



Published in final edited form as:

*Health Psychol Rev.* 2018 June ; 12(2): 129–132. doi:10.1080/17437199.2018.1445544.

## Pictorial cigarette pack warnings increase quitting: A comment on Kok et al

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### Keywords

Fear communication; pictorial warnings; smoking; tobacco control

In this issue of *Health Psychology Review*, Kok et al. (2018) argue that pictorial cigarette pack warnings are ineffective. Evidence published recently, however, shows that pictorial warnings do decrease smoking which is a notably deadly behavior (Brewer et al., 2016; Noar et al., 2017). Our commentary summarizes evidence of pictorial warnings' effectiveness and comments on other aspects of the article.

### Effectiveness of pictorial warnings

Tobacco use is the leading preventable cause of death in the world. No other behavior kills as many people (World Health Organization, 2013). For this reason, actions that can reduce cigarette smoking, by preventing initiation or helping people quit, are critically important. Effective approaches include policies that raise the cost of cigarettes and clinical interventions for cessation (International Agency for Research on Cancer, 2011; Stead, et al., 2012).

Our recent randomized trial provides convincing evidence of the behavioral effects of pictorial cigarette pack warnings (Brewer, et al., 2016). We randomly assigned 2,149 adult smokers in two US cities to have warnings on the side of their packs for 4 weeks. The trial was designed to estimate the effect of the US adopting newly legislated pictorial warnings. Thus, our intervention warnings had newly required messages and images of the harms of smoking; control warnings were the ones in use in the US for the past 30 years. In the trial, the pictorial cigarette pack warnings increased forgoing cigarettes, quit attempts and quitting for a week or more among a diverse community sample. The trial findings corroborate the

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#### Conflict of interest disclosure

NTB has served on paid advisory boards for FDA and served as an expert consultant in litigation against tobacco companies. Other authors declare no conflicts of interest.

conclusion of a recent systematic review of observational longitudinal studies ( $n=812,363$ ) showing that implementing stronger (typically pictorial) cigarette pack warnings was associated with reductions in smoking (Noar, Francis, et al., 2016). A recent modeling paper also estimated that implementing pictorial warnings in the US would prevent over 650,000 deaths over the next 50 years (Levy, Mays, Yuan, Hammond & Thrasher, 2016). Kok et al (2018) referred to Malouff et al.'s (2012) small pictorial pack warning trial with 56 people which up until recently was the only experiment that had examined behavioral outcomes. That experiment offered useful information on psychosocial outcomes but was underpowered to detect any effects on behavior and thus did not yield evidence about behavior one way or another. Thus, we believe it is now reasonable to update Kok et al.'s conclusion that "convincing evidence regarding [pictorial warnings] is not available" (p. 14). We now know that that pictorial warnings increase quitting.

## Other issues

When the US implements pictorial warnings, they may not include an efficacy message. A 2012 lawsuit that suspended the implementation of pictorial pack warnings focused in part on the initial proposal to include a phone number of a toll-free quit line (1-800-QUIT-NOW). Some legal scholars expect that the US will not challenge that part of the ruling given the quirks of commercial free speech protections in the US. A high-self-efficacy, high-threat message of the sort favored by Kok et al. may not be possible at present on US cigarette packs, but warnings without an explicit self-efficacy message could still have substantial impact on public health even if the absolute impact on smoking is small. For example, pictorial warnings – which did not include the quit line number in our trial – were effective without a self-efficacy message and even caused small increases in quitting self-efficacy (Brewer et al., 2018). That said, we agree with Kok et al. that the warnings would likely work even better with a self-efficacy message, and that self-efficacy messages should accompany fear communications whenever possible.

So why might pictorial cigarette pack warnings work even when the self-efficacy hypothesis suggests otherwise? Pictorial pack warnings in our trial were effective because they increased negative affect (Brewer et al., 2018). Mediation analysis showed that the pictorial warnings increased quit attempts because they increased fear and other components of negative affect such as disgust and sadness. Smokers are skilled at denigrating and rejecting risk messages, but cigarette pack warnings may act as a constant risk reminder that keeps the risk information literally at hand. Furthermore, cigarette pack warnings pair the warning directly with the behavior, with many exposures over an extended period (~600 exposures over the course of our trial for a pack a day smoker). One consequence is that pictorial warnings make smokers think about the messages, the harms of smoking, and quitting (Brewer et al., 2016; Noar et al., 2017), even as they do not change perceived risk (Noar, Hall et al., 2016). This is very different from many fear elicitation, such as the seminal work by Leventhal (1965, 1966), that use one-time exposure to fear communications, removed in time and place from the opportunity to engage in the target behavior. Pictorial warning exposure leads to weekly increases in intentions to quit smoking over the short term (Parada et al., 2017), and countries often rotate among different warnings on packs to expose smokers to different messages over time. Because pictorial warnings'

potency may begin to wane after several months or years, however, it is important to periodically refresh them with new content (Borland et al., 2009; Hitchman et al., 2014).

An important question is whether fear communication works in contexts beyond pictorial pack warnings. The strong efficacy statement hypothesis is that “fear appeals without efficacy statements will produce negative effects (i.e., will backfire);” while the weak hypothesis is that “fear appeals without efficacy statements will produce weaker (i.e., less positive or null) effects relative to fear appeals with efficacy statements.” (Tannenbaum et al., 2015, p. 1180). Two recent meta-analyses show clear support for the weak hypothesis (Table 1), consistent with previous reviews (de Hoog et al., 2007; Witte & Allen, 2000). These findings are reassuring because they demonstrate that fear appeals without efficacy statements do not backfire. Furthermore, fear communication without an efficacy statement can improve attitudes and motivate behavior change.

## Conclusion

Reasonable people can disagree about how to interpret the available evidence on fear communications in various domains, but the accumulated evidence supporting pictorial cigarette pack warnings is strong. Based on that evidence, we believe that pictorial warnings will reduce smoking (Brewer et al., 2016; Levy et al., 2016; Noar, Francis et al., 2016). They will do so by increasing fear and other negative affect and by increasing thinking about the warnings, among other psychological mechanisms (Brewer et al., 2018). Perhaps pictorial warnings are a special case, falling outside the territory covered by the self-efficacy hypothesis. All of this theorizing is interesting and important, and we behavioral scientists will spend the next decades refining hypotheses about how to improve fear communications. As we do so, policymakers in the US can help reduce smoking and save lives by joining over 100 countries and jurisdictions that have required pictorial cigarette pack warnings (Canadian Cancer Society, 2016).

## Acknowledgments

T32-CA057726 from the National Cancer Institute of the National Institutes of Health supported MGH's time on the commentary. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the Food and Drug Administration.

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Table 1

Impact of fear communication stratified by efficacy message

Source	k	Outcome	With efficacy	Without efficacy	Efficacy hypothesis supported
Tannenbaum, 2015	110	Attitudes	.39*	.14*	Weak hypothesis
Tannenbaum, 2015	161	Intentions	.40*	.27*	Weak hypothesis
Tannenbaum, 2015	70	Behavior	.43*	.14	Weak hypothesis
Peters et al., 2013	7	Behavior	.40*	-.14	Weak hypothesis
Peters et al., 2013	6	Behavior	.31*	-.31	Weak hypothesis

Note. k = number of studies. d = standardized mean difference.

\* p<.05