Accentuate the positive: Counteracting psychogenic responses to media health messages in the age of the Internet

Fiona Crichton, Keith J. Petrie

University of Auckland, New Zealand

ARTICLE INFO

Article history:
Received 28 February 2015
Received in revised form 23 April 2015
Accepted 25 April 2015
Available online xxxx

Keywords:
Environmental risks
Health scares
Internet
New technologies
Nocebo effect
Placebo effect

ABSTRACT

Objective: The Internet has expanded the scope for creating health scares and increased the risk of nocebo responding in individuals exposed to misinformation about threats to personal health posed by aspects of modern life, such as exposure to new technologies. It was the aim of this experiment to investigate whether the delivery of positive expectations might reduce or reverse symptoms triggered by negative expectations formed from such misinformation.

Method: In the context of a study investigating symptoms during exposure to windfarm sound, 64 volunteers assessed their symptomatic experiences during two discrete sessions, throughout which they listened to wind turbine sound containing audible and sub-audible (infrasound) components. Participants were randomly assigned to watch either positive or negative information about the health effects of infrasound prior to their first infrasound exposure session. They were then shown the alternate information and exposed to infrasound during their second session.

Results: Participants receiving negative expectations were less symptomatic during exposure if they had previously received positive expectations about infrasound. Further, participants given positive expectations after the earlier delivery of negative expectations exhibited a placebo response, reversing the nocebo response exhibited in their first exposure session.

Conclusion: Results suggest accessing positively framed health information may reverse or dilute the effect of negative expectations formed from exposure to media warnings about health risks posed by new technologies, such as wind turbines.

© 2015 Elsevier Inc. All rights reserved.

Introduction

The advent of the Internet has expanded the scope for creating, circulating and perpetuating health scares, and has dramatically increased the potential for consequent psychogenic responses in the community [1]. The Internet is now a pervasive source of misinformation about threats to personal health including those posed by outbreaks of infectious disease, such as H1N1 and Ebola [2], the dangers posed by public health interventions, such as fluoride programmes [3], as well as possible health problems arising from new technologies [4,5]. Common modern technology fears include the risks to health of vaccinations [6], genetically modified food [7], exposure to weak electromagnetic fields from cell phones and wifi [8], as well as health concerns about new forms of energy production, such as wind turbines [9]. The reporting of symptoms, as a result of being exposed to and accessing misinformation about modern technologies, can cause opposition to public health initiatives designed to improve community health, such as water fluoridation [e.g. 3]; reinforce irrational and sometimes socially damaging health behaviours, such as the avoidance of vaccinations [e.g. 10]; and result in on-going symptomatic experiences and distress in the community [11].

The availability of misinformation on the Internet can be very difficult to correct [12]. This has important public health implications because the dissemination of information, suggesting that adverse health effects may be induced by exposure to modern technologies and perceived environmental hazards, has been shown to create negative expectations prompting symptom reporting, during periods when exposure is irrefutably benign [e.g. 13,14]. Reported health impacts can be explained on the basis that such information provokes nocebo-related effects, where it is the expectation of ill effects that causes people to experience symptoms [15,16].

One solution to the use of the Internet to misrepresent science, and promote counterproductive health behaviours and expectation related responses, might be to employ the Internet to present alternative narratives [17]. Evidence indicates individuals are increasingly using the Internet to source health related information [18], so effective strategies designed to address the potential for consequential nocebo responding are likely to involve counteracting or mitigating the effect of accessing negative health messages, rather than attempting to prevent exposure to negative messages altogether. As expectations have been shown to
influence health in both positive and negative directions [19], a successful approach might be to harness positive expectations as protection against the potential for adverse health experiences to arise from negative expectations formed from negative health information about modern technologies.

To test this we designed a study in which people were given both negative and positive health information about sound generated by wind turbines. In the case of wind farms, suggestions from antiwind farm activists that sub-audible sound (infrasound) produced by wind turbines is directly responsible for a number of non-specific symptoms, such as headache, fatigue and nausea have persisted over recent years, and are perpetuated on the Internet [20]. Although the science does not support the existence of a link between exposure to infrasound produced by wind turbines and adverse health effects, [21,22], evidence indicates expectations triggered by negative information available on the Internet about the health effects of wind farms or formed from face to face encounters with those opposed to wind farms, provide a pathway for symptom reporting in community settings [23,24]. Interestingly, infrasound exposure also has reputed therapeutic benefits [25] and there are infrasound-producing devices marketed to the public as curative tools, promoted as ameliorating the same symptoms claimed to be caused by wind farms [26]. Thus, infrasound can also be framed in a positive way; as a naturally occurring phenomenon with claimed health benefits.

The experiment was devised to test two hypotheses: (1) that the experience of symptoms and deterioration of mood triggered by negative expectations about exposure to infrasound would be reversed or alleviated by the provision of positive expectations about infrasound exposure; and (2) that the provision of positive expectations about infrasound would provide a buffer against the influence of the later delivery of negative expectations about exposure to infrasound produced by wind farms.

Method

Sixty-four student volunteers, 44 females and 20 males, aged between 17 and 56 years (M = 22.09, SD = 7.03), were recruited by flyer to participate in the experiment, described as an experiment designed to assess the influence of infrasound on symptoms and mood. The experiment took place at the University of Auckland Acoustic Research Centre, a research facility designed for the study of sound, in a listening room constructed to international standards for the execution of subjective listening experiments (IEC268-13).

Participants took part in two ten minute listening sessions during which they were constantly and simultaneously exposed to infrasound (9 Hz, 50.4 dB) and audible wind turbine sound (43 dB). Audio-visual materials integrating information on the Internet about the ostensible therapeutic benefits of infrasound (the positive expectation DVD), as well as the purported adverse health effects of exposure to infrasound produced by wind farms (the negative expectation DVD), were viewed by every participant. Half the participants were randomised to watch the positive expectation DVD before their first listening session and the negative expectation DVD before their second listening session (the positive first group). The remaining participants watched the negative DVD before their first listening session and the positive DVD before their second listening session (the negative first group).

Randomisation of participants occurred using a computer generated random number sequence. Assessment of the optimal sample size was carried out using G-Power [27], on the basis of analysis involving a 2 x 2 mixed design analysis of variance to determine within and between group differences in relation to symptom reporting during listening sessions which followed the negative expectation DVD (the negative session) and listening sessions which followed the positive expectation DVD (the positive session). It was calculated that with at least 54 participants (27 participants in each group), setting power at .95 and alpha at .05, it would be possible to detect a medium effect ($f = .25$) [28]. Upon completion of the experiment participants received a NZ$520 shopping voucher. Participants were also fully debriefed at the end of the study.

Materials

A combination of the Adobe® Audition software package with a Presonus® Firepod audio interface, and a Mackie® HR 150 active studio woofer were used to construct custom-made sound files to produce infrasound at 9 Hz, which was transmitted during listening sessions at 50.4 dB. The audible sound played during listening sessions was transmitted at 43 dB. The sound had been recorded 1 km from a wind farm, and was representative of sound received at the location of a significant exposed dwelling near to a large wind farm. As such the sound had an overriding audible turbine character, but was a blend of all the sounds in the environment. This improved the ecological validity of the experiment, because, in a natural setting, when the wind is sufficient to drive a wind turbine, the sound experienced is an amalgam of all the sounds in the environment, including the sound of both the wind farm and background sounds, such as the sound of the wind itself.

Digital Video Display (DVD) presentations were each 6 min and 15 s in length. The positive expectation DVD depicted sound between 8 and 14 Hz as having reported therapeutic effects and studies investigating health benefits were outlined [e.g. 25]. In contrast, the negative expectation DVD put forward the explanation that when infrasound reached 20 Hz it moved from therapeutic levels, to an intensity that has been reported to cause adverse health effects in people living in the vicinity of wind farms. Participants were told the audible sound played during both ten minute listening sessions was that of a wind farm and the only point of difference between sessions was the level of infrasound being played; at 9 Hz in sessions following the positive DVD and at 20 Hz following the negative DVD. In reality, infrasound was continuously played at a constant 9 Hz during both listening sessions.

Measures

At baseline and during exposure sessions, participants assessed their experience of 24 physical symptoms (e.g. headache, ear pressure, tiredness), 12 positive mood items (e.g. calm, peaceful, cheerful) and 12 negative mood items (e.g. worried, anxious, distressed) on a seven point Likert scale ranging from 0 (not at all) to 6 (extreme or extremely). For each assessment period a total symptom score was evaluated as the sum of the ratings made for all symptoms reported with a rating of ≥1, and a total symptom intensity score was calculated as the sum of the ratings made for all symptoms reported. In relation to mood, for each period of assessment, a total positive mood score was evaluated as the cumulative total of the ratings given for all positive mood items, and a total negative mood score as a sum of the ratings made for all negative mood items. The scales used were shown to have good internal consistency (Cronbach’s alpha for symptom scale = .88; positive mood scale = .89; negative mood scale = .87).

Results

To evaluate whether the later provision of positive expectations reversed nocebo responding, triggered by the earlier delivery of negative expectations, we conducted repeated measures analyses of variance to evaluate differences in symptom and mood reporting in the negative expectation first group at three different time points (baseline, during session one and during session two). There was a significant effect of time of assessment in relation to the number of symptoms reported $F(1,47,45.5) = 44.72, p < .001, \eta^2 = .48$; negative mood $F(1,35,41.98) = 24.55, p < .001, \eta^2 = .44$; and positive mood $F(1,62) = 34.62, p < .001, \eta^2 = .53$. Post hoc analyses using Bonferroni corrections showed that, during session one, negative expectation first participants experienced an increase from baseline in symptoms, symptom intensity and negative mood, as well as a decrease in positive mood ($p < .001$). Thus results showed that negative expectations delivered prior to session one, triggered nocebo responding. Importantly, this was reversed during session two by the provision of positive expectations. Analysis showed that during session two negative expectation first participants experienced a decrease from baseline in symptoms ($p =$
.02) and negative mood (p < .001), as well as a return to baseline in symptom intensity and positive mood.

We also wanted to assess whether prior positive expectations had a dampening effect on the influence of subsequent negative expectations in relation to symptomatic experiences and mood. To evaluate this we next conducted 2 (type of expectation session: measurement during negative sessions versus measurement during positive sessions) × 2 (group: negative first versus positive first) mixed design ANCOVA, controlling for baseline scores.

Symptom and mood reporting by each group during positive and negative listening sessions is depicted in Fig. 1. There was a significant main effect of type of expectation session in terms of reported symptoms (F(1,61) = 27.64, p < .001, η² = .31; symptom intensity (F(1,61) = 24.62, p < .001, η² = .29; and negative mood (F(1,62) = 4.84, p = .032, η² = .07). Controlling for baseline scores removed any significant main effect of type of expectation on positive mood scores. Analysis also revealed significant interactions between group and type of expectation session in relation to reported symptoms (F(1,61) = 12.70, p = .001, η² = .17; symptom intensity (F(1,61) = 8.30, p = .005, η² = .12; and negative mood (F(1,61) = 12.65, p = .001, η² = .17).

Post hoc analyses using Bonferroni corrections demonstrated that, in the course of negative sessions, participants in both groups were more symptomatic and experienced greater negative mood. During negative sessions, positive first participants recorded more symptoms (p < .001), greater symptom intensity (p < .001) and greater negative mood (p = .017), than recorded during positive sessions. This pattern was also seen in relation to negative first participants, whereby during negative sessions they reported more symptoms, greater symptom intensity and greater negative mood (p < .001) than in positive sessions.

Importantly, post hoc analyses evaluating differences between the groups showed that, during negative listening sessions, positive expectation first participants had fewer symptoms (p = .026), lower symptom intensity (p = .047), and less negative mood (p = .006), than negative expectation first participants. This indicates that there was an ameliorating effect of receiving positive expectations prior to receiving negative expectations. Interestingly, during positive listening sessions, negative expectation first participants experienced fewer symptoms than positive expectation first participants (p = .041), and less negative mood (p = .009), although there was no difference in symptom intensity. Therefore the influence of positive expectations on symptom reporting was not undermined by the earlier delivery of negative expectations and was even more effective in reducing the number of symptoms experienced.

Discussion

The results of the study indicated that the framing health information about wind farm noise in a positive way can dilute or reverse the effects of negative expectations formed from accessing misinformation about the health effects of such technologies. The data were consistent with an ameliorating effect of receiving positive expectations prior to receiving negative expectations. During negative sessions, positive expectation first participants had fewer symptoms, lower symptom intensity, and less negative mood than negative expectation first participants. Further, participants receiving positive expectations following the earlier delivery of negative expectations exhibited a placebo response, which reversed the nocebo response exhibited in their first exposure session.

In the age of the Internet there is unprecedented community exposure to negative information about the speculated health risks posed by aspects of modernity, such as the use of renewable energy technologies and implementation of vaccination programmes, even when such technological advancement is designed to improve health outcomes. Our study confirms that accessing such negative information can create negative expectations leading to symptom reporting and negative mood effects. This is in line with both field and experimental evidence demonstrating that media messages, creating or exacerbating concern that exposure to modern technologies is harmful, can lead to symptom reporting, even during periods of benign exposure. In one such case,
after reports fuelled by the media that genetically modified corn had inadvertently entered the human food chain, a number of individuals reported symptoms they attributed to exposure to transgenic corn, ranging in seriousness from weakness to fainting requiring hospitalisation, although it was later established there had been no such exposure [29,30]. Further, in an experimental study, participants randomised to watch a television report outlining the negative health effects of wifi were shown to have an increased likelihood of experiencing symptoms following exposure to a sham wifi signal [14].

Relevantly, in relation to wind farms, we have shown that seeing information from the Internet that infrasound generated by wind turbines poses a health risk creates negative expectations triggering symptomatic experiences, during separate periods of exposure to genuine infrasound and sham infrasound (actually silence) [31]. Importantly, in a follow-up study participants randomised to receive negative health information about wind turbine infrasound before exposure to audible and sub-audible wind farm sound during two listening sessions, became more symptomatic over time [32]. Participants reported an increase from baseline experienced during listening session one and a further significant increase in symptoms from listening session one to listening session two. This indicates that when symptom experiences match negative expectations, this can reinforce expectations leading to further heightened symptomatic responses. This highlights the need for effective strategies to change negative expectations created by media misinformation about new technologies, without which a pattern of symptom reporting may become self-perpetuating.

Results also provide further evidence of the malleability of symptomatic experiences, and are consistent with research showing that an identical stimulus can produce either placebo or nocebo effects, depending upon the way it is portrayed [32]. This is exemplified in a study in which an inert sugar free drink, described as either performance enhancing or fatigue inducing, was shown to produce ratings of muscle discomfort during arm exercises which aligned with the expectation provided prior to the sports performance task [33]. Another such study demonstrated that positive and negative expectations shaped the experience of visceral pain, in that experimentally induced abdominal pain either increased or decreased following the application of the same inert substance depicted as either a potent pain killer or as having pain sensitising qualities [34].

Further, findings are consistent with evidence that framing health information about modern technologies in positive and negative ways can differentially influence symptom reporting. Framing influenza vaccine benefits positively, as the percentage of people who remain free of influenza and experience no side effects, as opposed to framing benefits negatively, as the percentage of people who acquire influenza and have vaccine side effects, has been shown to reduce reported side effects of the vaccination [35].

The current study is limited by the fact that expectations influencing subjective health, during discrete periods in an experimental setting, may not translate to experiences in real-world settings. However it is a strength of the study that negative expectations are created from media information which field evidence indicates are influencing symptom reporting in the community, thereby improving the study’s ecological validity [23]. It is a further strength that all the participants were exposed to negative health messages, as well as positive health messages, as individuals in the real world seeking health information about modern technologies, particularly through social media, are unlikely to be exposed simply to positive messages [e.g. 36].

The current study is the first to our knowledge to find that symptom reporting and worsening of mood initiated by negative expectations, created by information circulated by mass media, can be nullified by the provision of positive expectations. Further, delivering initial positive expectations appeared to operate to weaken later negative expectations. Findings suggest that providing positive expectations about modern technologies has the potential to reduce nocebo responding in the community as a result of exposure to negative health information, in part, by providing a buffer against the delivery of negative expectations. However, while this study provides critical information that negative expectations can be changed, future investigation is required to determine whether long-term symptom reporters, with more established beliefs about the negative impacts of exposure, will be receptive to an alternative positive narrative.

It is becoming increasingly necessary to address negative health messages circulated by mass media, particularly the Internet; a medium through which unsubstantiated lay opinions about health risks posed by new technologies can be disseminated as fact to a wide audience [37]. Future research should be directed to investigating the most effective way of widely communicating positive and accurate health messages about modern technologies. This is particularly important in relation to technologies designed to improve health outcomes, such as those involving vaccination programmes and alternative energy initiatives. Given the rising use of e-technologies to access health information [18], such research should encompass exploring the value of using web-based applications, such as social media, to distribute accurate and positive health information, to counteract negative health information often promulgated through those same channels.

Ethics

The study was approved by the University of Auckland Ethics Committee.

Author contributions

F. Crichton and KJ. Petrie both contributed to the conceptualization and design of the study. F. Crichton collected and analysed the data and wrote the first draft of the manuscript and both authors edited it.

Conflict of interest

The authors declare that they have no conflict of interest.

References


Please cite this article as: Crichton F, Petrie KJ. Accentuate the positive: Counteracting psychogenic responses to media health messages in the age of the Internet, J Psychosom Res (2015), http://dx.doi.org/10.1016/j.jpsychores.2015.04.014


Please cite this article as: Crichton F, Petrie KJ, Accentuate the positive: Counteracting psychogenic responses to media health messages in the age of the Internet, J Psychosom Res (2015), http://dx.doi.org/10.1016/j.jpsychores.2015.04.014