Graphic imagery is not sufficient for increased attention to cigarette warnings: The role of text captions

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Graphic imagery is not sufficient for increased attention to cigarette warnings:

The role of text captions

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Abstract

Aims The present study aims to assess the extent to which attention to UK cigarette warnings is attributable to the graphic nature of the content. Design A visual dot probe task was utilised, with the warnings serving as critical stimuli that were manipulated for the presence of graphic versus neutral image content, and the accompanying text caption. This mixed design yielded image content (graphic v neutrally matched images) and presence (versus absence) of text caption as within subjects variables and smoking status as a between participants variable. Setting The experiment took place within the laboratories of a UK university. Participants 86 psychology undergraduates (51% Smokers, 69% female), predominantly of Caucasian ethnicity took part. Measurements Reaction times towards probes replacing graphic images relative to probes replacing neutral images were utilised to create an index of attentional bias. Findings Whilst the graphic image content of the warnings elicited attentional biases (relative to neutral images) for smokers, this only occurred when there was an accompanying text caption, highlighting that although graphic images increase attention to a warning, the text caption is still a necessary requirement. Conclusions This study not only highlights that graphic imagery increases attentional capture, but it highlights the importance of accompanying text. It also represents a direction for future warning research, which should isolate specific features (such as their graphic nature) in order to ascertain the best characteristics of a warning.
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Introduction

Following a request from the Framework Convention on Tobacco Control [1], an increasing number of countries have implemented policies introducing larger, clearer cigarette warnings. A review by Fong, Hammond & Hitchman [2] documents the most notable changes to the warnings, notably the inclusion of colour and often graphic imagery depicting the dangers of smoking. Moreover, they provide evidence for the efficacy of graphic image based warnings in different countries (of varying income and literacy rates). Smoking warnings are potentially an extremely cost effective health intervention, with pack-a-day smokers being exposed to the warnings over 7000 times a year [3]. With this amount of exposure, even small increases in warning effectiveness could have a substantial impact, and as such, are deemed one of the most effective vehicles with which to inform people about the health consequences of smoking [4].

Attention towards cigarette warnings is stressed as important in models of warning effectiveness [5-6]; being viewed as a logical necessity for the processing of a persuasive message [5-7]. Thus, without any attention towards the warning, recipients cannot processes its information and eventually conform to the prescribed behaviour. Additionally, at any one time, numerous environmental stimuli are competing for attention. Warning labels must therefore effectively cut through the stream of superfluous information that could provide potential distraction from the message [8]. Cigarette brand labelling is an example of a potential distraction, with a highly attractive design, using striking colours and distinctive fonts [9]. Moreover, given its proximity (in time and space) with smoking behaviour, brand labelling is likely to serve as a smoking related cue, attention to which is hypothesised to provide a significant contribution to craving and cigarette seeking behaviour [10-12].
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Loeber et al [13] explored whether warning labels can capture attention, utilising a visual dot probe paradigm [14] to assess whether the cigarette packages containing the newer graphic image based warnings or the older, “text-only” style of warning influenced attentional biases relative to cigarette packages containing images from the International Affective Picture System [15]. In the typical visual dot probe task, two cue stimuli (e.g. graphic and text only warnings) are presented equidistant from a central point on a computer screen. In quick succession, a probe appears in the place of one of the cues, which subjects are required to respond to. The central premise of this task is that attention to a cue that appears in the same spatial location as the target is indexed by a faster reaction time to that cue. Faster reaction times to probes replacing one stimulus category over another indicate attentional priority given to that stimulus category. Thus, faster responding to probes replacing graphic warnings relative to text only warnings would indicate increased capture of attention by the former.

Loeber et al. [13] found that light smokers tended to avoid (divert attention away from) packages with graphic, but not text-only warnings. Heavy and non-smokers showed no attentional bias in either instance. It was concluded that warnings with a graphic image may reduce the incentive salience of cigarettes for smokers for whom tobacco consumption is less habitual. Notably, this study assessed attention towards cigarette packaging (i.e. warnings and brand labelling) as opposed to focusing on the warnings exclusively. A number of issues potentially limit the conclusions that can be drawn from this study. Firstly, in the visual dot probe paradigm, the typical presentation of a stimulus pair is 500ms, whereas Loeber et al. presented their stimuli for 50ms. Whilst the choice of a 50ms stimulus duration has been utilised in previous visual dot probe research, it is unlikely that the negative attentional bias score exhibited for light smokers was due to attentional avoidance with such a rapid stimulus
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presentation. Furthermore, the graphic cigarette warnings were not presented with their accompanying text in this study.

In a more direct assessment of attention to cigarette warnings, Munafo, Roberts, Bauld & Leonards [22] used a naturalistic viewing paradigm to assess whether brand labelling influences attention to the graphic image based warnings. Participants’ eye movements were monitored whilst cigarette packages with graphic image-based warnings and either normal or plain brand labelling were presented onscreen for ten seconds. Whilst non-smokers and weekly smokers examined health warning information more with plain brands, but brands and warnings equally for the normal style of brands, this effect did not occur for daily smokers. Moreover, this effect only occurred for the number of saccades and not duration of individual fixations. It was concluded that plain packaging increases visual attention for the warnings due to the decrease in salient, sensory driven brand features of the image. Whilst the study provided an assessment of attention to the graphic image based warnings, there was no attempt to isolate the influence of the graphic nature of the content from aspects such as colour and inclusion of any image, both of which have been proposed as potential factors that increase warning effectiveness [23], and may facilitate attentional capture to the warnings.

To date, previous research has also not investigated both the image and text portions of the graphic cigarette warnings; although a handful of studies have examined attentional processes towards text and images when presented simultaneously, in the context of advertisements [16], cartoons with captions [17], diagrams with accompanying text [18-19], subtitling [20] and a sentence picture verification task [21]. These studies have robustly found that people typically orient to text before examining images, even when text is superimposed over an image. Moreover, people rarely alternate between them: they concentrate on one, then the
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other. Crucially, this previous research suggests that text may influence attention to the
warnings, suggesting that it is important to examine both text and image together.

Whilst the studies from Loeber et al. [13] and Munafo et al. [22] both provide insight into
attentional allocation to cigarette warnings, they do not focus on this potential interaction
between image and text portions of the warnings. Moreover, they circumvent a crucial issue:
Whether the graphic content of the new warnings facilitates attention capture, or whether any
image in combination with text warnings results in attention capture. This issue is of
importance given the debate around adverse “boomerang” effects of such stimuli [24], in
which the threatening content of a fear appeal has an adverse effect. It has been assumed that
that we are biologically predisposed to attend to threat [25-27], suggesting that the
introduction of threatening imagery on cigarette packaging is likely to elicit attention towards
and therefore the processing of the new warnings. Previous studies that have examined
attention towards cigarette warnings using self reported measures of attention provide
evidence for this prediction [28-30] but do not provide an objective measure of attentional
processing.

This study builds on previous research by utilising the visual dot probe task to explore
whether the graphic image content of the new warnings can elicit attentional biases relative to
neutral matched images. To isolate the effect of the image content, neutral matched
images were created, allowing direct comparison with the graphic images. As with the
graphic image based warnings, these stimuli contained colour and a (neutral) picture, both of
which could influence attentional bias [5, 31]. Thus, whilst differences in attention towards
the newer (graphic image based) and older (text-only) style of warning could be attributed to
the colour or image present on the former, any difference between the graphic image based
warnings and neutral matches can only be attributed to the graphic nature of the content.
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Given research highlighting the interaction between images and text on attention, presence of text caption was also manipulated to assess its effect on attentional biases to the warnings. It was hypothesised that: a) participants will demonstrate an attentional bias towards the cigarette warnings relative to their neutral counterparts (due to the generic threatening nature of the images); b) smokers will demonstrate an elevated attentional bias compared to non-smokers given the warnings represent an increased threat for them; and c) there will be a difference in attentional bias between warnings with and without text captions.

Method

Participants

A total of 86 participants were sampled from a South Yorkshire University. The majority of this student sample were of a Caucasian ethnicity (91.86%). 44 were self-reported, defined as having at least one cigarette a day (17 males and 27 females) and 42 were never-smokers (10 males and 32 females). The mean age of the sample was 23.90 years (SD= 9.37).

Materials

Warning Images & Matches

Of the 15 warnings currently in circulation on UK packaging, four were excluded because they contained only a text statement, with no accompanying image. The images were digitized and converted to an indexed 256-colour palette using Adobe Photoshop (CS4) software, with image dimensions set to 200 x 160 pixels. Neutral images, matched in terms of content and visual complexity were selected to serve as appropriate controls (see Figure 1). This matching procedure has been undertaken in previous visual dot probe research [32-33].
In order to provide a strict experimental control, each neutral image contained the same text caption as its graphic warning counterpart.

**Design & Procedure**

The Visual Dot Probe paradigm was programmed in E-Prime (Psychology Software Tools Inc) and presented on an Intel(R) 1.66 GHz laptop, with a 15 inch monitor and screen refresh rate of 60 Hz. Participants were sat approximately 45cm away from the screen. Stimuli were presented at a visual angle of 5.52°. Participants were required to respond to the location of the probe by pressing either the 'z' or 'm' key for a left or right probe respectively. A probe location task was used, with a varying inter-trial interval (500ms -1500ms), the latter of which was implemented to reduce fatigue. Participants were required to complete 12 practice trials.

Each warning was presented four times along with its neutral counterpart. Out of these four presentations, the warning was presented twice on the left side of the screen and twice on the right. For each of the two presentations, the probe was presented in a congruent location once (i.e. on the same side) and an incongruent location once (i.e. on the opposite side). To test the hypothesis that the text caption played a role in attentional bias, an equal number of trials were included in which the same images and matches were presented without text. Thus, each of the 11 warnings was displayed four times with a text caption and four times without, giving a total of 88 critical trials. The order of presentation for all stimuli were counterbalanced and randomised.

*Insert figure 1 here*

For the task, participants were asked to respond as quickly and accurately as possible to target probes appearing on either the left or right side of the screen whilst ignoring the preceding
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images. The 'z' and 'm' keyboard letters were required to respond to targets presented on the left and right side of the screen respectively.

Data Analysis

Reaction times (ms) from error trials (1.17% of the data) and practice trials were excluded from the analysis. As in previous research [34-35], participants’ anticipatory (< 200ms) and slow responses (> 2 S.D. of the mean) were also excluded. Together, they accounted for 4.5% of the data. Parametric assumptions were met. To facilitate understanding of significant results, a single index of attentional bias was calculated [34], operationalised as the mean score on incongruent trials minus the mean score on congruent trials [37]. Bias scores were analysed in a 2x2 mixed ANOVA (Text Caption [Present, Not Present] x Smoking status [Smoker, Non-Smoker]) to assess whether attentional bias differed between groups. A-priori one sample t-tests were also conducted to assess whether attentional bias scores were significant for each group separately. [13]. Analyses were conducted with SPSS version 18.

Results

Results of the analysis revealed no general difference in attentional bias scores between conditions with and without text captions F (1, 84) = .558, p = .457, $\eta^2 = .007$. There was a significant main effect of smoking status, F (1, 84) = 4.377, p = .039, $\eta^2 = .050$, but this was subsumed within the interaction between presence of text caption and smoking status, F (1, 84) = 10.841, p = .001, $\eta^2 = .114$. Follow up testing of this interaction revealed that Smokers (M = 10.20 ± 2.56) exhibited a significantly larger attentional biases towards warnings with graphic image content when accompanied by a text caption than Non-Smokers (M = -4.19 ± 2.62): t (84) = 3.924, p < .001, d = 0.85 (see figure 2).
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Moreover, bias scores only significantly differed from zero in the case of Smokers $t(43) = 3.950, p < .001$. These findings refute the initial hypothesis of a general attentional bias for all participants, but an attentional bias in the smoker group provides support for the second hypothesis.

For trials in which the images did not have a text caption, there were no differences in terms of smoking status, $t(84) = -.521, p = .604$. Furthermore, both bias scores did not significantly differ from zero for both smokers ($M = .08 \pm 2.83$), $t(43) = .029, p = .977$ and non-smokers ($M = 2.19 \pm 2.89$), $t(41) = .745, p = .461$. As smokers only demonstrated an attentional bias when text captions were present, this supports the second and third hypotheses, which delineates a distinction in biases as a result of smoking status and text caption.

Discussion

This study assessed whether warnings with graphic image content can elicit greater attentional bias in comparison to neutrally matched counterparts and whether biases differed as a result of smoking status. Only smokers exhibited an attentional bias towards warnings with graphic image content, corroborating previous cigarette warning research that has demonstrated smokers’ increased attention to these warnings in self report [29, 38] designs. This bias however, is likely to be driven by the presence of the text caption, given that only a negligible bias was observed in the absence of text. This study expands upon previous research, through its manipulation and examination of graphic content and textual aspects of warning design.
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Smokers’ increased attentional vigilance for these warnings is likely a result of the threatening nature of the stimuli [39] that is particularly salient for this group. However, attentional biases were only demonstrated for warnings when they included a text caption, that is, presence of text facilitated responses to congruent probes when the text information was consistent with the image (i.e. on the cigarette warnings and not the matches). This is consistent with research arguing that when text and graphic serve a unified instructional goal, processing is faster [40] and relatively effortless [42]. Attentional bias to the warnings may therefore only occur in the presence of the text caption.

Limitations and future directions

This study has provided evidence for the role of graphic image content in the ability of cigarette warnings to capture Smokers’ attention, most likely because the threat is salient for this population. It also provides substantial evidence for the central role of the text caption in attentional biases to the warnings.

It is of worth to note that the non-representative nature of the sample somewhat hinders the generalisability of results. Moreover, unlike previous research, this study did not attend to the heterogeneity of responding in different smoking categories (such as the differences in attentional bias exhibited between daily and weekly smokers [22]. With regards to the latter concern, a distinction between these groupings was not feasible, given that individuals were required to smoke daily in order be categorised as a smoker. Moreover, as this grouping criterion somewhat differs from that established in other studies [13], creating a similar distinction without any a priori hypotheses may have easily lead to incorrect conclusions about attention towards the warnings, especially given that there was a significant effect resulting from smoking status in spite of such distinctions. Another noteworthy concern is
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that one could attentional biases towards the warnings may be attributable to familiarity of
the graphic image based warnings relative to the neutral matches. This is unlikely however,
given familiarity effects would also yield attentional biases for the graphic image based
warnings (relative to their neutral counterparts) when not accompanied by a text caption.

Although the present results are promising, future research must ascertain whether smokers
preferentially attend to the warnings over smoking related cues such as brand labelling,
utilising a more generalizable sample. Whilst the relative attention to brands and warnings
has been assessed in previous research [22], only aspects of the cigarette brand were
manipulated in this instance. Therefore, there was no assessment of the effectiveness of
cigarette warning content (i.e. text captions and graphic imagery) on attentional biases. As
such, research should systematically vary components of both the warning and brand to
assess which aspects are responsible for attentional capture. Additionally, further details
regarding phenomenology of attentional biases elicited by the warnings are of utility, such as
the distinction between engagement and maintenance aspects of attention [43]. Together, this
would provide further clarity on the practical significance of attention to the warnings in two
regards. Firstly, it could enable us to ascertain how well this increased attention to graphic
image based warnings translates to increased processing of the warning information and in
turn, behaviour change. Most importantly, given the role of cues (such as brand labelling) in
craving and drug seeking processes [12], preferential attention to the warnings over brand
labelling could potentially limit the effectiveness of brand labelling as a cue to initiate
smoking behaviour.

The present study provides a significant contribution to the warning literature through its
controlled assessment of whether a specific factor (graphic content) influences attention to
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the warnings. This is of particular importance given both the importance of attention for the
processing of a warning [5-6] and that the inclusion of graphic content is the most noticeable
(and documented) addition to the newer style of warnings. Focus on specific factors in this
way represents a benchmark that further research and warning design should adhere to in
order to produce more effective warnings.
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Figure 1: Examples of the new warnings and their neutrally matched counterparts.

Figure 2: Bias scores representing attention to the graphic warnings by smoking status and presence of text caption and attention to control or matched images with a text caption. Error bars represent standard error.
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References


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