From Me to You: The Effect of Social Modeling on Treatment Outcomes

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Abstract
The social context in which people take medicines can strongly influence the drug response in both positive and negative ways. We first examine the role of social modeling in influencing treatment outcomes through modifying placebo and nocebo responses, and then explore possible mechanisms for these effects. Viewing another person show improvement after taking a drug can increase the placebo component of the medicine and thus the overall potency of the treatment. Likewise, seeing another person who has taken the same medicine report side effects can substantially increase adverse effects. Such effects can also occur on a wider scale following changes in medicine formulations or from vaccinations programs, when the media transmit adverse effects from these treatments to a wider audience. Females seem to be more susceptible than males to the social modeling of adverse effects of treatments. A greater awareness of the effects of social modeling has potential to improve the effectiveness of medical treatments, minimize side-effect burden, and also lead to more effective management of health scares.

Keywords
social modeling, placebo effect, side effects, media, nocebo effect

In 2015, pharmaceutical companies spent an estimated $5.6 billion on drug advertising in the United States (Kantar Media, 2015). These ads show happy, healthy, socially engaged patients regaining control of their physical or emotional health, all thanks to the effectiveness of the advertised pharmaceutical in treating their illness. With this positive messaging about treatment benefits, such advertising presents opportunities for social observational learning of treatment outcomes. Indeed, advocates have suggested that direct-to-consumer prescription-drug advertising on television in the United States could increase the placebo component of the treatment response by enhancing patient expectations of effectiveness (Almasi, Stafford, Kravitz, & Mansfield, 2006). This may offer one explanation as to why placebo effects appear to have increased over time in clinical trials carried out in the United States but not in Europe or Asia, where such drug advertisements are not permitted (Tuttle et al., 2015).

In stark contrast to the images of happy and healthy patients, these advertisements end with an extensive list of possible treatment side effects, often including symptoms that occur very infrequently. Social observation of treatment side effects also has the potential to occur in face-to-face settings between friends, family, and other patients, as well as through technological mediums including Internet support groups, social media, and news media coverage. Television news coverage and Internet support-group discussions were implicated in spreading nocebo symptoms in a health scare involving a medication formulation change in New Zealand (Faasse, Cundy, & Petrie, 2010). Television coverage contained interviews with patients who had purportedly been harmed by the medication. Adverse-event reporting increased following early news coverage, particularly for side effects specifically mentioned by patients in the news segments (Faasse, Gamble, Cundy, & Petrie, 2012).

Increasingly, attention is being paid to the social contexts in which medication use occurs, and for good reason. The social observation of others’ treatment outcomes has the potential to influence both positive and negative outcomes in the viewer. Research has focused on two primary domains: the influence of viewing improvement, such as pain relief after treatment use, and the influence...
of viewing side effects. Experimental research using placebo paradigms has highlighted the importance of social observational learning in enhancing placebo responding, and has also provided evidence that the modeling of adverse events or unpleasant outcomes can increase nocebo responding. In addition, research into the social observation of symptom reporting has important implications for episodes of mass psychogenic illness and may offer insights into findings that women are overrepresented as casualties in such episodes. While still in its infancy, research investigating possible explanations for such effects has looked at the role of viewer and model gender, empathy, and anxiety as potential contributors to the outcomes of social modeling.

Social Modeling of Treatment Benefits and the Placebo Response

Social modeling of improvement in a medical context has the potential to enhance the placebo component of treatment outcomes (Colloca & Miller, 2011). Research into the impact of social modeling on treatment outcomes is relatively recent, with the first experimental evidence published less than a decade ago (Colloca & Benedetti, 2009). Since then, work has mainly been focused on the social modeling of pain reduction, and further expansion into non-pain placebo paradigms is needed.

Observing a male model report reduced pain under specific circumstances (viewing a colored light, in this case) subsequently generated a substantial analgesic response in the viewer under those same circumstances (Colloca & Benedetti, 2009). The degree of placebo responding was significantly and positively correlated with reported empathy in the viewer. The effects of social modeling on placebo responding were seen regardless of whether the (this time female) model was viewed face-to-face or via video (Hunter, Siess, & Colloca, 2014). Empathy scores correlated with placebo analgesia, but only in the face-to-face observation group, suggesting that empathy alone may not explain placebo responding following social modeling.

Following on from this work, Koban and Wager (2015) again demonstrated that the social modeling of pain reduction resulted in enhanced placebo analgesia and, more importantly, that it also resulted in lower skin conductance—a physiological indicator of pain. These findings suggest that such positive social-modeling experiences did not just produce a reporting bias by changing participants’ self-reported levels of pain but enhanced placebo responding by influencing physiological responses to pain. Further, participant expectations of reduced pain fully mediated the effects of social modeling of pain reduction on both placebo analgesia and skin conductance.

Social Modeling of Side Effects and the Nocebo Response

To date, experimental work in this area has focused exclusively on pain paradigms, primarily using relatively small student samples. While the studies have been well designed and have highlighted the potential role of social modeling in enhancing placebo effects, the literature would be strengthened by the replication of findings in more varied research paradigms and participant populations. Study designs would also benefit from the inclusion of a no-treatment (or no-placebo, in this case) control group. Additionally, current research has used only placebo treatments. In order to assess how useful social modeling might be in enhancing treatment effectiveness in clinical settings, future research could usefully also investigate outcomes of active treatments.
antiviral medication” reported significantly more symptoms than did those in the control group (Broderick, Kaplan-Liss, & Bass, 2011). Recent work has also investigated the role of social observation of side effects in the context of a beta blocker (actually a placebo) drug study (Faasse, Grey, Jordan, Garland, & Petrie, 2015). Social modeling of side effects by a female confederate resulted in dramatic increases in both symptom reporting and the number of symptoms attributed to treatment side effects in female, but not male, participants. Importantly, the social observation of side effects also had an impact on placebo responding: Participants (independent of gender) who saw the model report side effects had a substantially reduced placebo response in both systolic and diastolic blood pressure compared to participants in the control group.

The nocebo literature benefits from having used a broader range of experimental research paradigms to investigate the role of social modeling in the experience of side effects. Again, the studies have been well designed and have highlighted the potential importance of social modeling in the experience of nocebo effects, but future research would benefit from the addition of a no-treatment control group. The literature would be strengthened by replication of the current findings across a broader range of participants, and consideration of the role of social modeling of side effects in active treatments going forward.

Social Modeling in the Media

These direct and crossover effects from side-effect modeling to nocebo and placebo responding are of particular importance in treatment-related health scares—where news or social-media coverage of others’ side effects may not only increase side effects across a large number of viewers but also reduce the placebo component of the treatment, thereby diminishing its overall effectiveness. Misleading media reporting can result in increased anxiety, driving patients to seek care and reassurance unnecessarily, overwhelming healthcare systems (Yuji, Narimatsu, Tanimoto, Komatsu, & Kami, 2011). Increased levels of anxiety in the public following health scares can be seen in language use in blog posts and appears to drive people to seek additional health information (Tausczik, Faasse, Pennebaker, & Petrie, 2012). Television news coverage has been linked to increased adverse-event reporting following a highly publicized medication formulation change (Faasse et al., 2012). Media reporting has also been linked to the spread of symptoms following influenza vaccination, with the additional consequence of suboptimal levels of vaccination being reached (Huang, Hsu, Lee, & Chuang, 2010). Thus far, research in this area has been observational, and future work would benefit from an experimental approach.

Mass Psychogenic Illness

The social transmission of nocebo symptoms also occurs in group settings—with symptoms spreading via line of sight, sound, or communication (Bartholomew & Wessely, 2002). These mass psychogenic illness episodes involve an illness outbreak that follows a perceived toxic exposure (which can include medications or vaccinations), but for which no feasible organic explanation can be found (Page et al., 2010). Women are often overrepresented as casualties of mass psychogenic illness episodes (Bartholomew & Wessely, 2002). Seeing a model report unpleasant symptoms is likely to both increase viewers’ expectations that they will also become unwell and cause extreme anxiety about the possibility of toxic exposure (Baralatnasingam & Janca, 2006). In these episodes, not just one but multiple potential models provide information to others as psychogenic illness symptoms spread through the group. Such social modeling may also happen through technological channels, including Internet-based social media (Bartholomew, Wessely, & Rubin, 2012). The spread of psychogenic symptoms through viewing YouTube videos is suspected in at least one incident involving U.S. schoolgirls (Bartholomew et al., 2012).

Some symptoms appear to be particularly prone to social transmission, including contagious yawning, itching, and coughing (Norscia, Demuru, & Palagi, 2016; Papoiu, Wang, Coghill, Chan, & Yosipovitch, 2011; Pennebaker, 1980). Contagious yawning occurs significantly more often in female than male viewers and tends to occur more readily between people who have closer social bonds (Norscia et al., 2016). This may explain why mass psychogenic illness episodes tend to occur within cohesive or isolated groups (Bartholomew & Wessely, 2002).

Episodes of mass psychogenic illness tend to change with society, reflecting dominant social beliefs and concerns of the time (Baralatnasingam & Janca, 2006; Bartholomew & Wessely, 2002). The relatively recent rise in episodes following medical treatments, in particular vaccination, may reflect heightened public concern around such interventions (Clements, 2003). A number of vaccines have been implicated in mass psychogenic illness episodes, including those for human papillomavirus (Clements, 2007) and H1N1 influenza (Huang et al., 2010). Given the importance of medical treatments and mass vaccination campaigns, these events have the potential to severely compromise health behaviors and health outcomes. The rise of social media and the ease
with which information can be transmitted may mean that such media-driven incidents will increase in the future.

Future Directions

The role of social modeling in health and treatment outcomes has been paid relatively little attention, particularly given that such processes have the capacity to either enhance medication effectiveness or dramatically increase side effects, depending on the modeled outcome. To date, questions remain around why women appear to be more likely to experience symptoms in response to social modeling and, more broadly, why women are overrepresented in cases of mass psychogenic illness. This may, in part, be explained by findings that indicate that women tend to report higher numbers of physical symptoms in daily life and are more likely to experience nocebo effects (Barsky, Saintfort, Rogers, & Borus, 2002; Liccardi et al., 2004; Petrie, Faasse, Crichton, & Grey, 2014). Women tend to experience more symptoms and more side effects, meaning that they may also be more likely to model symptoms to others. Because observers learn more from models they can readily identify with (Braaksma, Rijklaarsdam, & van den Bergh, 2002), such social modeling may have particular influence on female observers. However, little research has been done in this area, and it remains unclear whether seeing a model of the same gender as the viewer is particularly effective (as suggested by Mazzoni and colleagues, 2010) or whether there might be different mechanisms at work in male and female viewers; additional research is needed to answer these questions.

The role of empathy—both dispositional and situational—warrants further investigation. In the social modeling of pain relief, viewer empathy also appears to play a role in placebo responding (Colloca & Benedetti, 2009; Hunter et al., 2014). Women tend to report higher levels of empathy than men, and these psychological differences are associated with both neuroanatomical differences in the mirror-neuron system and greater neuronal activity when processing emotion-related stimuli (Cheng et al., 2009; Christov-Moore et al., 2014; Schulte-Rüther, Markowitsch, Shah, Fink, & Piefke, 2008). Empathy and the mirror-neuron system may facilitate the social contagion of symptoms in cases of mass psychogenic illness (Lee & Tsai, 2010), offering another possible piece of the puzzle in explaining why women may be more responsive to the social modeling of symptoms than men.

High levels of anxiety are often present in mass psychogenic illness episodes. However, the role of emotional distress in the social transmission of placebo and nocebo effects has received little attention to date. Heightened emotional distress is associated with increased rates of symptom reporting (Salovey & Birnbaum, 1989), as well as the tendency to attribute more symptoms to a medical treatment or intervention (Petrie, Moss-Morris, Grey, & Shaw, 2004). As might be expected in cases of mass psychogenic illness, evidence also suggests that distress can be “caught” from other people (Laird et al., 1994). This social spread of anxiety appears to be facilitated when participants face the same threatening situation (Gump & Kulik, 1997). Emotional contagion has also been found in online social networks (Kramer, Guillory, & Hancock, 2014), which may help to explain apparent episodes of technological transmission of mass psychogenic illness symptoms.

Finally, the role of social modeling in both placebo and nocebo responding may have particular utility and importance in medical care. Future research would benefit from the examination of the role of social modeling (of either treatment effectiveness or side effects) in patient outcomes from active medical treatments, bridging the gap between theory and real-world applications. While the influence of social modeling of placebo responding has been demonstrated in pain paradigms, evidence for responses outside of pain is currently lacking. Social modeling has the potential to act as a powerful intervention to increase overall treatment effectiveness. Increased symptoms following face-to-face or online social modeling during medical treatment could lead to increased demand for medical care, as well as treatment discontinuation or non-adherence (Barsky et al., 2002; Petrie et al., 2014). Similarly, the experience of psychogenic symptoms in response to a presumed toxic exposure has the potential to overwhelm medical services in real health emergency situations (Engel et al., 2007; Page, Petrie, & Wessely, 2006). Social modeling processes could also have important implications for the way randomized controlled trials are carried out. Generating a deeper understanding of these processes, and how to use them to facilitate the best outcomes for patients, has the potential to enhance treatment effectiveness and minimize unpleasant symptoms and side effects.

Recommended Reading

Bartholomew, R., Wessely, S., & Rubin, G. J. (2012). (See References). Provides an example of social modeling and transmission of symptoms through social media.

Colloca, L., & Benedetti, F. (2009). (See References). An early study showing the influence of social modeling on placebo effects in pain.


Declaration of Conflicting Interests
The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

References


