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Going with the Grain of Human Cognition: Applying insights from psychology to build support for vaccination

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ABSTRACT

Childhood vaccination is widely considered to be one of the most successful public health interventions. Yet, the effective delivery of vaccination depends upon public willingness to vaccinate. Recently, many countries have faced problems with vaccine hesitancy, where a growing number of parents perceive vaccination to be unsafe or unnecessary, leading some to delay or refuse vaccines for their children. Effective communication strategies for raising parental confidence in vaccination are currently sorely lacking, however. Here, we argue that this may be because existing communication strategies are grounded more in intuition than insights derived from psychology. Consequently, vaccination communication strategies are often at variance with basic principles of human psychology. By going against the grain of human cognition, such strategies run the risk of imperiling persuasive efforts to promote vaccine confidence. We demonstrate this by drawing on key insights from cognitive and social psychology to show how various known features of human psychology can lead seemingly intuitive communication strategies to backfire, yielding unintended and undesirable repercussions. We conclude with a summary of potential avenues of investigation that may be more effective in building parental confidence in vaccination. Our key message is that communication strategies must be crafted that go with the grain of human cognition by incorporating key insights from the psychological sciences.

Keywords: backfire effect, communication, information-deficit-model, vaccination, vaccine hesitancy, vaccine confidence

INTRODUCTION

Childhood vaccination is a safe and effective way of reducing infectious diseases. Yet in many countries, there has been a decline in public confidence surrounding vaccination, leading some parents to delay or refuse vaccines for their children (Dubé et al., 2013). While rates of vaccination coverage remain generally high, such vaccine hesitancy is a significant cause for concern, since geographical clustering

of vaccine refusal has recently contributed to outbreaks of diseases previously considered eradicated or controlled (Omer et al., 2008). In response to growing vaccine hesitancy, several policy and communication strategies have been advanced in an attempt to increase parental confidence in vaccines. However, such strategies have largely been met with limited success (Dubé et al., 2015; Henrikson et al., 2015; Nyhan et al., 2014; Sadaf et al., 2013). Here, we argue that this may be because existing strategies go against the grain of human cognition—that is, they fail to acknowledge the complex psychological processes that impinge on the vaccination decision process. In so doing, they run the potential risk of exacerbating, rather than alleviating, the problem of vaccine hesitancy. We demonstrate this by providing examples where communication strategies have backfired; discuss why they may have backfired; and consider how such backfire effects might be circumvented. We argue that efforts to spur vaccination must go with the grain of human cognition—they must be grounded in insights from psychology vis-à-vis how people think about vaccination. Specifically, they must recognise how people update their knowledge and memory, form attitudes and opinions, and interact socially.

DEFINING VACCINE HESITANCY

While there has been some disagreement in the literature regarding the exact definition of vaccine hesitancy, recently, in an effort to provide a standardised global definition, the World Health Organisation SAGE working group on vaccine hesitancy settled on the following interpretation—"the delay or refusal of vaccination, despite the availability of vaccine services" (MacDonald, 2015). They identified three different drivers of vaccine hesitancy—*complacency* resulting from low risk perceptions of vaccine preventable diseases; a lack of *convenience* arising from insufficient access to vaccine services; and low *confidence* due to concerns about the safety of vaccines and the legitimacy of the services that deliver them (the "3Cs" model). While complacency and convenience are important reasons for vaccine hesitancy that merit psychological investigation, in the current article we focus on hesitancy based on confidence (see Betsch et al., 2015, for a broader review), which encompasses uncertainty about the safety and effectiveness of vaccines, a lack of trust in the systems that deliver vaccines, and doubt about the motives of policy-makers who decide on the required vaccines. We focus on confidence because we regard it as a crucial tipping point toward vaccine refusal or acceptance.

GOING *AGAINST* THE GRAIN OF HUMAN COGNITION

It is a shortcoming of most existing communication strategies that they are grounded more in commonsense and intuition than insights from psychology. Traditionally, for example, most strategies for raising confidence in immunisation have been based on the so-called *Information Deficit Model* (IDM) of science communication. This model is predicated on the assumption that public misconceptions regarding science arise due to insufficient knowledge. On this approach, the solution to vaccine hesitancy is to provide hesitant parents with more scientific facts in order to plug the "knowledge gap" that is presumed to be the barrier preventing them from vaccinating their children. Given the widespread myths and misinformation surrounding childhood vaccination (Betsch et al., 2010; Jolley & Douglas, 2014; Kata, 2010), it is easy to see the intuitive appeal of this approach. The IDM is wrong, however—knowledge is rarely a good predictor of vaccination acceptance, and informational interventions that seek to inform or educate hesitant parents have little or no impact on vaccine uptake (Dubé et al. 2015). A different approach is therefore required—one that is grounded in insights from psychology, rather than intuition. Our communication strategies must recognise that the decision to vaccinate one's child involves complex cognitive, social, and emotional processes. As we show next, communication strategies that disregard these complex

psychological processes may not merely be ineffective in their capacity to sway hesitant parents, they may even inadvertently increase their resistance to vaccination.

COGNITIVE CONSTRAINTS

Research in cognitive psychology shows that because of various biases of human memory, simply refuting vaccination myths and communicating scientific facts can backfire. For example, in order to debunk a myth, it seems logical to expose people to the myth so they know what you are referring to. Indeed, a common strategy for highlighting false information is to present myths juxtaposed with relevant facts. In one study examining the efficacy of such an approach, people were presented with a flyer that displayed both myths and facts about flu vaccines. Immediately after presentation, people could accurately separate the myths from the facts. Yet, 30 minutes later, most people had trouble determining which of the statements about the flu vaccine were myths or facts (Skurnik et al., 2005). Dubbed the *familiarity backfire effect*, it seems that exposure to the myth can actually increase familiarity with the misinformation, paradoxically increasing the likelihood that people will recall it and assume it to be true (Lewandowsky et al., 2012).

Another example of how the mere mention of a vaccine myth can undermine informational interventions was reported by Nyhan et al. (2014). In their study, parents were presented with a passage taken from the Centers for Disease Control and Prevention, correcting the widespread myth that the measles, mumps, and rubella (MMR) vaccine causes autism. Although myth-debunking reduced belief in the false claims, it also paradoxically decreased vaccination intent, suggesting that despite being explicitly refuted, the MMR-autism myth persisted in people's minds and impinged on their subsequent vaccination intention decision.

It is also possible to elicit the *overkill backfire effect* when attempting to correct misinformation. While it may seem intuitive to present many counter-arguments to debunk a myth, processing many arguments is more cognitively taxing than processing a few, which renders it less likely that the information will be integrated into individuals mental models, especially when compared to a simple and compelling myth (Cook & Lewandowsky, 2011; Lewandowsky, et al., 2012; Schwarz, et al., 2007).

SOCIAL MOTIVATIONS

Attempts to change parental attitudes regarding vaccination by simply presenting people with scientific facts also overlook basic findings from social psychology. Psychologists have long demonstrated that people are motivated to defend and justify their pre-existing beliefs, even if those beliefs are in conflict with an overwhelming body of evidence. Therefore, merely presenting evidence in favour of vaccination is unlikely to change attitudes because people engage in motivated reasoning—the tendency to search for information in support of, and disregard evidence in conflict with, one's prior beliefs (Ditto Lopez, 1992; Ditto et al., 2009; Lord et al., 1979). Moreover, presenting information that clashes with people's worldviews can also lead to a backfire effect due to attitude polarisation—when confronted with belief-incongruent information, people tend to call to mind all the evidence and arguments in opposition to this information, leading them to cling to their original beliefs even stronger than before (Lord, et al., 1979). There is some research demonstrating that people engage in motivated reasoning about vaccination. In a study of public acceptance of evidence regarding the HPV vaccine, people were more likely to discredit information about the safety and effectiveness of the vaccine when the information was framed in a way that clashed with their pre-existing worldviews (Kahan et al., 2010).

A similar line of research speaks to the caution that should be taken when introducing monetary incentives or disincentives to spur vaccination. Much public policy assumes the people are fundamentally creatures of the marketplace and can be encouraged to change their behaviour if offered a financial motive. Yet, when behaviour (such as refusing vaccination) is grounded in one's deeply held beliefs, it tends to be viewed as a moral rule that cannot be violated, rather than a preference that can be subject to cost-benefit analysis. Indeed, research shows that when people are asked to trade off their moral values for instrumental rewards they react with moral outrage and become even less likely to engage in the desired behaviour (Berns et al., 2012; Ginges et al., 2007; Sheikh et al., 2013). These insights are particularly noteworthy in light of moves by various governments to withhold welfare payments or restrict access to other goods and services from parents who choose not to vaccinate their children. It may be that the introduction of monetary value to what is otherwise viewed as a moral issue, has the potential to lead vaccine hesitant parents to become more entrenched in their beliefs. There is very recent evidence from an experimental setting showing that perceived coercion may have unintended consequences on vaccination rates. In a simulation of vaccine decision making, compulsory vaccination increased the level of moral outrage among those already opposed to vaccination and led vaccine hesitant individuals to be less likely to voluntarily vaccinate in subsequent iterations of the vaccine decision making paradigm (Betsch & Böhm, 2015).

Another pitfall of countless public health campaigns is the tendency to highlight a problem behaviour as being regrettably frequent e.g., "parents are increasingly becoming distrustful of childhood vaccines". This approach overlooks the basic tendency for people to act in accordance with social norms—people's perceptions of which behaviours are frequently performed. Therefore, highlighting the extent of a problem can backfire by inadvertently communicating a social norm drawing attention to the fact that the undesired behaviour is engaged in by many people, and is therefore appropriate and normal (Cialdini, 2003). Indeed, studies in numerous contexts show that when people overestimate the prevalence, and degree of social approval, of undesirable behaviours (e.g., binge drinking), it increases the likelihood that they will engage in the undesirable social conduct (Schultz et al., 2007). It may be that recent media reports and public campaigns highlighting vaccine hesitancy as a growing problem, have led people to overestimate the extent to which parents actually distrust vaccines, thereby decreasing their own confidence.

Insights from social identity theory further demonstrate the powerful influence of social context and group allegiances on behaviour. People form an important part of their self-esteem from the social groups they belong to and identify with (Tajfel & Turner, 2004). When people feel that a group they identify with has been evaluated negatively, those who are highly committed to the group are likely to demonstrate even stronger group affiliation, display expressions of in-group loyalty, and a heightened willingness for collective action (Ellemers et al., 2002). This becomes problematic because it seems likely that social identities may be formed around opposition to vaccination, or at least more broadly around the adoption of an alternative lifestyle and questioning of the medical status quo (Attwell & Freeman, 2015; Leask, 2015). Therefore, media communications and policies that explicitly deride vaccine hesitant parents or pit vaccinating parents against non-vaccinating parents may do more damage than good by threatening the group identities of those opposed to vaccination, thereby leading them to rally together and hold their beliefs more strongly than before.

EMOTIONAL RESPONSES

Another pervasive and seemingly intuitive tactic for behaviour change is the use of fear appeals. This approach is based on the assumption that if people fear the consequences of their risky behaviours, then they will be motivated to adopt safer alternatives. This logic seems particularly fitting in the context of

vaccination, given that vaccines have become a "victim of their own success"—since the diseases prevented by vaccination have been reduced or eliminated, the dangers posed by them are less visible and salient than the risks of side-effects from vaccines. Appealing to this logic, one study presented parents with either a dramatic narrative of a child that contracts measles or a graphic picture of a child with measles. However, both strategies led parents to express greater, rather than reduced, fear of side-effects from vaccination, compared with parents who were not exposed to a fear appeal (Nyhan, et al., 2014). Although this result seems counterintuitive, it is nevertheless consistent with a wealth of research within health psychology examining the efficacy of fear appeals. Research across multiple health contexts, from alcohol consumption to smoking, has shown that health warnings strongly infused with fear can make people less likely to engage in the desired health behaviour (Ruiter et al., 2014). This is because threatening health information often results in defensive responses such as denial of the risk, and importantly, leads people to avoid the risk information. Furthermore, such defensive and avoidant responses occur disproportionately among those who are most at risk from failing to engage in the desired health behaviour (van't Riet et al., 2010).

GOING *WITH* THE GRAIN OF HUMAN COGNITION

The number of possible backfire effects can paint a disheartening picture. Yet, there is also a wealth of psychological literature outlining optimal ways to design communications to effectively shift behaviour that may be relevant to vaccine hesitancy. Given what we know about how people's attitudes and decisions are systematically influenced by (1) how they remember information, (2) their group identities and deeply held beliefs, and (3) their emotional responses, effective communications to build confidence in childhood vaccination can potentially be crafted to harness these fundamental aspects of human psychology.

For example, there are various debiasing techniques that can be used to correct myths surrounding vaccination (Cook & Lewandowsky, 2011). In order to avoid the familiarity backfire effect, it is best to begin by stating the facts; then introduce the myth; then debunk it; and finally replace the myth with a scientific fact. Crucially, the myth should never be repeated. Similarly, to avoid the overkill backfire effect, communicators should present a few, rather than many, counterarguments to a myth, since numerous counterarguments take more cognitive effort to process, thus reducing the potency of the correction. It is encouraging to note that these findings have been incorporated into recommendations by the European Centre for Disease Prevention and Control (ECDPC, 2014). However, there is currently no work that has directly tested these insights from cognitive psychology in the vaccination space, so their effectiveness in an experimental setting still remains to be seen.

Other approaches suggest bypassing the facts altogether. For example, messages couched in terms of an individual's pre-existing beliefs and values, are much more likely to shift attitudes than those that are incongruent with their values (Day et al., 2014; Feinberg & Willer, 2013; Kahan, 2010). Opposition to vaccination tends to be based on a preference for a natural, alternative lifestyle, and the belief that governments should not intrude into one's personal life (Brown et al., 2010; Kata, 2010; Mills et al., 2005). It may be possible to redefine vaccination as congruent with such values. There is some promising work in this vein. A community based intervention found that framing vaccination as congruent with an alternative lifestyle led some parents lacking confidence in vaccination to feel more positively towards vaccination (although it did seem to backfire among those most opposed to vaccination) (Attwell & Freeman, 2015). Future studies should further test the effectiveness of such an approach.

Furthermore, considering the emotion that a given message elicits is also important when constructing public health campaigns. Rather than relying on fear as a motivator, it may be more helpful to design

messages that arouse positive emotions. There is some research suggesting that communications based on positive emotions, may be more likely to shift attitudes by creating a sense of self-efficacy—the perception that a given behaviour is realistic and achievable. It may also be possible to employ fear based messages in a more productive manner. Experimental studies demonstrate that when an individual is asked to self-affirm—viz. list positive attributes about themselves, or reflect on their own values—messages with a fearful component are more likely to be accepted (Harris et al., 2007; Sherman et al., 2000). Again, an essential first step would be to examine whether these key insights can be effectively applied in the context of vaccine hesitancy.

It may also be possible to take advantage of people's tendency to act in accordance with perceived social norms. In recent years, there has been an upsurge in social norms marketing campaigns which have harnessed the tendency for people look to others for cues about the appropriate and correct ways to behave. Interventions that seek to correct people's perception of the frequency and degree of social approval of deleterious behaviour such as drinking, smoking, energy consumption, littering, and gambling, have proven very successful (Moreira et al., 2009; Schultz, et al., 2007). Despite growing parental concern, vaccination rates are still very high in most communities (90-95%). Communicating this high level of community endorsement may be an effective approach for leveraging support for vaccination. Finally, research on social identity theory further suggests the conditions under which normative messages may be most potent. For example, if a counter-attitudinal message is communicated by an in-group source it is much more likely to be accepted (Cohen, 2003).

CONCLUDING REMARKS

Too often, communication strategies to raise confidence in childhood vaccination ignore key insights from psychology. This is problematic because, as we have shown here, by disregarding such insights many common and seemingly intuitive communication strategies may inadvertently do more harm than good. Our communication strategies must go with the grain of human cognition—they must be crafted in a way that acknowledges how people actually think and reason about vaccination, rather than how they ought to. In the same way that vaccination programmes rely on rigorous medical science, so too should vaccination communication strategies be informed by the best-available evidence from the psychological sciences. Of course, there are some noteworthy instances where psychology has been incorporated into thinking about vaccine hesitancy (Betsch, et al., 2015; ECDPC, 2014). Nevertheless, such instances are the exception rather than the rule. We suggest therefore that research programmes should be initiated that seek to develop an empirical base of psychologically informed strategies that can inform public policy and communication efforts to address vaccine hesitancy.

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