The Effects of Emotion on Judgments of Effectiveness and Good-Design

Hui Yueh Hsieh

Department of Visual Communication Design, Ming Chi University of Technology
84 Gungjuan Rd., Taishan, New Taipei City, Taiwan
tsauk@mail.mcut.edu.tw

Abstract. This study investigated participants' judgements of effectiveness and good-design with regard to visual messages of risks, as well as the relationships between their judgements and emotional responses. It examined whether fear-appeals influence emotional responses and judgements. The findings suggested that emotions appeared to be strong predictors of judgements of effectiveness and good-design. In general, for both the designers and users, the more emotionally salient (high arousal, high dominance and either high pleasure or high displeasure) stimuli were perceived, the more effective and the better the design they were judged. In addition, strong fear appeals were perceived as more effective and better designed.

Keywords: emotion, judgement, fear-appeals.

1 Introduction

A growing number of researchers in the design field have become aware that the emotional response to a visual artefact is vital to the message's success in communicating information to users. These researchers, often by examination of the visual aspect of a design, have endeavoured to understand how it can be affected by emotions. Cameron and Chan [1] pointed out that much of the research on risk communication has centred on cognitive mechanisms and rationality, but relatively little has been done to delineate the influence of emotion and imagery on health behaviour. Previous studies sought to understand the relationship between emotion and risk perception found that fear appeals can affect risk perceptions; there is, however, considerable debate as to whether fear appeals can affect attitudes, decision-making or behaviour.

Although visual messages designed to communicate risk are not always effective [2], sometimes even misleading, little empirical research has been carried out to investigate the use of visual display for risk communication. Most of these studies on visual communication of risks focuses on specific risk (e.g. HIV/AIDS), or specific precautionary behaviours [e.g. breast cancer screening in3]. In addition, research in the areas of psychophysics, and human factors has not examined risk communication fully. Studies on visual representation to communicate risk are often atheoretical [4, 5]. In the area of visual communication, although a great deal of attention has been

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paid to visual health campaigns, especially campaigns in third world countries, these publications are largely advocacy-based and aesthetic judgements rather than empirical research.

This study investigated the possibility of differences in emotional responses and the judgements of effectiveness and good-design among the users and the designers. It sought to answer three questions: 1. Do participants' judgment of effectiveness correlate with their judgments of good design? 2. Do participants' emotional responses correlate with their judgements? 3. Whether fear-appeals influence emotional responses and judgements?

1.1 Emotional Design: A Visual Communication Perspective

More marketers and product designers recognise emotion as a vital factor in successful selling products [6] and that emotion-engendering products generate higher customer-perceived value [7]. Givechi and Velázquez said that better design can provoke positive emotions from people such as a feeling of achievement, inspiration and joy [8]. Noble and Kumar [9] suggested, positive emotions are strongly associated with marketing-based outcomes such as attachment, loyalty, commitment and passion. In the book "Designing Pleasurable Product", Jordan [10] proposed a three-level hierarchy model (Level 1: Functionality; Level 2: Usability; Level 3: Pleasure). When the functionality and usability are fulfilled, people will want something more - products that bring pleasure. He described three aspects which are associated with pleasurable products: emotional and hedonic and practical benefits. Similarly, psychologist Donald Norman published one of the most highly cited books in design: "Emotional Design: Why We Love (or Hate) Everyday Things", which emphasizes emotion plays an important role in product design; human-centred and attractive designs (products) work better [11]. A considerable research effort has been devoted to this area, for instance, Jordan [10] formulated a questionnaire for assessing 'product pleasurability' for Philips Corporate Design [as cited in 10]; Khalid and Helander [12] presented a framework for evaluation of affective design, and "the goal is to achieve a pleasurable and satisfying product" [12].

1.2 Fear Appeals

Previous studies have demonstrated a correlation between emotion and perceived risk. For example, when participants were asked to identify the first thought or image they associated with nuclear waste repository, most of the images that aroused people were emotionally negative, for example, dangerous/toxic, death/sickness [13, 14]. Many theorists believe that, arouse visceral emotion of fear in individuals will increase their perceived severity of the health risk. "Fear appeals are persuasive messages that emphasize the harmful physical or social consequences of failing to comply with message recommendations"[15]. Fear appeals evoke not only fear but a variety of emotions, such as anxiety and disgust, and each arousal emotion has separate and unique effects on persuasion [16, 17]. According to Cauberghe et al. [18] the term 'fear appeals' is incorrectly used when referring to 'threat appeals'. Nevertheless, because it is a prevailing usage in the literature, the term 'fear appeals' is used here.

Dilemma of Fear Appeals. Health promotional campaigns have been confronted with dilemmas involving whether to incite people's negative emotions, often using an imagery of grotesque body, to take up precautionary measure. Having reviewed the literature on fear appeals, Strahan and colleagues stressed that fear appeals can be effective in influencing health behaviour [19]. For example, in research which examined whether fear appeal messages related to skin cancer can promote skin protective behaviour, the results showed that participants who received highly threatening fear appeal messages (with pictures of people with skin cancer) expressed more willingness to take preventive measures to protect their skin than those who only received text messages alone [20]. Hammond and colleagues [21] found that smokers who had greater negative emotions in response to the graphic warning labels were more likely to have quit, attempted to quit, or reduced smoking. Studies on the web-based avian influenza (bird flu) education program found that the fear appeal program was more effective than the humour-based program in improving risk perception and educating the students about healthy behaviour [22]. Research has also demonstrated the effectiveness of both positive and negative emotional health messages in influencing relevant behaviour [23].

Although the above studies stressed the role of emotion in the effectiveness of health risk communication, there has been controversy over the use of fear appeals. Critics of this approach have opposed the use of fear appeal, contending that it is ineffective [1, 24]. It has also been suggested that using fear arousal as a persuasion tactic is unethical. Hastings and colleagues [25] pointed out that there may be consequential collateral damage. As fear appeal messages in mass media reach far larger audiences, and inevitably reach unintended audiences such as untargeted children.

1.3 The PAD Emotion Scales

The dimensional approaches of measuring emotions- the PAD Emotion Scales [26] were employed for this study. The PAD devised by Mehrabian and Russell is one of the most critically acclaimed emotional assessment instruments. Mehrabian and Russell [27] proposed a three-dimensional model of emotion, stating that all human emotions can be adequately described by three continuous, bipolar, and nearly orthogonal dimensions, pleasure (P), arousal (A) and dominance (D). One of the strengths of the PAD is that it permits calculation of the average emotional response of a group to any stimulus, and that it is designed to capture the entire domain of emotional experiences rather than to measure specific emotions.

The validity and reliability of the PAD is well established [28-30], and it has also been employed and gained recognition in various fields for assessing emotional responses, such as in consumer research [31, 32] and in design [33]. Havlena and Holbrook [28] assessed comparative reliabilities and validities of Mehrabian and Russell's PAD Emotion Scales and Plutchik's Emotion Profile Index (basic emotion approach), and posited that the PAD scheme allows one to describe an emotional experience in terms of specific emotions as well as the dimensions underlying the emotion states. They concluded that the PAD paradigm outperforms Plutchik's emotional categories.

Behavioural studies have shown that emotions are multidimensional [34]. How these multiple dimensions are processed in the brain is still not understood. Evidence from a recent fMRI study demonstrated that a three-dimensional approach is a more robust emotional assessment method than the discrete approach. Morris and associates identified different functional regions of the brain that correspond to both the pleasure and the arousal dimensions of the PAD Emotion Scales and found that there was a high correlation between the self–report PAD measurement and the fMRI data [35].

2 Method

2.1 Participants

A total of 324 Taiwanese participated in this study. The effective sample size was 289 (mean age 22.18, SD 6.08, range 18-63; 196 women: mean age 21.74, SD 5.30, range 18-45); 113 men: mean age 22.88, SD 7.10, range 18-63) after discarding invalid samples. Some data were eliminated from further analyses because of omitting items or a suspicion of careless responding, i.e. lack of variability and extremity bias [36]. Among the participants there were 180 from a visual communication design background and 109 from a non-design related background (such as engineering). The design students participating in the study were recruited from three universities in Taiwan.

2.2 Materials

The stimuli consisted of visuals representing different emotional dimensions and particularly whether fear or non-fear appeals. Mehrabian [37] believed that discrete emotion are better described as a three-dimensional PAD space, and single emotions always confound two or more of the PAD dimensions. It was found, "Fear = (- .64*P, +.60*A, -.43*D)", that fear is represented by low degrees of pleasure (-P), high arousal (+A), and involved low dominance (-D) [27]. The six stimuli that had the highest mean pleasure-displeasure scores (low pleasure) and the lowest mean arousal/non-arousal scores (high arousal) were selected for the fear-appeal group, and the four stimuli that had the lowest mean pleasure-displeasure scores (high pleasure) and highest mean arousal/non-arousal scores (low arousal) were selected for the non-fear group.

PAD Scales. The Chinese-language PAD Emotion Scales[38] were used to assess participants' emotional responses (see Table 1).

Table 1. 12 items PAD Emotion Scales

Pleasure (P)	Arousal (A)	Dominance (D)
P1: Happy-Unhappy	A3: Frenzied-Sluggish	D1: Controlling-Controlled
P2: Pleased- Annoyed	A4: Jittery-Dull	D2: Dominant –Submissive
P3: Satisfied-Unsatisfied	A5: Wide awake-Sleepy	D3: Influential-Influenced
P5: Hopeful –Despairing	A6: Aroused- Unaroused	D6: In control-Cared for

2.3 Procedure

Using the 12-item Chinese version of the PAD Emotion Scales, participants viewed 15 visual stimuli and rated how each stimulus made them feel according to three dimensions of emotional response. They ticked one of seven spaces between two bipolar adjectives to show their evaluation. Two additional questions were asked with each stimulus to assess participants' opinions. The first question was "Do you think this visual artefact is effective?" and secondly "Do you think this is a good design?" Participants were requested to rate both questions on a 7-point-scale, from 'strongly disagree' to 'strongly agree'. The experiment took an average of 30 to 50 minutes to complete.

3 Results

Pearson correlation coefficients were calculated to reveal possible relationships between participant's judgement of effectiveness (E) and their judgement of good-design (G). The results showed that the overall Person correlation between E and G based on all participants was 0.65, $p<0.01$. Further analyses confirmed that, irrespective of stimuli categories (i.e. fear or non-fear), high correlations between the ratings of effectiveness and ratings of good-design were observed for both designers and users (all at $p<0.01$).

In order to determine whether emotional responses predict judgements of effectiveness and good-design, regressions were performed on the ratings of effectiveness and good-design using three PAD scales as the predictors. The multiple regression analysis revealed that, in response to non-fear appeals the same patterns were found for designers and users (Fig. 1 and 2). The ratings of effectiveness of both the designers and users were negatively correlated with arousal (all at $p<0.01$), and the ratings of good-design were negatively correlated with pleasure and arousal (designers: all at $p<0.01$; users: $p<0.05$ for pleasure and $p<0.01$ for arousal). These results imply that when the induced arousal was greater they evaluated the non-fear appeal stimuli as more effective, and when they perceived greater pleasure and arousal they rated the non-fear appeals as better designed.

In regard to fear appeals, different patterns were found for designers and users (Fig. 3 and 4). Designers' pleasure and arousal responses predicted their ratings of effectiveness and good-design. Pleasure was positively correlated with effectiveness ($p<0.05$) but negatively correlated with good-design ($p<0.01$); arousal was negatively correlated with both effectiveness and good-design (both at $p<0.01$). These results indicate that when the designers perceived a greater displeasure and arousal they evaluated the fear appeal stimuli as more effective; however, greater pleasure and arousal were associated with better-designed. Users' arousal responses predicted their effectiveness ratings, and arousal and dominance responses predicted their ratings of good-design (all at $p<0.01$), indicating that the users evaluated the fear appeal stimuli as more effective when they perceived a greater arousal, and when the perceived arousal and submissiveness were greater they rated the fear appeals as better designed.

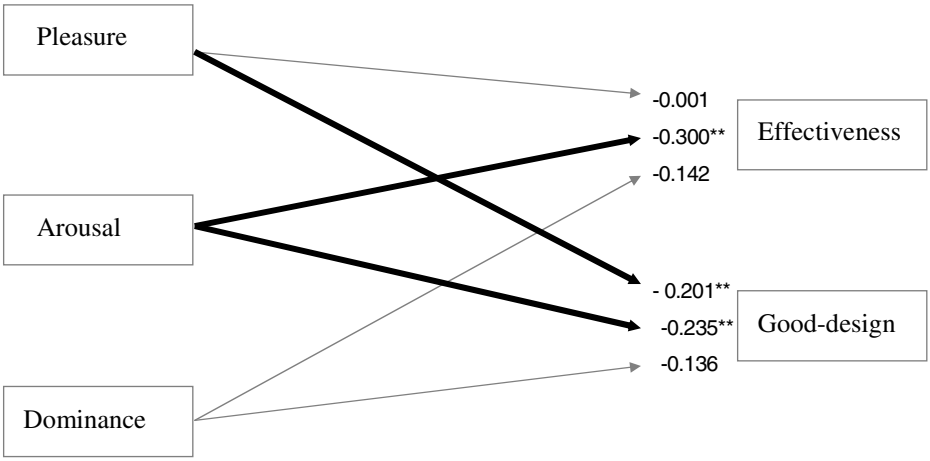

Fig. 1. Output diagram of emotion predicting ratings of effectiveness and good-design on non-fear appeals by designers

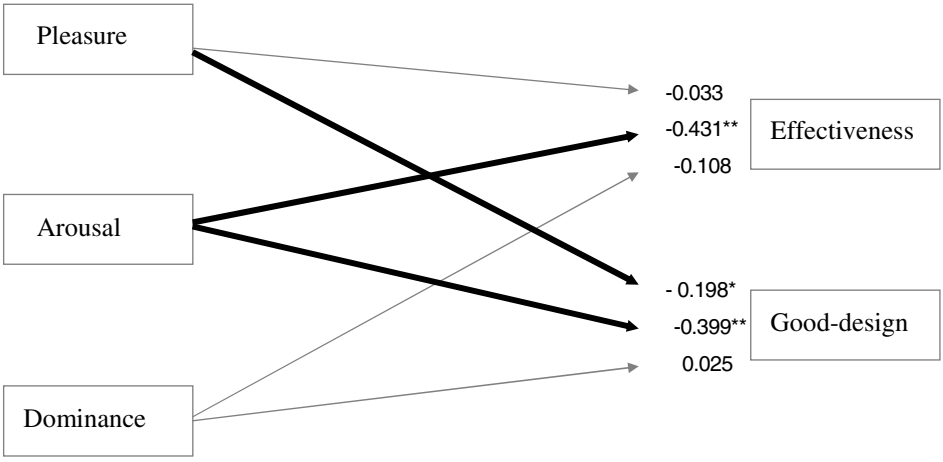

Fig. 2. Output diagram of emotion predicting ratings of effectiveness and good-design on non-fear appeals by users

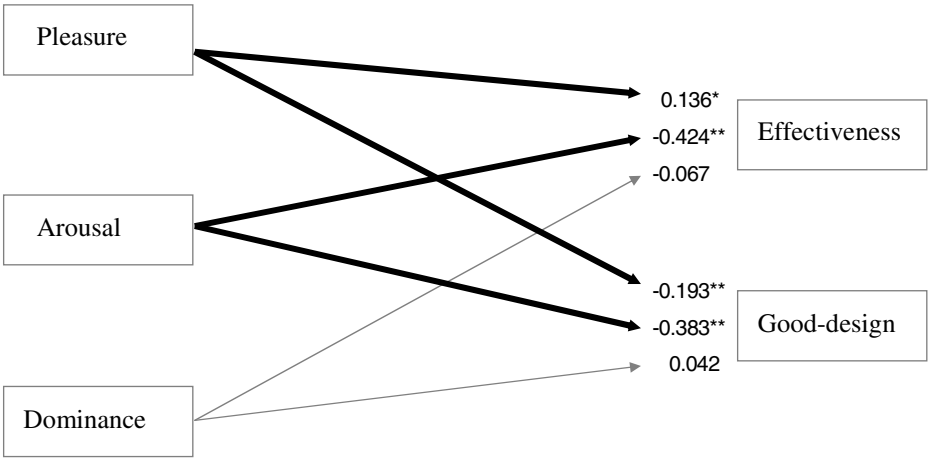

Fig. 3. Output diagram of emotion predicting ratings of effectiveness and good-design on fear appeals by designers

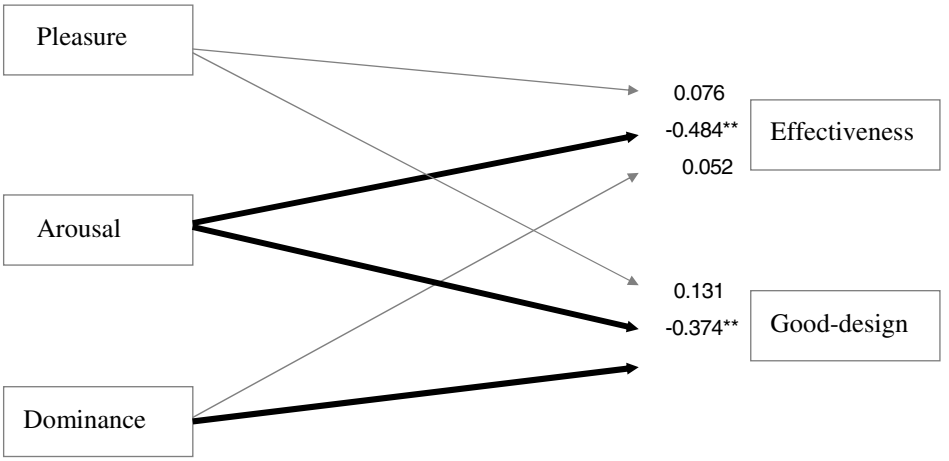

Fig. 4. Output diagram of emotion predicting ratings of effectiveness and good-design on fear appeals by users

4 Discussion

This study investigated participants' judgements of effectiveness and good-design, and whether emotional responses predict the judgements. For both designers and users and irrespective of stimuli categories, it was found that the ratings of effectiveness and ratings of good-design exhibited extremely high correlations, which indicates that they might be measuring similar concepts. The multiple regression analyses revealed a high degree of association between participants' ratings of effectiveness and good-design with three PAD scales.

Although the two questions, effectiveness and good-design, addressed somewhat different content, the Pearson correlations between the two were reasonably high. This indicates positive associations between the two questions; when the rating of effectiveness was high, the rating of good-design was high in both designers and users. Designer Milton Glaser recalled that 'good' used to refer to a quality of honest and truthful in the early fifties, but today, "good simply means effective" [39]. The current findings indicate that the concepts of good design and effective design might be similar for both participating designers and users, although the correlations between the two measures were marginally higher for users. An effective design may not be a good design; a good design requires a balanced combination of aesthetics, usability, ethics and effectiveness. The concepts of good design and effective design are not synonymous.

There is a high degree of association between judgements of effectiveness and judgements of good-design with three PAD scales. In general, for both the designers and users, the more emotionally salient (high arousal, high dominance and either high pleasure or high displeasure) stimuli were perceived, the more effective and the better the design they were judged. It also indicates that strong fear appeals were perceived as more effective and better designed.

The results of the regression analyses revealed that emotions were strong predictors of judgements of effectiveness and good-design. Pleasure and arousal accounted for most of the significant relations. Arousal stood out as the strongest predictor of the judgements of effectiveness and good-design; the higher the arousal, the more effective and the better the design for both the designers and users. In regard to fear appeals, different patterns were observed for designers and users. Pleasure and arousal predicted the judgements of effectiveness and good-design of designers, although pleasure appeared to exert opposite effects between their ratings of effectiveness and good-design. On the other hand, pleasure did not predict users' ratings of effectiveness and good-design, but dominance significantly correlated with users' judgements of good-design. These findings fit well with the observation that addresses the powerful influence of emotion on judgement, and reinforce the need for a better understanding of the emotional dimensions in visual communication of risks.

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