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Avoidance of smoking: the impact of warning labels in Brazil

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ABSTRACT

Background: Research on human emotion shows that pictures drive the activity of specialised brain networks affecting attitude and behaviour. Pictorial warnings on cigarette packages are considered one of the most effective ways to convey information on the health consequences of smoking. However, few studies have evaluated the effectiveness of warning labels to elicit avoidance of smoking.

Objectives: To investigate the impact of pictorial health warnings conveyed by the Brazilian tobacco control programme through a well-established psychometric tool designed for studies on emotion and behaviour.

Methods: Graphic Brazilian cigarette warnings labels were evaluated. They consisted of the two sets of warning pictures displayed in 2002–4 (n = 9) and 2004–8 (n = 10). Pleasant, unpleasant and neutral pictures selected from a standard catalogue were used as controls. Undergraduate students (n = 212, 18% smokers) evaluated the emotional content of each picture in two affective dimensions: hedonic valence and arousal. Participants were not provided with the sources of distinction between control and warning pictures.

Results: The judgements of hedonic content of the warning pictures ranged from neutral to very unpleasant. None was classified as highly arousing. Smokers judged warning pictures representing people smoking significantly more pleasant than pictures without smoking scenes, and significantly more so than non-smokers. No significant differences between smokers and non-smokers were found for warning pictures without these smoking scenes.

Conclusion: Previous studies have shown that the most threatening and arousing pictures prompt the greatest evidence of defensive activation. Emotional ratings of Brazilian warning pictures described them as unpleasant but moderately arousing. To intensify avoidance of the packages, future graphic warnings should therefore generate more arousal. The ratings for the Brazilian warning pictures indicated that, except for those depicting people smoking, judgements by smokers and non-smokers were similar, suggesting a potential applicability in both prevention and cessation. Smoking cues, however, should be avoided.

The tobacco industry has long used mass media advertising to influence people to smoke.^{1–3} Longitudinal studies show that exposure to tobacco advertising and promotion influences the attitudes of non-smoking adolescents, making them more likely to try smoking.³ Public health initiatives for tobacco control have counteracted this with considerable success, especially in counter-marketing campaigns.^{4–5} The strategies of the

campaigns have involved a wide spectrum of actions aimed at preventing people from starting to smoke and stimulating smokers to quit.⁶

More recently, the Framework Convention on Tobacco Control (FCTC)⁷ requested nations to implement a range of tobacco control policies, including important provisions for package labelling (Article 11). Packages of tobacco products must carry large, clear, visible and legible health warnings describing the harmful effects of tobacco use, occupying more than 30% of the principal display area. In addition, Article 11 suggests the inclusion of pictorial warning labels.

In Brazil the use of cigarette packs as a vehicle to inform health risks is not new. The first health warning was introduced in August 1988 and consisted of a single sentence: “The Ministry of Health warns: smoking is harmful to health”. The strategy of graphic warning labels was launched in May 2001, becoming effective in February 2002 by law. Packages of tobacco products must carry health warning labels containing colour pictures depicted in 100% of one of the main surfaces.⁸

Warning labels are one of the most effective vehicles to inform citizens about the health consequences of smoking and to increase avoidance behaviours.^{9–11} Graphic warnings can make a successful impact on consumers, particularly on starters and those willing to quit smoking, especially when warnings are highly visible and advertise the negative health effects of smoking.¹⁰ Nonetheless, remarkably little is known about the mechanisms involved. Furthermore, experimental research on the motivational impact of cigarette warnings has been limited.

A vast body of research in the neurobiology of emotion shows that visual stimuli affect attitude and behaviour. The processing of visual information involves more than half the total volume of cortical cerebral tissue in primates, including humans. Looking at pictures became a ubiquitous natural human activity, led by magazines, films, television and the Internet. It is also generally acknowledged that pictures can evoke emotions; politicians, the media and polls of the general public all readily agree that media depictions of sex and violence are effectively compelling and may significantly influence the morals and aggressive behaviour of society.¹²

Whereas the patterns of emotional expression are highly varied, according to many theorists their motivational basis can be conceived as a simple two-factor organisation^{12–13}—that is, emotion is founded on brain systems that adaptively respond either to appetitive or aversive stimulation. This

biphasic organisation of emotion grounded on appetitive and defensive systems would be modulated by activation or metabolic arousal. Thus, judgements of pleasure or displeasure indicate which motivational system is active, and judgements of arousal indicate the intensity of motivational activation. Reports of emotion are not, of course, direct readouts of activity in motivational circuits. They are also affected by many other factors including personal, context and cultural imperatives. Nevertheless, the consistency of the two-factor view across varying languages and cultures encourages the hypothesis of a more general underlying biological substrate.^{12 14}

With the aim of developing a standard set of visual stimuli to use in the scientific studies of emotion, Lang and collaborators built a catalogue—the International Affective Picture System (IAPS)—with hundreds of pictures¹⁵ and developed a psychometric scale, the Self-Assessment Manikin (SAM),¹⁶ to directly access the pleasure (hedonic valence) and emotional arousal associated with each picture. SAM has been used effectively to measure subjective emotional responses in a variety of situations including reactions to pictures, words, imagery, sounds, advertisement and painful stimuli.¹⁶ SAM has also been employed in clinical samples such as in patients with anxiety, psychopaths¹⁶ and in those with addiction problems.^{17 18} Interestingly, the ratings obtained from this scale are correlated with several physiological reactions to the stimuli and can be considered, to some extent, an index of emotional activation of the appetitive (approach-like) and defensive (avoidance-like) systems.¹⁴

The tobacco industry has long employed very pleasant images in advertisements. In other words, they consistently work to generate approach-like behaviours to their products. Since tobacco advertising in all media became more and more restricted, the relevance of cigarette packages as a primary instrument for tobacco promotion has increased and packages have become more attractive and appealing.¹⁹

Besides informing on the hazardous consequences of smoking, graphic warnings might act to deconstruct the pleasurable appeal, inducing avoidance predispositions to the cigarette packages. The present study analyses the emotional impact of pictures from health warning labels displayed on tobacco products packages in Brazil using the SAM psychometric instrument and the IAPS standard catalogue of pictures. Important hints and suggestions to develop more effective tobacco warning labels can be enlightened by this procedure.

METHODS

Participants

Two hundred and twelve undergraduate students (118 women, 94 men) from the Health Sciences, Math and Computer Sciences and Arts courses, took part in the study. The mean (SD) age of the smokers and non-smokers was 21.9 (1.8) years and 21.2 (4.2) years, respectively ($p=0.28$, Student *t* test). Smokers comprised 18% of the sample ($n=38$), which approaches the estimated prevalence of young smokers in Brazil.²⁰ Gender distribution among smokers and non-smokers was not significantly different.

The volunteers were told that the experiment consisted of the evaluation of emotional pictures. The connection between the experimental session and the tobacco control programme was not made explicit to them. Each participant gave written informed consent to participate in the study and meal and transport costs were reimbursed when applicable. The study protocol was approved by the ethics committee of the Federal University of Rio de Janeiro.

Apparatus

The experiment was conducted in a room dimly lit with comfortable desks placed in rows in front of a slide projection screen. The desks were arranged in such a manner that the screen was perfectly visible to every participant. A computer-projector system controlled the timing of the stimuli presentation. No more than 40 subjects performed the test simultaneously.

Stimuli

Warning pictures

They consisted of the 19 pictures printed on tobacco products as part of the tobacco control programme developed by the Brazilian government. Nine of these pictures were displayed in the first set (2002–4) and 10 in the second set (2004–8). All were meant to illustrate the harms caused by smoking. To avoid an explicit association with the tobacco control programme, every word or symbol printed in the original warnings was excluded so their graphical layouts were indistinguishable from the other pictures. This was important to avoid undesirable interference from a priori subjective opinions about the health warning itself.

International Affective Picture System (IAPS)

As a background to the investigation of the emotional impact of the warning pictures, the IAPS was used.¹⁵ This provides pictures, emotional ratings and standard procedures. Following its recommendations concerning number and categories of pictures, we selected a total of 62 pictures balanced in the degree of both pleasantness (hedonic valence) and arousal. They consisted of pleasant (from low to high arousal: happy families, babies, nature scenes, food, sports, erotica), neutral (mushrooms and utensils) and unpleasant (from low to high arousal: pollution, loss, disgusting animals, disease, mutilated bodies and violence) images.

Habituation control set

Eight pictures were selected from the worldwide web that approximately matched those of the warning labels to control for the effects of habituation due to previous exposure. Each picture aimed to cover a theme represented in several warning images. For instance, if a group of warning pictures depicted hospitalised people, a picture with similar visual information (hospitalised people) was also selected from the worldwide web as a control.

Psychometric instrument

Participants were asked to rate the picture along the dimensions of hedonic valence and emotional arousal using the paper and pencil version of the SAM.¹⁶ The scale of the hedonic valence dimension is composed of pictorial drawings of manikins with expressions ranging from “smiling-happy” to “frowning-unhappy”. For the arousal dimension, the expressions of the manikins range from an excited wide-eyed figure to a relaxed sleepy figure. For analyses purposes, the ratings in the hedonic valence dimension were converted to numbers ranging from -4 (extremely unpleasant) to 4 (extremely pleasant), with 0 being neutral. The ratings in the emotional arousal dimension were converted to numbers ranging from 1 (low arousal) to 9 (high arousal).

Experimental design

Each rating trial began with a preparation slide (“Get ready to rate the next image”) that lasted for 3 s and was followed by a 6 s picture observation period. During the next 10 s,

participants were asked to rate the picture along the dimensions of hedonic valence and emotional arousal using the paper and pencil version of the SAM scales.¹⁶ The participants rated a total of 89 pictures during the experimental session. The ratings of the first nine pictures (from the IAPS) were considered practice and were not included in the analyses. The sequential order of pictures was randomised with the constraint that a given category could not be displayed consecutively more than twice.

Once the experimental session was over, participants completed an adapted questionnaire originally used by the Brazilian National Institute of Cancer to classify smokers and non-smokers.²⁰ Those who had consumed >100 cigarettes were considered to be smokers.

Data analysis

Pearson's correlation coefficient between the average ratings of IAPS pictures from the present study and those reported for North Americans was computed.¹⁵ To control for habituation effects of previous exposure to warning pictures, "warning" and

"habituation control" pictures evaluated by smokers were compared using the Student *t* test.

Motivated by evidence from previous studies,^{21–23} we carried out an exploratory analysis to test if pictures depicting scenes of people smoking (pictures 3, 12, 15 and 16) had a different impact on smokers compared with non-smokers. To test this hypothesis, we conducted a two-way repeated measure ANOVA on valence and arousal ratings separately with "group" (smoker or non-smoker) as the between-factor variable and "smoking scene" (present or absent) as the within-factor variable. Post-hoc tests were performed with Tukey's HSD.

The statistical threshold for significance employed for all analysis was α value of 0.05. All statistical analyses were performed using Statistica 7.0 (StatSoft, USA).

RESULTS

The average scores for each of the IAPS pictures were compared with those reported for North Americans.¹⁵ The correlation was high for both the hedonic valence ($r = 0.98$, $p < 0.05$) and the emotional arousal ($r = 0.94$, $p < 0.05$) dimensions. In addition, a plot of the mean scores for valence and arousal on a Cartesian plane (fig 1A) revealed the same "boomerang"-shaped distribution as that described by Lang *et al.*¹⁴ They proposed that the upper arm of the boomerang indexes appetitive (approach-like) motivation—in which stimuli judged to be pleasurable range in rated arousal from relatively calm to highly arousing—and the lower arm indexes defensive (avoidance-like) motivation—in which unpleasant stimuli range from calm to highly arousing.

The whole set of warning pictures was rated along the lower arm of the boomerang, which is supposed to reflect avoidance predispositions (fig 1A, black squares). The scatter plot of valence and arousal mean scores for the warning pictures are magnified in fig 1B. The 19 warning pictures are shown in fig 2, ranked according to their projection over the defensive motivation vector combining valence and arousal magnitudes (ie, in increasing order of aversiveness). The average valence and arousal ratings for each warning picture are shown in table 1.

For smokers the mean (SD) comparisons between warning and habituation control sets did not reveal significant differences in either valence (-1.8 (0.96) vs -1.7 (1.00); $t^{35} = -1.08$; $p = 0.29$) or arousal (5.0 (1.31) vs 5.1 (1.42); $t^{35} = -1.09$; $p = 0.28$), suggesting that habituation did not play a significant role on participants' ratings.

As expected, warning pictures depicting people smoking did impact differentially on smokers. We found a significant interaction between "group" and "smoking scene" on valence

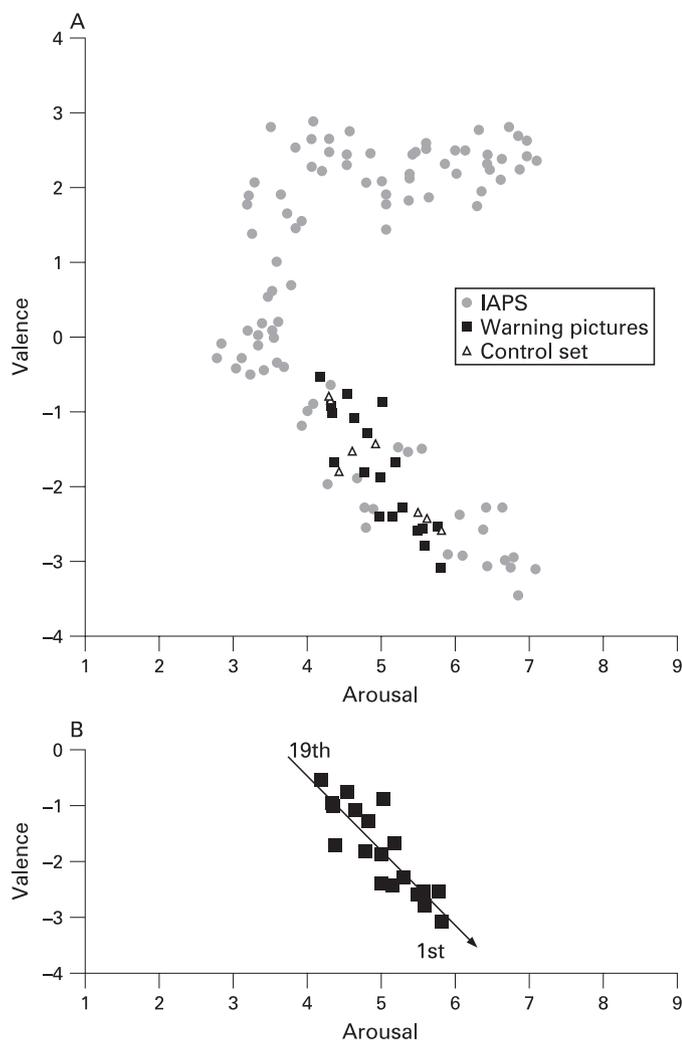


Figure 1 Affective space. (A) Illustration of a two-dimensional space defined by Self-Assessment Manikin (SAM) valence (*y* axis) and arousal (*x* axis) ratings. Each point in the plot represents the average ratings for a picture. International Affective Picture System (IAPS) (grey circles); habituation control set (open triangles); warning pictures (black squares). (B) Amplified affective space showing the regression line for the warning pictures plots, assumed to reflect a defensive vector. The most aversive is classified as the 1st and the least aversive as the 19th.

Table 1 Ranking of warning pictures (valence, arousal)

Picture no	Ranking	Picture no	Ranking
1	-3.1, 5.8	11	-1.8, 4.7
2	-2.8, 5.6	12	-1.7, 4.4
3	-2.6, 5.8	13	-1.4, 4.8
4	-2.6, 5.4	14	-0.9, 5.0
5	-2.5, 5.5	15	-1.1, 4.6
6	-2.3, 5.3	16	-0.8, 4.6
7	-2.4, 5.1	17	-1.0, 4.2
8	-2.4, 4.9	18	-0.9, 4.3
9	-1.8, 5.0	19	-0.5, 4.1
10	-1.7, 5.2		

Data are ranked by their aversiveness (combination of valence and arousal) as shown in fig 2. For each warning picture the numbers denote the average valence and arousal scores, respectively. Valence range: 0 (neutral) to -4 (extremely unpleasant). Arousal range: 1 (low arousal) to 9 (high arousal).

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Figure 2 Brazilian warning pictures. The ranking order along the defensive vector is shown below each picture. Picture 1 is the most aversive and picture 19 is the least aversive.

($F(1,208) = 26.57$; $p < 0.05$). Post-hoc analysis showed that smokers judged the warning pictures with smoking scenes significantly more pleasant than did non-smokers ($p < 0.05$). Smokers also considered those pictures significantly more pleasant than the ones without scenes of people smoking ($p < 0.05$). For the (larger) group of pictures without people smoking, there were no significant differences between valence judgements by smokers and non-smokers ($p = 0.89$). No significant interaction was found between “group” and “smoking scene” for judgements of pictures’ arousal.

DISCUSSION

With the use of a well-established tool for emotion studies, this study showed that most of the pictures used in the Brazilian cigarette warning labels were considered unpleasant and moderately arousing by both smokers and non-smokers in our sample. Their judgements of the pictures from the IAPS catalogue suggest that the reports did not deviate from the general norms established previously for a North American sample and give support to the appropriateness of the methodology. We can also discard a putative contamination of previous exposure to the warning labels as smokers did not differentiate the classification of the warning pictures from the habituation control set.

As a symbolic threat, pictures seldom evoke overt emotional actions; nonetheless, these stimuli do vary in their perceived intensity and on the extent to which they prompt avoidance predispositions. Among different categories of unpleasant pictures, the highest arousal rates are directed to the ones with the most threatening content from a survival perspective (eg, injured or mutilated people; human and animal attack). These categories strongly activate the areas in the brain involved in emotional processing, beyond prompting strong psychophysiological reactions, negative affect and high arousal reports.¹⁴ In addition, previous studies on the emotional impact of visual stimuli conducted by our group revealed that threatening pictures capture attention and induce avoidance predispositions.^{24–27}

In the present study the emotional impact of Brazilian warning pictures did not reach the highest level of arousal. New cigarette warning labels could therefore benefit from the choice of more arousing unpleasant pictures. Scenes like a necropsy image with the message “this will kill you”, a gun with the message “this will murder you” or a snake with the message “this will poison you” could be effective enactors of avoidance behaviour towards tobacco packages.²⁸

We found that warning pictures depicting people smoking were considered more pleasant by smokers than by non-smokers. These pictures were also more pleasant to

What this paper adds

- ▶ The tobacco industry attempts to make packages extremely appealing. Graphic warnings can counteract this strategy by displaying highly unappealing images, as well as informing on the health consequences of smoking.
- ▶ Few studies have evaluated the effectiveness of warning labels to elicit avoidance towards smoking. We propose the use of a well-established psychometric tool designed for studies on emotion to analyse the impact of graphic warning labels.
- ▶ Our study shows that, to achieve this goal, warning labels should include aversive and arousing pictures and smoking scenes should be avoided.

smokers than the other group of pictures lacking smoking cues. Indeed, addiction-relevant clues exert a powerful influence on people with related craving behaviour, grabbing their attention and implicitly activating their appetitive system.^{21–23} Caution should therefore be exerted when choosing cigarette warning pictures since the presence of smoking cues may fail to induce the intended withdrawal attitude.

It should be noted that the picture of the “pregnant woman smoking” (fig 2, picture 3), a beautiful picture in itself, was considered very unpleasant even by smokers. This was not the case for the judgement of a control picture depicting a non-pregnant woman smoking. The hazardous association between the use of tobacco by pregnant women and the consequent damage to the fetus has long been conveyed by the educational actions of the Brazilian tobacco control programme. This finding suggests that the tobacco control programme is achieving one of its goals.

This study has some limitations that are worth noting. Only college students were investigated, and this may have limited the generalisability of the findings to some degree. It would be helpful to extend this research to other groups such as samples of different ages or social backgrounds.

The evaluation of the emotional impact elicited by the warning labels can provide important information on their efficacy for the prevention and cessation of smoking. The method described here could be used in the selection of new warnings before their circulation, increasing the success of the tobacco control programme. Currently, the tobacco industry attempts to make packages extremely appealing. Graphic warnings can counteract this strategy by displaying highly unappealing images as well as informing on the health consequences of smoking. In order to achieve this goal, the results of the present study indicate that warning labels should include aversive and arousing pictures and smoking scenes should be avoided.

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