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Emergency warnings and non-compliance: Why the effect of repeated exposure needs to be examined within the emergency management sector

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Emergency warnings and non-compliance: Why the effect of repeated exposure needs to be examined within the emergency management sector

ABSTRACT:

Effective community messaging is a challenging and ongoing area of investigation within the emergency management sector. In an attempt to evoke compliance, the public are repeatedly exposed to warnings which convey risk information. However, these warnings are often ignored which can result in situations with catastrophic outcomes. Thus, there is an urgent need to identify the reasons behind this non-compliance. One such reason that requires further investigation is that of message wear-out or message fatigue. In fact, recent research has made a recommendation to emergency management professionals to not 'over-warn' through repeatedly alerting the public about a single event. However, this poses the question: How many times should the public be exposed to warnings before their effectiveness begins to wane? This question could be addressed by exploring the mere exposure effect to the disaster warnings.

The mere exposure effect refers to the observation that repeated, unreinforced exposure to a stimulus increases affective evaluations of that stimulus. The stimuli used in mere exposure studies are typically neutral and meaningless, with meaningful, and in particular, emotionally-valenced stimuli relatively overlooked. This leaves questions open regarding whether or not the usual attitude-enhancing effects of repeated exposure found for neutral stimuli would also apply to aversive emergency stimuli. A recent mere exposure study sought to investigate the effects of controlled, repeated exposure on subsequent affective evaluations of aversive stimuli, specifically, cigarette health warning images. Within this study, it was identified that participant liking ratings actually began to significantly increase after their initial exposure. Likewise, the health warnings also became significantly less unpleasant and arousing following only two exposures. Hence, given that both health and emergency warnings are designed to be attention grabbing and provide directive instruction to influence behaviour, these findings suggested that the intended behaviours are not always elicited as a result of repeated exposure, possibly due to message wear-out or fatigue. We argue that these findings could extend to other types of emergency warnings. Therefore, emergency professionals need to be aware of the possibility that warnings can be susceptible to the effects of repeated exposure (i.e., the mere exposure effect). As a consequence, consideration

of how often the design of emergency warnings needs to be updated and refreshed to retain message efficacy is required.

Keywords: *The mere exposure effect; Emergency warnings; Non-compliance; Message wear-out and fatigue; Effectiveness of emergency warnings.*

Introduction

Emergency warnings have been identified as ‘a primary tool for disaster management’ and are relied upon to help protect lives. According to the Attorney-General’s Department (2013), an emergency warning is a message that indicates an imminent hazard. The purpose of these warnings is generally two-fold: to inform the public and to prompt appropriate action. However, an ongoing and challenging issue within the emergency management sector is that the intended purpose of the emergency warnings is not always achieved. This is commonly demonstrated by non-compliance or the failure of the public to engage in the ‘appropriate action’.

Given that non-compliance can have devastating consequences such as loss of life, there is an urgent need to identify why non-compliance occurs. As such, many theoretical models have been put forward that focus upon the decision making processes involved when an individual encounters a warning. These models include the conflict theory model of emergency decision making (Janis & Mann, 1977); the elaboration likelihood model (Petty & Cacioppo, 1986) and the protective action decision model (Lindell & Perry, 2012). However, as acknowledged by Vermeulen (2014), while these models are advantageous by highlighting the multitude of factors that can influence a person’s decision making, their resulting complexity inhibits a practical application to the design of emergency warnings. Consequently, Vermeulen argued that the most common human factors in the decision making process should be focused upon, yielding a more holistic approach to encouraging compliance at a societal level. According to Vermeulen, emergency management officials should create warnings which: moderately scare the public about something controllable; avoid jargon; are credible, and finally, do not over-warn by repeatedly alerting the public about a single event (refer Vermeulen for a more detailed review). Vermeulen’s latter recommendation to not over-warn presumably incorporates the concept of repeated exposure. However, how many times should the public be exposed to warnings before their

effectiveness begins to wane and thus, non-compliance possibly occurs? Insight into this question could be gained by exploring the mere exposure effect to emergency warnings.

In the sections to follow, a brief overview of the mere exposure effect will be given, followed by a discussion of how the mere exposure effect has already been applied to aversive health warning stimuli. Next, the potential application of the mere exposure effect to other types of emergency warnings is highlighted, indicating its possible role in non-compliance.

The Mere Exposure Effect

The mere exposure effect refers to the observation that repeated, unreinforced exposure to a stimulus increases affective evaluations of that stimulus (Zajonc, 1968). Put simply, the more familiar a person is with a given stimulus, the more they are reported to like it. The mere exposure effect has received a great deal of attention within numerous research domains such as design and social psychology. In 1989, Bornstein conducted a meta-analysis of over 200 experiments that had found evidence of the mere exposure effect. Thus, the exposure-affect relationship has been reported to be a robust psychological phenomenon, with unreinforced stimulus exposures not only enhancing affect towards visual stimuli (e.g., Zajonc, 1968) but to auditory (e.g., Heingartner & Hall, 1974; Witvliet & Vrana, 2007), gustatory (e.g., Crandall, 1985; Pliner, 1982), and tactile (e.g., Jakesch & Carbon, 2012) stimuli as well. In addition, evidence of the mere exposure effect has also been obtained across cultures (Ishii, 2005), time (Zajonc et al, 1972), and settings (laboratory: Stang & O'Connell, 1974; naturalistic: Zajonc & Rajecki, 1969).

A typical mere exposure paradigm in a laboratory setting involves two phases: an exposure phase and a test phase. The exposure phase involves presenting participants with stimuli in succession, at varying exposure frequencies and for a pre-determined length of time (e.g., one second). The task of the participant during this phase is to passively view the stimuli. Following this, participants undergo the test phase, which can involve one of two different procedures. The first procedure involves a forced-choice format, wherein each stimulus from the exposure phase is presented again, one at a time, together with a similar but never-before-seen equivalent. Participants are required to select the stimulus out of the pair which they prefer. The second procedure also involves presenting the stimuli from the exposure phase again, one at a time, but the similar yet never-before-seen equivalents are

dispersed among them. For this procedure, participants are required to rate, generally on a Likert scale, their degree of liking for each stimulus shown. For the first procedure, evidence of the mere exposure effect is obtained when participants consistently prefer the ‘old’ stimuli previously encountered in exposure phase over the ‘new’ stimuli encountered in the test phase only. Similarly, for the second procedure, evidence is obtained when participants consistently ascribe higher liking ratings to the frequently exposed stimuli from the exposure phase rather than the infrequently exposed stimuli from the test phase only.

Generally, the stimuli used in mere exposure studies are neutral and meaningless to ensure that variables such as prior exposure can be finely controlled. The use of meaningful stimuli, and in particular emotionally-valenced stimuli has been relatively overlooked. Given that emergency warnings typically convey unpleasant and arousing content in order to prompt a desirable response or action (e.g., ‘take shelter’ or ‘activate your emergency plan’; Attorney-General’s Department, 2013), it is important to ensure that these emotional properties (i.e., the degree of unpleasantness and arousal) of the warnings are maintained when the public are repeatedly exposed to them. However, if the emotional properties of the emergency warnings were found to decrease over time, this would suggest that the effectiveness of the warnings has reduced and hence, may explain why non-compliance occurs. Thus, returning to Vermeulen’s (2014) recommendation to emergency management officials to not ‘over-warn’, the application of the mere exposure paradigm would subsequently enable a more specific analysis of when changes in the perceived effectiveness of the emergency warnings occur over the course of exposure, if at all.

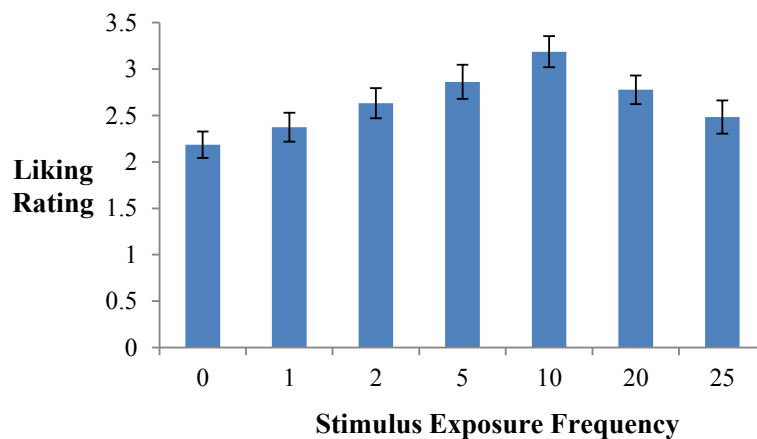
The Mere Exposure Effect to Aversive Health Warnings

Justification for why a change in the perceived effectiveness of the emergency warnings is likely to occur comes from a recent mere exposure study conducted by Aimers (2015). Within this study, Aimers investigated the effect of repeated exposure on participant liking, valence (degree of unpleasantness) and arousal (degree of excitability) ratings of cigarette health warning images. Within the exposure phase, seven health warning images were displayed at one of seven exposure frequencies (i.e., 0¹, 1, 2, 5, 10, 20 and 25 exposures) equally as often across participants. For example, one health warning image was displayed once, another warning image was displayed twice, another warning image was displayed five

¹ Stimuli in the zero frequency condition were excluded from the exposure phase. That is, the stimuli were presented in the test phase only.

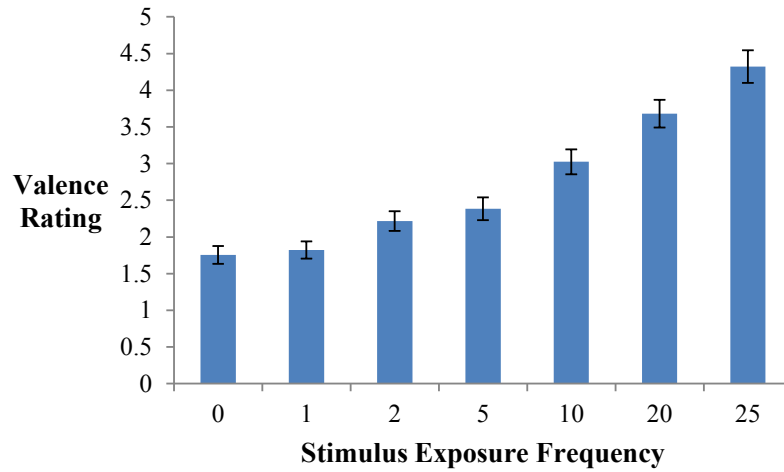
times etc. Within the test phase, the same health warning images that were presented in the exposure phase were presented again, together with one never-before-seen equivalent (i.e., the image that was not displayed in the exposure phase; denoted by '0' or no exposure). However, in contrast to the exposure phase where the warning images were shown multiple times, the images in the test phase were only displayed once, at which point the participants indicated their liking, valence and arousal ratings on a series of 9-point Likert scales. As can be seen in Figure 1, the findings of Aimers revealed that liking ratings initially increased but then declined beyond 10 exposures ($F(2.44, 109.90) = 9.39, p = <.001, partial \eta^2 = .173$). Hence, a mere exposure effect was found at the lower exposure frequencies.

Figure 1. Mean liking ratings of cigarette health warning images by stimulus exposure frequency. Error bars denote standard deviations ($n = 47$).



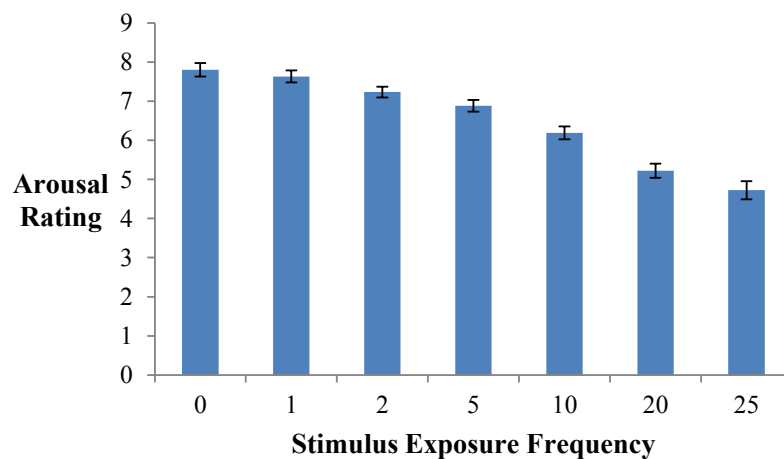
In addition, as can be seen in Figure 2, the findings also indicated that valence ratings remained unchanged between 0 and 1 exposure but then began to increase with increasing exposure frequency ($F(2.02, 90.66) = 106.77, p = <.001, partial \eta^2 = .703$), indicating that the health warning images became more pleasant over the course of exposure.

Figure 2. Mean valence ratings of cigarette health warning images by stimulus exposure frequency ($n = 47$).



Likewise, as displayed in Figure 3, it was also found that arousal ratings remained unchanged between 0 and 1 exposure but then began to decrease with increasing exposure frequency ($F(2.23, 100.11) = 87.74, p = <.001, partial \eta^2 = .661$). Thus, in addition to the health warning images becoming more liked and more pleasant, they also became less arousing with repeated exposure.

Figure 3. Mean arousal ratings of cigarette health warning images by stimulus exposure frequency ($n = 47$).



Through the use of post-hoc tests, which are rarely reported in the previous mere exposure literature, Aimers (2015) was able to provide clarity as to exactly when changes in affect ratings of adverse stimuli occurred from baseline (i.e., stimuli shown in test phase only) as a result of exposure. By establishing when significant changes in affect occurred from the participants' first exposure, it is possible to simultaneously highlight a change in the effectiveness of these health warnings. The findings that the health warning images became more pleasant (or less unpleasant) and less arousing over time could be explained by 'message wear-out' or 'message fatigue'. According to Shanahan and Elliott (2009), 'message wear-out' or 'message fatigue' refers to when health warnings become familiar and thus their potency in conveying the health message decreases. However, the rate at which this change occurred was disturbing (i.e., at 2 exposures) because, as acknowledged by Hammond (2011), it is the unpleasant and arousing nature of the health warning images that is meant to be responsible for creating a strong emotional impact on the public. Strikingly, the findings of Aimers indicated that the effectiveness of the health warning images is short lived. Also of great concern was the finding that liking ratings of the health warning images actually increased, at least initially. According to the Department of Health (2012), the implementation of the graphic warnings relies upon the effect of repeated exposure to convey a quit message every time a person reaches for a cigarette. Thus, the finding that liking ratings increased is counterproductive to the reasons why health warning images exist, namely to deter people or motivate people not to smoke.

Discussion and Directions for Future Research

The findings of Aimers (2015) strongly support the need to investigate the mere exposure effect to emergency warnings, particularly because of the similarities between health and other types of emergency warnings. Specifically, both types of warnings are considered to be an important medium for communicating vital information to the public and are designed with the intention to impact human behavior (Attorney-General's Department, 2013; Hammond, 2011). Moreover, both types of warnings are aimed at providing high reach and frequency of exposure in an attempt to convey the intended message (Attorney-General's Department; Department of Health, 2012). Thus, in light of the findings of Aimers, it is highly plausible that emergency warnings will also be susceptible to the effects of repeated exposure, such that they increase in liking and are also perceived as less unpleasant and arousing, the very effects that they are designed to avoid.

The findings of such a mere exposure study would be highly beneficial and informative to the emergency management sector. Specifically, if similar findings to that of Aimers (2015) were found, this would indicate that the effectiveness of emergency warnings are also short lived and thus, may be a contributing factor to the prevalence of non-compliance. Furthermore, by identifying how many times the public should be exposed to the emergency warnings before their effectiveness begins to wane, it is possible to inform emergency management officials as to how often the design of emergency warnings needs to be updated and refreshed. This would be crucial for the emergency warnings to sustain their intended salience and impact and potentially, save lives.

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