Scanning the brain for answers about effectiveness of graphic warning labels

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We know that smokers who perceive greater risks to their health from smoking are more likely to quit.[1] Thus, while 'traditional' cigarette pack imagery helps to reinforce cigarette advertising and promote purchasing behaviour,[2 3] graphic warning labels (GWLs) may serve as a form of 'reverse' advertising—increasing smokers' knowledge about the risks associated with smoking and promoting behavioural change by preventing smoking initiation and fostering cessation.[4–6] In fact, as a smoking cessation and prevention intervention, GWLs are particularly valuable since they are located directly on the product and delivered at the point of use. Moreover, if smoking is associated with a lapse of judgment and temporary disregarding of health consequences, messaging by highlighting the risk of smoking coincident with use may be most beneficial.[7 8]

While there remains some controversy around the effectiveness of GWLs across populations, studies of their relative effectiveness show a decrease in intention to smoke among never and experimental smokers,[9] and an increase in intention to quit among experimental and established smokers after viewing the GWLs.[10] This argument is further supported by the finding that GWLs are more effective in influencing antismoking intentions and behaviours compared with the less emotion provoking, text-only messaging found on current cigarette packaging.[11–13] Consequently, use of GWLs is recommended by the WHO. Unfortunately, despite efforts by the US Congress to mandate such warning labels,[14] implementation has been suspended by legal actions on behalf of the tobacco companies. Specifically, tobacco companies have argued that GWLs do not provide information to the smoker, but rather evoke 'negative emotions'. The neurobiological underpinnings for the antismoking efficacy of GWLs are still being elucidated. However, it may be the provocation of high emotions which help form the basis for behavioural change.[15]

Studies have documented strong relationships between self-reported arousal and neural responses as measured by functional MRI (fMRI),[16] and strongly emotional stimuli have been linked to memory encoding and retrieval (likely through an interaction between the amygdala and hippocampus).[17–19] These findings have particular relevance for GWLs since emotional antismoking visual stimuli have been shown to produce activation in similar regions of the brain (eg, the amygdala),[20–22] and this activation is associated with quitting smoking.[23]

In the accompanying manuscript, Wang *et al* used fMRI to further investigate the neurobiological basis for the efficacy of GWLs in adult daily smokers. Specifically, they compared the levels of brain activation and self-reported urge to smoke produced by GWLs, rated either high or low on an emotional reaction (ER) scale. The authors reported that GWLs with the highest ER ratings produced greater neural activation in brain regions associated with emotional memory, including the amygdala, hippocampus and insula, compared with the low ER GWLs. Supporting prior research on memory formation and emotion, they also reported that this increased activation coincided with greater image recall. More importantly, they found that the higher ER GWLs produced a greater reduction in the craving to smoke. Taken together, these findings provide further support for the idea that it is the strong emotional response that drives the behavioural impact from GWLs.

Relevant limitations noted by the authors include the fact that non-daily and non-smokers were excluded from study and they suggest that future studies include these important groups. Although smokers may be the main target audience for GWLs, an evaluation of the neurobehavioural responses to GWLs in non-smokers and adolescents, in particular, would provide further information on their ability to inhibit intention to smoke or smoking initiation. Importantly, the authors also call for longitudinal studies to evaluate the effects of different GWLs on behavioural change.

This study adds to the growing list of literature on GWLs by providing support for the utility of these important health-messaging tools and offers further support for the relevant regulatory bodies in their antismoking efforts. Further, understanding how the brain responds to different GWLs can also help inform the development of more effective types of visual messaging in the future.

Competing interests None.

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