



Subconscious responses to fear-appeal health warnings: An exploratory study of cigarette packaging

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Background: Tobacco smoking has serious health and financial implications for both smokers and non-smokers. A wide range of measures have been used over many years to combat this scourge. One of these measures is social marketing communication campaigns. Whether these campaigns are effective has been the subject of some debate. Some of the questions that arise are: What kind of advertising appeals (for instance, informational versus emotional) should be used? Which elements should form part of such campaigns? Some argue that pictures are more effective. Others believe that text-based messages are more effective. Regardless of how these campaigns are structured, they have very little chance of success if they are unable at least to cause arousal (activation) among the target audience. Not only does emotional arousal increase engagement, enhance information-processing and render communication memorable, it also helps to increase the mental accessibility of related knowledge.

Aim: In this exploratory study, the ability of fear-based pictures and text messages on cigarette packaging to create emotional arousal among consumers is explored.

Methods: Galvanic skin response and eye-tracking methodologies were used.

Results: The results indicate that both fear-based pictures and fear-based text messages activated arousal among consumers.

Conclusion: The extent of arousal is influenced (at least to some extent) by both gender and whether or not the viewer is a smoker.

Introduction

The harmful impact of tobacco smoking on human health has been well documented. For instance, in 2000 it was estimated that tobacco smoking was responsible for a large portion of premature mortality, causing approximately 4.8 million adult deaths worldwide (Saloojee 2005). This figure is expected to increase to about 10 m. by 2025 and to 7 m. in developing countries alone by 2030 (Saloojee 2005). In China, India and South Africa there is evidence that chronic respiratory diseases account for a higher number of deaths than they do in developed countries (Groenewald et al. 2007). It is further estimated that about 2 m. deaths per year in the developed world can be directly attributed to tobacco use (Saloojee 2005).

This situation, as well as the resultant unnecessary health-related expenditure in particular, has a significant economic impact. In Taiwan, for instance, medical expenditure attributable to smoking is estimated at \$397.6 m. per year and accounts for 6.8% of total medical expenditure. Per capita medical expenditure for people who smoke is \$70.00 more than for those who do not smoke (Yang et al. 2005). In China, the medical spending attributable to smoking and consumption spending on cigarettes is estimated to be responsible for impoverishing 30.5 m. urban and 23.7 m. rural residents (Liu et al. 2006). Reducing tobacco consumption thus appears to be not only a public health strategy, but also a poverty-reduction strategy.

Unfortunately, despite these alarming statistics, many people still grossly underestimate the health risks associated with tobacco use. The cessation and prevention of tobacco smoking can substantially reduce these risks.

Although fear-based social marketing campaigns (communication campaigns using marketing principles to address societal problems) have been implemented internationally to point out the dangers of smoking, their effectiveness has been questioned (Manyiwa & Brennan 2012; Prevention First 2008; Van't Riet & Ruiter 2013). One possible reason is that the impact of these campaigns on consumers' emotional and subconscious responses has never been properly assessed. This 'oversight'

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may be an important limitation, as there is considerable evidence that suggests that consumers often make decisions at the subconscious level rather than at a cognitive level (Zaltman 2003:9). In other words, consumer behaviour is often driven by subconscious thoughts and feelings rather than by conscious ones, although the latter are no less important (Lindstrom 2008).

Understanding subconscious responses may be particularly valuable when investigating reactions towards social marketing communication campaigns that make use of the so-called 'fear-appeals', such as those used on cigarette packaging in Australia and Ireland. These fear-appeals attempt to activate the human emotion of fear and are used in the belief that emotional arousal raises consumer involvement and thus enhances consumers' motivation to process the information (consistent with the Elaboration Likelihood Model). Fear-appeals usually take the form of either social disapproval or physical danger (Shimp 2003:304).

It is against this background that this study attempts to contribute to both the social marketing and the smoking cessation literatures by exploring how consumers respond at the subconscious level to fear-based appeals on cigarette packaging. Fear-appeals are often at the centre of social marketing campaigns. However, how consumers process the information conveyed in these advertisements and how they respond to these fear-appeals at the subconscious level are still poorly understood (Lindstrom 2008).

Consumer information-processing

In a marketing communication context, the concepts of attitude and persuasion go hand-in-hand. Persuasion is an effort by a communicator to influence the consumer's attitude and behaviour (Shimp 2003:222). The basic purpose of any social marketing communication campaign is attitude change (to refrain from smoking or to start wearing a seatbelt when driving a vehicle, for instance). Persuasion is thus a key feature of these efforts. Persuasion, according to the Elaboration Likelihood Model (ELM) of Petty and Cacioppo (1986), can occur via either the so-called central route or the peripheral route.

According to the ELM, the level of a consumer's motivation and ability to process a message determine the extent to which they will engage in the different routes of elaboration (Lewis, Watson & White 2008). Should a consumer possess a high level of motivation and a high ability to process a message, the subsequent elaboration will also be high, resulting in the central route of persuasion being taken (Fry 2006; Lewis et al. 2008). Conversely, if a consumer possesses low motivation and low ability to process a message, their elaboration will be low and the peripheral route of persuasion will be engaged (Lewis et al. 2008). The peripheral route of processing is automatic, shallow, heuristic and often mindless (Petty & Cacioppo 1986).

Many believe that cognitive change can be effected by both routes of persuasion, but that the systematic (the central route) rather than heuristic processing of a message (the peripheral route) is more effective (Petty & Cacioppo 1986:191).

More specifically, messages that are processed by way of the central route of persuasion are believed to be more persistent and more difficult to alter, and will better predict behavioural intentions than messages that are processed via the peripheral route of persuasion (Vidrine, Simmons & Brandon 2007). It is for this reason that many marketers and advertisers believe that they should strive to create persuasive messages that draw full attention and that engage consumers in the systematic, cognitive processing of messages. Others argue that by using emotional arousal (such as a fear-appeal), elaboration is high and the chances of attitude change being permanent and enduring are high (Petty & Cacioppo 1986:191). In the context of this study, emotion-based persuasion was operationalised as the graphic fear-appeal warnings, and the text-based fear-appeal warnings represented the message-based persuasion in a social marketing communication context.

Social marketing

The term 'social marketing' was first coined in 1971 to refer to the use of commercial marketing principles in the resolution of societal problems (Kotler & Zaltman 1971:3; MacFadyen, Stead & Hastings 1999). Since its inception, this idea has been widely used in attempts to effect attitudinal and behavioural changes that contribute to the well-being of society (Weinreich 2006) or to alter deviant behaviours that are difficult to modify (Fry 2006:33). Such behaviours include cigarette-smoking, unsafe road usage practices such as drinking-and-driving, traffic speeding, unsafe sex, unhealthy eating patterns and other poor lifestyle choices (Sheer & Chen 2008:936; Thompson, Barnett & Pearce 2009:181).

Changing human behaviour, however, is not easy. As knowledge is a pre-condition of behaviour change (Renner & Schwarzer 2003:189), marketers who focus on social issues need both to inform and to caution at the same time. Often they must convey a message whose information is both unpalatable and undesirable to a target market that is behaving dysfunctionally (Cummings 2012:26). Considering the sensitive and sometimes controversial nature of social marketing messages, it is important that social marketing campaigns are carefully constructed. More importantly, the type of persuasive interventions, messages and appeals used should be grounded in a sound understanding of the core contributing factors to the occurrence and re-occurrence of dysfunctional behaviour (Fernandes, Hatfield & Job 2010:180) so that the persuasive message's impact is optimised.

Types of persuasive messages

The purpose of persuasive messages is to influence consumer thoughts and actions. It is by means of creative strategies that marketers translate these persuasive messages into precise communication (Kotler & Keller 2012:506). These creative strategies can be broadly defined as either positive or negative in nature and can further be classified as using either an informational or an emotional message appeal (Brennan & Binney 2010:141). Informational message appeals, otherwise known as rational appeals, focus on providing

meaningful facts to consumers (Cutler, Thomas & Rao 2000:69). The purpose is cognitive engagement by the consumer via the central route of information-processing, in terms of the ELM model (Cacioppo & Petty 1986). Those marketers who favour informational appeals believe that it is by providing factual information that the consumer is cognitively engaged and ultimately persuaded towards some form of action. Others believe that appeals to the emotions of consumers are more effective.

In contrast to informational appeals, emotional appeals are concerned with the evocation of emotions to persuade consumers (Aaker & Williams 1998:243). Cameron (2009:310) believes that persuasive messages should attract the receiver's attention and Peters, Ruiters and Kok (2014:73–74) suggest that the best way to do so is by arousing their emotions. Not only does emotional arousal render communication memorable, but it further helps to increase the mental accessibility of related knowledge (Hendriks, van den Putte & de Bruijn 2014:685; Peters et al. 2014:74).

Emotion-based social marketing campaigns

Emotions can be described as internal mental states that vary in intensity and represent evaluative, valenced reactions to occurrences, agents or objects (Nabi 2015:114). Watson and Tellegen (1985:219) suggest that emotion is a two-dimensional structure, consisting of positive (high or low) and negative (high or low) affect. They argue that the emotions a consumer will experience in a given situation will alternate, depending on the valence and urgency of the prevailing event.

Shaver et al. (1987:1061) identify five basic emotional categories: love, joy, anger, sadness and fear. These five basic emotions are further categorised as either a positive superordinate (i.e. love and joy) or as a negative superordinate (i.e. anger, sadness and fear) emotion. The positive emotions, otherwise known as 'approach affect', arise from beneficial stimuli, while the negative emotions, alternatively known as 'avoidance affect', result from threatening stimuli (Fry 2006:26). In other words, how a consumer perceives a situation (i.e. as either beneficial or threatening) will determine which superordinate category (positive or negative) and basic emotions (love, joy, anger, sadness or fear) will be aroused.

Well-accepted consumer behaviour models and theories such as the Affect-Beliefs-Conation (ABC) model of attitude (tri-component models) acknowledge the influence of both cognition (beliefs) and affect (feelings and emotions) and the resultant attitudes in consumer decision-making (Hawkins & Mothersbaugh 2013:384–388). Some researchers argue that the role of emotions in consumer decision-making may previously have been under-estimated (Zaltman 2003:9). The argument is that consumers often first make decisions on a subconscious and emotional level and then justify them on a rational level (Blair-Broeker, Ernst & Myers 2003:118;

Heath 2007:172). As Zaltman (2003:8) points out: 'Although our brains have separate structures for processing emotions and logical reasoning, the two systems communicate with each other and jointly affect our behaviour'. More importantly, emotional arousal strongly influences decision-making processes, attitudes and behaviour change, particularly in the realm of persuasion (Blair-Broeker et al. 2003:118; Heath 2007:172; Nabi 2015:115).

As the objective of social marketing campaigns is to influence or persuade consumers to avoid or stop harmful behaviour, focusing on subconscious and emotional responses can be an important means to realise this objective. Therefore, this study focuses on one specific emotional appeal, namely fear.

Fear-appeals in advertising

Fear-appeals in advertising attempt to evoke fear to stimulate a desired behaviour (such as not starting to smoke tobacco) or to initiate a behaviour change (such as to stop smoking tobacco) among a target audience. Campaigns based on fear-appeals typically attempt to persuade the target audience to change their maladaptive behaviour patterns by recommending the adoption of more constructive, alternative behaviour (Morales, Wu & Fitzsimons 2012).

However, in a social marketing context the effectiveness of fear-based appeals has been controversial, as years of research have still not produced conclusive evidence that social marketing is effective (O'Hegarty et al. 2006:467; Peters et al. 2014:68).

Some have concluded that these campaigns have a significant effect on message recall, persuasion and behavioural responses (Rayner, Baxter & Ilicic 2014:62). Moreover, it has been demonstrated that fear is a key motivator of systematic message processing (Terpstra et al. 2014:1509) as well as behaviour change (Rogers 1983:155; Soames Job 1988:164).

Using fear-appeals instead of other types of emotional message has been advocated because of evidence that consumers more frequently recall messages that use fear than other appeals (Chung & Ahn 2013:454). Similarly, fear is a primary motivator of behaviour change (Rogers 1983:155; Soames Job 1988:164).

Typical themes in campaigns where fear-appeals have been used to alter undesirable behaviour include unsafe road usage (Hastings, Stead & Webb 2004), abuse, fat consumption (Grier & Bryant 2005), breast cancer, rape and HIV (Hastings et al. 2004; Kees et al. 2010; Kotler & Keller 2012; Witte 1992). Fear is also a theme that social marketers have regularly used in anti-smoking campaigns.

However, several studies have questioned the effectiveness of fear-based appeals in social marketing campaigns and have pointed out that they can lead to unintended consequences. More specifically, they have pointed out that fear-appeal messages have the potential to reinforce

maladaptive behaviour patterns by encouraging some of those exposed to the fear-appeal message to become defensive (Prevention First 2008; Van't Riet & Ruiter 2013). More importantly, it has been suggested that defensive reactions are most likely to occur in individuals who are categorised as most at risk, based on their current behaviour (Harris et al. 2007:438).

Defensive reactions include: (1) avoidance, which refers to the actions of escaping the threatening communication; (2) denial, otherwise known as the rejection of the message; (3) suppression, which is defined as inhibiting threatening thoughts or emotionally charged behaviour; (4) cognitive dissonance, a state of discomfort when an individual simultaneously holds two conflicting mental representations; and (5) psychological reactance, which is aroused when an individual perceives their freedom as being restricted or removed and attempts to gain back that freedom by means of behavioural defiance (Kessels et al. 2014; Shen 2015; Van't Riet & Ruiter 2013). These defensive outcomes will diminish the effectiveness of fear-appeal messages as receivers of the communication regard the message as a psychological attack on their freedom (Müller et al. 2009; Shen 2015). In order to recover their freedom, defensive individuals then typically continue engaging in a maladaptive way or, as found in some studies, even partake in the behaviour to a greater extent than before exposure to the fear-appeal message (Prevention First 2008; Ruiter et al. 2001).

A theoretical perspective on consumer responses to fear

When facing a threatening situation or event, Protection Motivation Theory suggests that how humans respond depends on four considerations: (1) how severe the threat is perceived to be; (2) how capable the person judges themselves to deal with the potential threat should it occur (self-efficacy); (3) the chance or probability of the threat actually occurring (in other words, vulnerability); and (4) how effective the methods considered for dealing with the threat are expected to be (Rogers 1975).

Protection Motivation Theory has formed the basis of several studies in which persuasive communication, as well as the use of fear-appeals in particular, was a central theme (Rogers 1983). These studies were conducted in the domains of health care, including HIV-related studies (Van der Velde & van der Plight 1991), sun protection behaviour (Prentice-Dunn, McMath & Cramer 2009) and anti-social behaviour such as drinking-and-driving (Fry 2006; Witte & Allen 2000), alcohol abuse (Stainback & Rogers 1983) and smoking (Pechmann et al. 2003). In these contexts, protection motivation can be described as a mediating variable that can arouse, sustain and direct protective health care behaviour (Boer & Seydel 1996).

Text-based versus picture-based fear-appeals

In many countries, the (often growing) number of deaths attributable to smoking is forcing governments to adopt a

stricter stance on cigarette consumption. In some countries, legislation requires the use of picture-based cigarette warnings, ousting the use of text-based cigarette warnings (Tobacco Labelling Resource Centre 2016; Tobacco Tactics 2016; World Health Organization [WHO] 2013). The current text-based cigarette warning labels attempt to engage consumers in a rational thought process in the hope that they will realise the negative effects of smoking. By engaging a consumer in this cognitive thought process, marketers hope to influence their attitudes (Hawkins & Mothersbaugh 2013). However, when introducing fear-appeals that use picture-based warnings, the effect on consumer attitudes is believed to increase dramatically (Hammond et al. 2003; O'Hegarty et al. 2006; Thrasher et al. 2007). This intensification is because the use of pictures makes the possibility of the threat occurring seem much more credible (Cantrell et al. 2013), leaving the consumer feeling susceptible to the threat. As a result, picture-based warnings create a more believable warning that could affect consumer attitudes more effectively (Cantrell et al. 2013).

Because of this belief, picture-based warnings (see examples under the section on stimuli below) have been used extensively (Hammond et al. 2003). Their effectiveness has been questioned, however, and contradictory evidence has been reported. Some researchers caution against the use of graphic labels, as these gruesome images are more likely to initiate defensive reactions than to bring about the desired adaptive behaviours (Harris et al. 2007:438). Others claim that graphic warnings cause avoidable emotional discomfort, result in the weakened credibility of the message, cause smokers to avoid the warning message altogether and even increase smoking behaviour because of reactance (Hammond et al. 2004:1442). These findings suggest that graphic warnings could initiate selective attention where smokers (and potential smokers) ignore warning messages or react in a defiant manner by continuing their maladaptive behaviours. Little research exploring the potential and unintended results of graphic warnings exists, however (Gallopel-Morvan et al. 2011:8). More importantly, whether or not consumers respond subconsciously to these cues has never been explored. Also, how gender and smoking status (smoking vs. non-smoking) subconsciously influence responses to cigarette warnings has never been investigated either.

Gender-based responses to advertising stimuli

Differences between males and females have been considered in consumer research in the past (Brebner 2002; Eagly et al. 2004; Kempf, Laczniak & Smith 2006; Noble, Pomeroy & Johnson 2014; Putrevu 2004). These studies are particularly diverse; examples include the study of gender identity (Palan 2001), the impact of gender on information-processing in an advertising context (Darley & Smith 1995; Kempf et al. 1997) and gender differences in technology adoption and schematic processing (Venkatesh, Morris & Ackerman 2000), to name a few. Although researchers have reported that

gender often explains only limited amounts of variation in a range of dependent variables (Fischer & Arnold 1994), gender differences have been widely reported in responses to a range of stimuli, including advertisements (Covell, Dion & Dion 1994).

Several studies have explored gender differences in the context of information-processing (Brunel & Nelson 2003; Wolin 2003), where some have specifically considered responses to advertising for low-involvement products in different information-processing conditions (Papyrina 2015). No gender differences were observed when the opportunity for processing was low. In contrast, when there was an opportunity for detailed information-processing, females were more likely to use it and methodically consider the content of an advertisement, while males were more likely to disregard it and instead process an advertisement in a heuristic manner (Papyrina 2015).

In the past females have often been considered to be more emotional than males, and therefore they are believed to respond more strongly to advertisements with emotional content or emotional appeals (Moore 2007).

When studying the differences in information-processing between male and female consumers at an emotional or subconscious level, it is important to acknowledge that traditional research methods (such as survey research or observation of what is believed to be emotional responses) might not reveal underlying differences that could still influence the behaviour of the consumer, specifically with regard to information that the consumer does not consider rationally or think about. It is against this background that this study used a data collection method (neuro-physiological research) that collects data on responses that are not under the direct control of the central nervous system. The benefit of the use of neuro-physiological methodologies in consumer research is aptly described by Telpaz, Webb and Levy (2015:511): '... neuroscience can reveal information about consumer preferences that is unobtainable by conventional methods'.

Objectives

The primary objective of this study was to explore how consumers respond at the subconscious (emotional) level to the anti-smoking, fear-based appeals typically found on cigarette packaging. The secondary objectives of the study were:

- to compare the neuro-physiological responses to text-based versus picture-based, fear-based anti-smoking appeals typically found on cigarette packaging;
- to explore whether males and females differ in how they respond to the anti-smoking, fear-based appeals typically found on cigarette packaging; and
- to explore whether smokers and non-smokers differ in how they respond to anti-smoking, fear-based appeals typically found on cigarette packaging.

Methodology

Sample

The sample size was 90 consumers in the age category of 25–50 years, as that is typically the age group of current smokers or those susceptible to becoming smokers. The sample size compares favourably with others in similar studies (Boksem & Smidts 2015 - 32 subjects; Hazzlet & Hazzlet 1999 - 49 subjects). The gender split was 50%. However, smokers were under-represented, with only 21 of the participants being smokers at the time of the data collection. As a result, the empirical results related to this sub-sample are reported using descriptive statistics only.

Stimuli

The stimuli used in this study were four anti-smoking, fear-based appeals that are typically found on cigarette packaging and consisted of two text-only warning messages (Figures 1 and 3) and two text and picture warning messages (Figures 2 and 4). For each text-only warning label a pictorial warning message (still including the original text-only warning message) was also used. The combination of text and visuals on one stimulus is consistent with previous studies (Kees et al. 2010:266; Vardavas et al. 2009:1).



FIGURE 1: Text-based warning: Smoking causes peripheral vascular disease.



FIGURE 2: Both text and picture-based warning: A gangrene-affected foot.

When referring to results relating to picture stimuli, reference is therefore made to the combination of text and picture warning messages on the same packaging (see graphics in Figures 2 and 4).

The neuro-physiological measurement of consumers' subconscious responses

Research has shown that, when exposed to marketing stimuli, consumers exhibit a variety of different emotions that influence outcome variables such as behaviour (Shimp 2003). However, the literature on emotions still contains a number of caveats. The inadequacy of studies of consumers' emotional responses to marketing stimuli has been pointed out by several authors (Heath 2007; Zaltman 2003). Its measurement has been a particularly thorny issue (Bagozzi, Gopinath & Nyer 1999). Although attempts have been made to measure consumers' emotional responses, they have almost always used 'self-report' assessments from which to draw conclusions. In these studies, consumers are asked to indicate the degree to which they feel they experienced each emotion on an ordinal response scale such as a Likert or a semantic differential scale. This approach, often relying on introspection at a later stage or even memory and recall,



FIGURE 3: Text-based warning: Smoking causes mouth and throat cancer.

as several authors have pointed out, is seriously flawed (McCull-Kennedy & Smith 2006; Zaltman 2003:38–39). Even efforts to *deduce* emotional responses by observing customers' eye contact, smiling and thinking behaviour (Matilla & Enz 2002) must be questioned because they rely on the researcher's interpretation of physical responses and attempts to link that observation to the observed person experiencing a certain emotion.

The data collection methodology used in this study overcomes many of these limitations by focusing on consumers' subconscious responses that are not controlled by the central nervous sub-system (as would be the case if a self-report type test were used). This mechanical, 'observation-like' approach to data collection (Galvanic skin response [GSR] measurement and eye-tracking) allows the researcher to bypass the mind's 'cognitive rationaliser' and does not rely on potentially false and often inaccurate self-reports of experienced emotions from consumers (LaBarbera & Tucciarone 1995:37).

In this study, two data collection methods were used: GSR and eye-tracking. These two methodologies were selected because a change in skin conductance is a measure of arousal, and eye-tracking allows the researcher to link where a



FIGURE 4: Both text and picture-based warning: A mouth with a tooth missing, several damaged teeth and cancerous sores on the lower lip.

respondent looks (gaze, or eye-fixation) directly with the subsequent arousal and attention (Wedel & Pieters 2000).

Galvanic skin response

GSR refers to a change in the electrical conductance of the skin, which is influenced by its moisture level (Labarbera & Tucciarone 1995). Electrical activity is the result of the activity of the eccrine (sweat) glands in the human skin, and is regulated by the sympathetic nervous system (Bridger 2015), a part of the autonomic nervous system that regulates the human body's 'fight or flight' response. Because it is regulated by the autonomic nervous system, a person does not have control over the response (skin conductance), which is a 'direct measure of arousal when watching an ad' (Venkatraman et al. 2015). These electrodermal responses (as the glands dilate) are thus unbiased indications of activation or arousal in response to stimuli (Labarbera & Tucciarone 1995) or – in the current study's case – to advertising material. Before a subject is exposed to any stimulus, a baseline of GSR measurement is first established. The resultant stimuli-induced response score (or data) is then statistically compared with the baseline. It should be noted, however, that the arousal measured by GSR cannot indicate valence (Shimp 2003:339).

Eye-tracking

Given the fact that advertising managers typically 'place' physical stimuli in front of potential purchasers (mostly by means of advertising), consumers' target searches and what attracts consumer attention when exposed to the stimuli are important considerations to advertisers. As arousal (activation) will result in quicker and more accurate perception-formation during periods of eye-fixation, eye-fixation provides evidence of the extent to which sensory information has been transferred to short-term memory for further processing (Kroeber-Riel 1979). Witt (1977) has demonstrated that the elements of an advertisement on which consumers focused more frequently were recalled more successfully. Attracting and retaining consumer attention is an important issue from an advertising effectiveness perspective (Pieters & Wedel 2004). Where consumers focus their attention when watching an advertisement is, however, an unobservable mental process (Van der Lans, Pieters & Wedel 2008). However, modern eye-tracking equipment allows analysts to track eye-movement patterns accurately and, at least to some degree, to understand the relationship between the conscious eye-fixation of consumers and their subsequent activation and attention levels. Eye-tracking thus offers a rich source of data on temporal psychological processes (Kroeber-Riel 1979). From a marketing perspective, the study of eye-movement patterns has been linked to outcomes such as retail shelf allocation decisions (Drèze, Hoch & Purk 1994), product choice (Lohse 1997) and the ability to remember brands (Wedel & Pieters 2000).

Empirical results

Comparison of text-based versus picture-based warnings

Galvanic skin response baseline results

Before addressing the first objective, an attempt was first made to assess whether both the text and the pictorial warnings were able to solicit a GSR response that would differ significantly from the baseline. A 'baseline' in neuro-physiological research usually means that the respondent looks at a blank computer screen (no stimuli) for about 10 s and a measure (in this case GSR) is taken during this period. The respondent is then exposed to the stimuli (in this case a picture of cigarette packaging) and a new reading taken. The difference between the two (GSR) scores is then statistically compared.

The GSR results reported in Table 1 show that both the text and the picture warnings of gangrene and mouth cancer generated GSRs that were significantly different from the baseline. Figure 2 (gangrene-affected foot) seemed to produce the highest level of arousal, followed by text message 2 that smoking causes mouth and throat cancer.

Comparison of stimuli

After concluding that all stimuli were able to solicit a GSR response that was statistically different from the baseline,

Objective 1 (to compare the neuro-physiological responses to text-based vs. picture-based, anti-smoking, fear-based appeals) could be addressed. In order to address the first objective, each text message was compared with its picture counterpart to determine whether a pictorial warning label (coupled with a textual explanation) is able to elicit a significantly higher GSR response than a text-only version. Because it was expected that graphic images should result in higher responses (compared with textual stimuli), a one-tailed *t*-test was used.

Table 2 reveals that Figure 2 initiated a higher difference in GSR responses than did Figure 1 ($p = 0.06$). However, the same result was not found for Figures 3 and 4. In the case of the packaging highlighting mouth and throat cancer, the text stimulus initiated a higher GSR response than did the pictorial warning. Therefore, Figure 4 did not result in a significantly higher GSR score than did the text-only warning.

Gender comparison

The next step (Objective 2) was to explore gender differences in the GSR responses to both the text and the pictorial warnings.

Table 3 explores the relationship between gender and the GSR responses to the pictures. Table 3 shows that males were aroused to a significant extent ($p < 0.01$) by Figure 2 (the gangrene-affected foot). The GSR responses of females to Figure 2 were not significant, although the difference approaches statistical significances ($p = 0.06$). However, the responses of males to Figure 2 seemed to be much stronger than those of females.

TABLE 1: Galvanic skin response baseline results: Text and picture.

| Stimuli | GSR index [†] | <i>t</i> | <i>p</i> | <i>df</i> |
|----------|------------------------|----------|----------|-----------|
| Figure 1 | 2.12 | 2.99 | 0.00* | 41 |
| Figure 2 | 2.45 | 3.66 | 0.00* | 43 |
| Figure 3 | 2.27 | 3.34 | 0.00* | 41 |
| Figure 4 | 1.44 | 2.61 | 0.01* | 43 |

GSR, Galvanic skin response.

*, $p < 0.01$.

[†], The Galvanic skin response index is the difference between the baseline score and the GSR score (see discussion on GSR in the Methodology section).

TABLE 2: Galvanic skin response results: Pictures versus text[†].

| Stimulus | Text | Picture | <i>t</i> | <i>p</i> | <i>df</i> |
|--|------|---------|----------|----------|-----------|
| Peripheral vascular warning | | | | | |
| Figure 1 versus Figure 2 | 1.12 | 2.70 | -1.61 | 0.06* | 64.9 |
| Mouth and throat cancer warning | | | | | |
| Figure 3 versus Figure 4 | 2.93 | 0.65 | 1.50 | 0.93 | 47.4 |

*, $p < 0.10$.

[†], The Galvanic skin response values listed here are *post hoc* measures not expressed relative to the baseline reading.

TABLE 3: Galvanic skin response results: Pictures.

| Gender | Stimuli | GSR index | <i>t</i> | <i>p</i> | <i>df</i> |
|--------|----------|-----------|----------|----------|-----------|
| Female | Figure 2 | 1.55 | 1.97 | 0.06* | 21 |
| | Figure 4 | 1.44 | 1.82 | 0.08* | 21 |
| Male | Figure 2 | 3.35 | 3.13 | 0.01** | 21 |
| | Figure 4 | 1.44 | 1.82 | 0.08* | 21 |

GSR, Galvanic skin response.

*, $p < 0.10$; **, $p < 0.05$.

Neither males' nor females' GSR responses to Figure 4 differed statistically significantly from the baseline, although both approached significance at the 5% level.

Table 4 reveals that, when exposed to the text messages, both males and females returned significant responses from the baseline, except when females looked at Figure 1 ('Smoking causes peripheral vascular disease'). It thus appears as if text-based messages were also able to solicit subconscious responses among the participants.

To address the objective of investigating the relative impact of text-based messages compared with picture-based messages on the same cigarette package, a statistical comparison (text vs. pictures; males vs. females) was conducted using independent sample *t*-tests. Table 5 shows that the GSR comparisons for both males and females did not differ significantly, regardless of whether the text or picture warnings were compared. In other words, when comparing the two messages (picture vs. text) on the two packages that had both a picture and a text warning, no differences emerged. Thus, when combining both picture and text warnings on a single package, one does not fare better than the other in soliciting a subconscious response, and this conclusion applies to both genders.

Table 6 shows that males did respond more strongly than females to Figures 1 and 2, but that the opposite is true for Figure 3. However, these differences are not statistically significant.

Eye-tracking results

As mentioned earlier, attracting and retaining consumer attention is an important consideration from an advertising

TABLE 4: Galvanic skin response results: Text.

| Gender | Stimuli | GSR index | <i>t</i> | <i>p</i> | <i>df</i> |
|--------|----------|-----------|----------|----------|-----------|
| Female | Figure 1 | 1.51 | 1.40 | 0.18 | 18 |
| | Figure 3 | 2.77 | 2.54 | 0.02* | 18 |
| Male | Figure 1 | 2.62 | 2.76 | 0.01** | 22 |
| | Figure 3 | 1.86 | 2.15 | 0.04* | 22 |

GSR, Galvanic skin response.

*, $p < 0.05$; **, $p < 0.01$.

TABLE 5: Galvanic skin response results: A comparison of text versus picture responses per gender.

| Gender | Stimuli | Pictures | Text | <i>t</i> | <i>p</i> | <i>df</i> | Significance |
|--------|--------------------------|----------|------|----------|----------|-----------|--------------|
| Female | Figure 1 versus Figure 2 | 1.55 | 1.51 | 0.03 | 0.98 | 39 | n.s. |
| | Figure 3 versus Figure 4 | 1.44 | 2.77 | -1.01 | 0.32 | 39 | n.s. |
| Male | Figure 1 versus Figure 2 | 3.35 | 2.62 | 0.51 | 0.61 | 43 | n.s. |
| | Figure 3 versus Figure 4 | 1.44 | 1.86 | -0.36 | 0.72 | 43 | n.s. |

n.s., not significant.

TABLE 6: Galvanic skin response results: Gender comparison of pictures versus text.

| Stimuli | GSR females | GSR males | <i>t</i> | <i>p</i> | <i>df</i> |
|----------|-------------|-----------|----------|----------|-----------|
| Figure 1 | 1.51 | 2.62 | -0.772 | 0.445 | 40 |
| Figure 2 | 1.55 | 3.35 | -1.353 | 0.183 | 42 |
| Figure 3 | 2.77 | 1.86 | 0.660 | 0.513 | 40 |
| Figure 4 | 1.44 | 1.44 | 0.000 | 1.000 | 42 |

GSR, Galvanic skin response.

effectiveness perspective, particularly for advertisements (Pieters & Wedel 2004:36). Where consumers focus their attention when exposed to an advertisement is an unobservable mental process (Van der Lans et al. 2008). Modern eye-tracking equipment, however, allows analysts to track eye-movement patterns accurately by means of the so-called 'scan paths' and, at least to some degree, to understand the relationship between the conscious vision of consumers and their subsequent attention levels (Pieters & Wedel 2004).

It is against this background that this study explored the contact time of the participants with both the text-based and the picture-based warnings.

Consistent with the study's first objective, a comparison between each text stimulus and its picture counterpart was conducted by comparing eye-fixation time (measured in seconds). By means of a one-tailed *t*-test, this comparison further explored whether pictorial warnings are able to generate statistically longer periods of fixation than do text-only labels. Table 7 reveals that eye-fixation for Figure 4 is significantly longer than for its text-only label, where the statistical difference between Figure 2 and its text-only counterpart approached significance ($p = 0.09$).

In addressing Objective 2, Table 8 compares the eye-fixation time spent on both text and pictures between genders. It is apparent that the eye-fixation time of males was longer than that of females in all four instances. These differences (between males and females) were, however, not statistically different.

Comparison of smokers with non-smokers

Because of the small sub-sample of smokers who participated in this study, the data related to them could not be analysed using inferential statistics. The results shown in Tables 9 and 10 are thus reported as a descriptive analysis. Table 9 shows the comparison of smokers with non-smokers when

TABLE 7: Contact time results: Text versus pictures.

| Contact time | Text | Picture | <i>t</i> | <i>p</i> | <i>df</i> |
|--------------------------|--------|---------|----------|----------|-----------|
| Figure 1 versus Figure 2 | 5.23 s | 5.88 s | -1.36 | 0.09* | 85 |
| Figure 3 versus Figure 4 | 3.86 s | 5.59 s | -3.56 | 0.00** | 84 |

*, $p < 0.1$; **, $p < 0.05$.

TABLE 8: Contact time results comparing genders: Text and pictures.

| Stimuli | Females (A) | Males (B) | Difference (A-B) | Significance |
|----------|-------------|-----------|------------------|--------------|
| Figure 1 | 4.76 s | 5.61 s | -0.85 s | n.s. |
| Figure 2 | 5.50 s | 6.27 s | -0.77 s | n.s. |
| Figure 3 | 3.30 s | 4.30 s | -1.00 s | n.s. |
| Figure 4 | 5.01 s | 6.19 s | -1.18 s | n.s. |

GSR, Galvanic skin response; s, seconds.

TABLE 9: Peripheral vascular (gangrene) warning: Analysis of both text and pictures.

| Stimuli | Variable | Smokers | Non-smokers |
|----------|--------------|---------|-------------|
| Figure 1 | Contact time | 5.56 s | 5.05 s |
| | GSR | 2.26 | 2.05 |
| Figure 2 | Contact time | 5.72 s | 5.81 s |
| | GSR | 1.46 | 2.71 |

GSR, Galvanic skin response.

exposed to the warning referring to peripheral vascular disease (commonly known as 'gangrene') (Figure 1). In terms of the text message 'Smoking causes peripheral vascular disease', it appears as if:

- The eye-fixation of smokers on the text (5.56 s) was longer than that of non-smokers (5.05 s).
- Smokers looked at the picture (5.72 s) longer than at the text-only version (5.56 s).
- The GSR responses (arousal) of smokers to the text (GSR 2.26) were higher than those of non-smokers (GSR 2.05).

When exposed to the picture of a gangrene-affected foot, it appears as if:

- The eye-fixation of smokers on the picture was slightly shorter (5.72 s) than that of non-smokers (5.81 s).
- The GSR responses (arousal) of smokers (1.46) were lower than those of non-smokers (2.71).

Table 10 tabulates the results of the second packaging. In this case the text message reads: 'Smoking causes mouth and throat cancer', while the associated picture shows a mouth with a tooth missing, damaged teeth and cancerous sores on the lower lip. The empirical results (Table 3) are very similar to those reflected in Table 10.

When exposed to the warning about mouth and throat cancer, it appears as if:

- The eye-fixation of smokers on the text (4.72 s) was longer than that of non-smokers (3.44 s).
- Smokers looked at the picture (5.53 s) much longer than at the text (4.72 s).
- The GSR responses (arousal) of smokers to the text (GSR 3.06) were higher than those of non-smokers (GSR 1.88).
- Smokers' contact time with the picture (5.53) was slightly shorter than that of non-smokers (5.58).
- The picture produced a stronger GSR (1.50) among non-smokers than among smokers (1.17).

When comparing the results from Tables 9 and 10 (the two different cigarette packages), the results were consistent in terms of both text and the pictures. The eye-fixation of smokers on the text was longer than that of non-smokers, and the GSR responses (arousal) of smokers to the text were higher than those of non-smokers. In terms of pictures, the eye-fixation of smokers on the pictures was slightly shorter than that of non-smokers, and the GSR responses (arousal) of smokers were lower than those of non-smokers.

TABLE 10: Mouth and throat cancer warning: Analysis of both text and pictures.

| Stimuli | Variable | Smokers | Non-smokers |
|----------|--------------|---------|-------------|
| Figure 3 | Contact time | 4.72 s | 3.44 s |
| | GSR | 3.06 | 1.88 |
| Figure 4 | Contact time | 5.53 s | 5.58 s |
| | GSR | 1.17 | 1.50 |

GSR, Galvanic skin response.

Summary and conclusions

The point of departure of this study is that behaviour modification in respect of tobacco smoking (both prevention and smoking cessation) by means of mass communication such as social marketing campaigns will not be successful unless they at least solicit some arousal among the target audience (Hendriks et al. 2014:685; Peters et al. 2014:74). Emotional arousal (or activation) makes communication memorable, it enhances involvement with the message, it increases information-processing and it allows the mental accessibility of related knowledge (Hendriks et al. 2014:685; Peters et al. 2014:74).

It is against this background that the ability of fear-based appeals on cigarette packaging to generate subconscious arousal among consumers was investigated. Both GSR and eye-tracking data were collected as subjects were exposed to both picture-based and text-based warning labels.

Galvanic skin response baseline results

All four stimuli (two text only warnings and two text and picture warnings) were able to solicit a subconscious response, as measured by GSR, among participants. However, the fear-based appeal in the gangrene-affected foot picture produced the highest level of arousal.

Gender comparison

When comparing the two gender groups, both females and males responded more strongly to the very graphic depiction of a gangrene foot than to the mouth cancer picture. Males' responses to the gangrene foot picture were more than twice as strong as those of females.

When exposed to the text messages, both males and females returned significant responses from the baseline GSR data, except when females looked at Figure 1 ('Smoking causes peripheral vascular disease').

Message stimuli

When comparing the text warning to the corresponding picture warning (including the original text warning) for both messages ('Smoking causes peripheral vascular disease' and 'Smoking causes mouth and throat cancer'), no significant differences emerged. Thus, when combining both picture and text warnings on a single package, one does not fare better than text-only warnings in arousing a subconscious response.

Smokers versus non-smokers

The descriptive analysis of smokers' responses compared with non-smokers suggests that smokers paid more attention to the text-only message (longer eye-fixation), and they experienced higher levels of GSR arousal than did non-smokers.

The picture warning produced different results: the eye-fixation of smokers on the picture was slightly shorter than that of non-smokers, and their arousal levels were lower than those of non-smokers.

Eye-tracking results

The eye-tracking results also suggested differences. Respondents looked longer at the peripheral vascular disease picture than at the text-only message. The same trend was evident for the mouth cancer picture compared with the text-only counterpart. Males consistently looked longer at both the picture-based warning labels and the text-based warnings than did females, but the distinctions were not statistically different.

It was also apparent that the eye-fixation of smokers on the text was longer than that of non-smokers, and the GSR responses (arousal) of smokers to the text were higher than those of non-smokers. However, the eye-fixation of smokers on the pictures was slightly shorter than that of non-smokers, and the GSR responses (arousal) of smokers were lower than those of non-smokers.

In summary, the results of the study indicate that both fear-based pictures and text messages activated arousal among consumers. The study also demonstrated that the extent of arousal is influenced (at least to some extent) by gender and by whether or not the viewer is a smoker.

Implications of the study

An exploratory study, by definition, does not attempt to provide final, conclusive results or insights. It explores a relatively new subject domain in the hope that it will provide a basis for further, future research that may attempt to offer more conclusive (even irrefutable) empirical results. Typically, exploratory studies use modest sample sizes, and the interpretation of the results is not beyond question. Based on the results of this exploratory study, we offer tentative conclusions, but we are not able to provide firm managerial guidelines.

Having said that, it appears that if social marketers want to arouse the emotions of males, graphic fear-inducing imagery should be effective (Table 3). For females, however, text-based appeals are more likely to stimulate subconscious arousal (Table 4), particularly when the graphics are less threatening.

Furthermore, if social marketers want to arouse the emotions of non-smokers in seeking to dissuade them from starting to smoke tobacco, the use of strong graphic imagery should achieve that goal. When targeting smokers, on the other hand, social marketers should take note that smokers spend longer on eye-fixation and demonstrate higher emotional arousal when viewing text-based warnings as opposed to picture-based warnings. It could be that smokers find the graphic image 'unrealistic' – 'That will not happen to me!' – and

then avoid the graphic. The results could thus suggest that a defensive reaction, known as denial, follows exposure to the graphic image (Müller et al. 2009; Shen 2015).

A theoretical contribution of the study is the insights offered by the ELM. The results seem to suggest that the images that are more graphic successfully lead to emotional arousal. By contrast, the text message (targeting the central route) generated higher levels of arousal (although not statistically significant) when the picture message is less graphic. This result raises the concern that more graphic, high fear-appeal pictures may distract viewers or draw their attention away from the factual information provided by the text message.

Limitations of the study

A limitation of most studies using neuro-physiological measures to collect data is the relatively small sample size. Although the sample size in this instance was relatively large for studies of this nature, it was still limited when sub-samples were analysed.

A second limitation is that too few smokers participated in the study to draw firm conclusions, or statistically to compare their subconscious responses with those of non-smokers. Despite this limitation, it appears that there is evidence that smokers and non-smokers differ substantially in how they respond at the subconscious level to fear-appeal cigarette warnings. This tentative result paves the way for exciting opportunities for future research.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

Both the authors have contributed to the article equally.

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