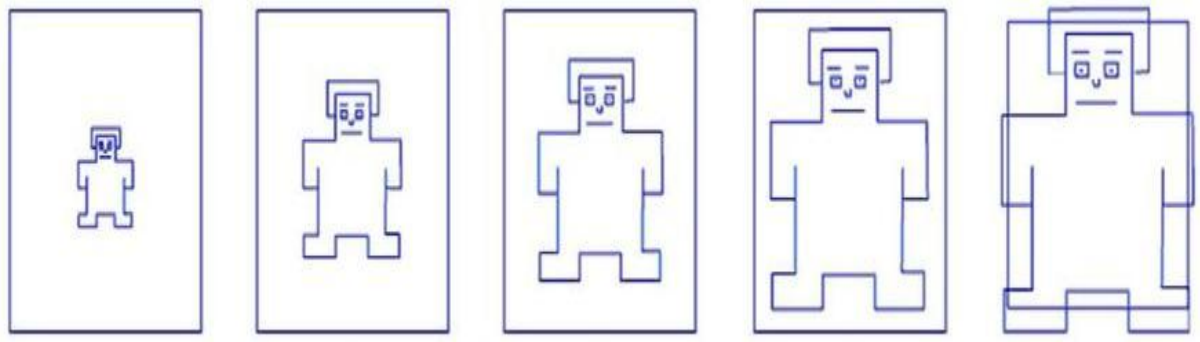
**Arousal**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Arousal | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |



**Dominance**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Dominance | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |



*Page: 3*

**Please watch the complete video attentively. It is advised to first let the video be completely loaded. The video has no sound on purpose!**

Thank you!

Here, the stimulus video appeared

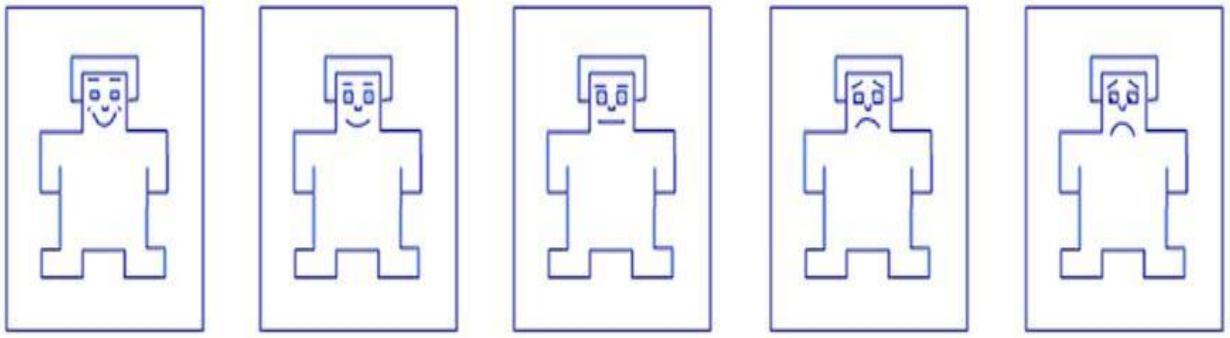
*Page: 4*

**Please, once again, fill in the following three scales on how you are feeling right now.**

Use the pictures right under the scale as an expression of your state of being. (From left (1) to right (9), every uneven number stands for a picture, every even number if your expressed feeling/state is between too pictures)

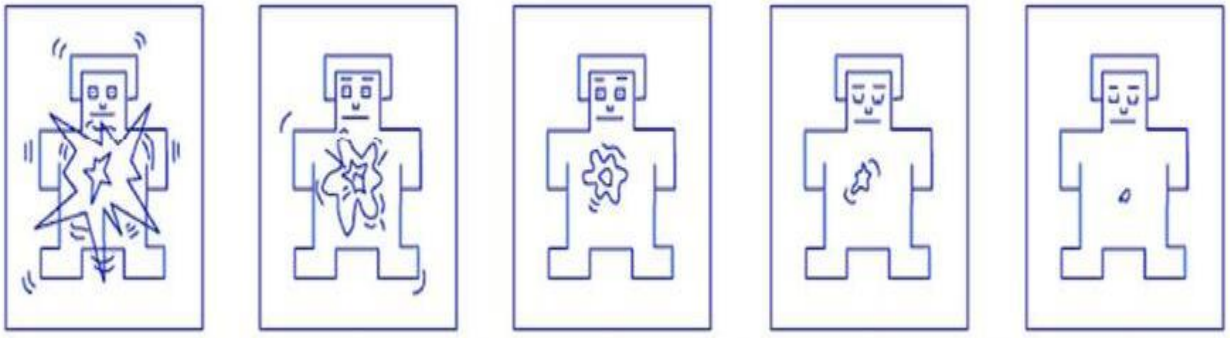
**Valence / Emotion**

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
|---|---|---|---|---|---|---|---|---|---|
| Valence / Emotion | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |



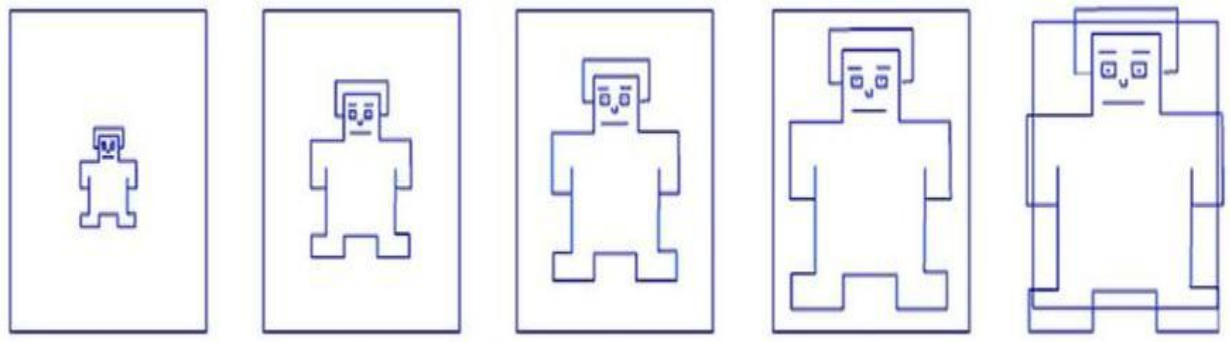
**Arousal**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Arousal | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |



**Dominance**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Dominance | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |



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**Please watch the complete video attentively. It is advised to first let the video be completely loaded. For this video you do need the sound of it, so please turn up your volume to your usual level!**

Thank you!

Here, the commercial video appeared.

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**Please indicate the name of the brand and product, its logo and the color of the product and the color of the logo of every brand of the five commercials. If you do not remember leave it empty, if there wasn't a color or logo, for example, visible, then write down 'no'.**

Name Commercial No.1

Logo Commercial No.1

Color Product Commercial No.1

Color Brand Commercial No.1

Name Commercial No.2

Logo Commercial No.2

Color Product Commercial No.2

Color Brand Commercial No.2

Name Commercial No.3

Logo Commercial No.3

Color Product Commercial No.3

Color Brand Commercial No.3

Name Commercial No.4

Logo Commercial No.4

Color Product Commercial No.4

Color Brand Commercial No.4

Name Commercial No.5

Logo Commercial No.5

Color Product Commercial No.5

Color Brand Commercial No.5

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**What was the name of the brand of the first commercial?** *

- Sunrise Delight
- Sunny Be Light
- Sandy Alright
- Sunny Delight

- Sunny feel right

**What was the name of the brand of the second commercial?** *

- MSN
- AOL
- Juno
- NetZero
- Earthlink

**What was the name of the brand of the third commercial?** *

- Cremel
- Fremel
- Tremel
- Dremel
- Bremel

**What was the name of the brand of the fourth commercial?** *

- Red Donkey
- Red Dog
- Red Horn
- Red Giraffe

- Red Mouse

**What was the name of the brand of the fifth commercial?** *

- Winterfresh
- Doublemint
- Big Red
- Spearmint
- Juicy Fruit

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**Did you already know the commercial or the product/brand?**

| | Yes | No |
|---|---|---|
| Sunny Delight - Product/Brand | | |
| Sunny Delight - Commercial | | |
| America Online/ AOL - Product/Brand | | |
| America Online/ AOL - Commercial | | |
| Dremel (Multi-Pro) - Product/Brand | | |
| Dremel (Multi-Pro) - Commercial | | |
| Red Dog Beer - Product/Brand | | |
| Red Dog Beer - Commercial | | |

| | | |
|---|---|---|
| Winterfresh Gum - Product/Brand | ○ | ○ |
| Winterfresh Gum - Commercial | ○ | ○ |

**Do you like the product 'Sunny Delight' that was displayed in the first commercial?** *

○ Yes

○ No

**Do you like the product 'AOL' that was displayed in the second commercial?** *

○ Yes

○ No

**Do you like the product Dremel Multi-Pro that was displayed in the third commercial?** *

○ Yes

○ No

**Do you like the product Red Dog Beer that was displayed in the fourth commercial?** *

○ Yes

○ No

**Do you like the product Wrigley's Winterfresh Chewing Gum that was displayed in the fifth commercial?** *

○ Yes

○ No

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**Gender** *

- ○ Male
- ○ Female

**Age**

**Occupation** *

- ○ Pupil
- ◉ Student
- ○ Employed
- ○ Unemployed
- ○ Other

**How often do you watch/consume stimulating erotic material? (Magazines, Pictures, Videos, etc.)**

| | Never | | | | Very often | No Answer |
|---|---|---|---|---|---|---|
| Erotic Magazines (Playboy, Penthouse etc) | ○ | ○ | ○ | ○ | ○ | ☐ |
| Erotic/ Nude Pictures | ○ | ○ | ○ | ○ | ○ | ☐ |

| | | | | | | |
|---|---|---|---|---|---|---|
| Soft-Porn Videos | ○ | ○ | ○ | ○ | ○ | ☐ |
| Hardcore- Porn Videos | ○ | ○ | ○ | ○ | ○ | ☐ |

**Sexual Orientation**

| | **Homosexual** | | | **Heterosexual** | | **No Answer** |
|---|---|---|---|---|---|---|
| Sexual Orientation | ○ | ○ | ○ | ○ | ○ | ☐ |

**If you have any suggestions, questions or something else (video did not work, i.e.), please fill in the box here below.**

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Once again, thank very much for participating. You have been a huge help for my research!