The Impact of Evidence Type and Message Framing on Promoting HPV Vaccination in Online Health Communities

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Abstract. Message features and type are crucial in health-related communication, especially due to the potential impact these messages can have on an individual’s health. This study uses a $2 \times 2$ experimental design (evidence type: statistical evidence vs. narrative evidence; message framing: gain-framed message vs. loss-framed message), to investigate how evidence type and message framing affect the attitudes, health beliefs, and intentions of college students in online health communities, regarding getting the HPV vaccination. Preliminary results (N=300) indicated that; (1) evidence type and message framing both influence attitudes and intentions significantly; Statistical evidence will lead to more favorable views than narrative evidence, and loss-framed messages will lead to more favorable views than gain-framed messages. (2) Concerning the interactions, we used construal level theory and found that, for gain-framed message, narrative evidence will lead to more favorable attitudes, free intentions, perceived benefits and barriers of HPV vaccination than statistical evidence; for loss-framed message, statistical evidence will lead to more favorable attitudes, intentions, perceived seriousness, benefits and barriers of HPV vaccination than narrative evidence.

Keywords: Evidence Type, Message Framing, Construal Level Theory, HPV, Online Health Communities.

1 Introduction

Human papillomavirus (HPV) is the most common sexually transmitted infection and is the main cause of cervical cancer and genital warts. In recent years, the incidence and mortality of HPV associated cancers have been increasing. In 2008, cervical cancer was within the top ten (Bray et al., 2018). The HPV vaccination has been shown to have a high efficacy in preventing an HPV infection and has attracted worldwide attention. However, despite this having the potential to alleviate the high incidence and mortality rates, public acceptance of the HPV vaccine is not satisfactory, especially among young adults (Centers for Disease Control and Prevention [CDC], 2012). According to the CDC, only 1/4 of people have received HPV vaccines in the
United States (CDC, 2015). Additionally, in China, women aged between 30 to 40 had 0.4% screening rate (Beijing Municipal Science & Technology Commission [BMS&T], 2018). So, vaccination rates are dangerously low, which should be of great concern.

Online health communities (OHCs) can help users access professional health knowledge, promote the dissemination of information and publicize prevention and screening programs. OHCs can guide users with health management, which attracts health-conscious users. (Lamberg, 2003; Lu & Zhang, 2019). Haofd.com (OHC) alone has more than 3 million visitors per day (Haofd, 2019). OHCs play an important role in guiding individuals with health management, education, etc. Especially as, the information found on online health communities tends to be reliable compared to other sources, mostly as it is from doctors (Nambisan, 2011), this makes OHCs very popular and trusted within China. As a controversial topic, HPV conversations are active across OHCs, for example, Haofd.com and chunyu.com. Doctors generate a lot of information about HPV daily, of which the messages are diverse. Therefore, scholars are exploring how the structure, type, and organization of the information itself affects persuasion behavior.

Using literature review, we found that message framing has proven a persuasive factor in health communication promotion (e.g., Rothman & Salovey, 1997; Rothman, Bartels, Wlaschin & Salovey, 2006; Gallagher & Updegraff, 2012; Updegraff, Brick, Emanuel, Mintzer & Sherman, 2015). Emphasizing the benefit of taking action seen with gain-framed messages (e.g., exercising can reduce the risk of heart disease), while conversely the cost of not taking action as seen in loss-framed messages (e.g., not keeping exercising can increase the chance of heart disease) (Rothman & Salovey, 1997). The result shows that individuals make different choices according to gain-framed/ loss-framed message use (Detweiler, Bedell, Salovey, Pronin & Rothman, 1999). Equally, due to the influence of the readers’ personality, studies about message framing may be inconsistent (O’Keefe & Jensen, 2006, 2007, 2008, 2009). In addition, evidence type also meaningfully impacted persuasion (Perloff, 2003; Kazoleas, 1993; de Wit, Das & Vet, 2008). Statistical evidence is based on abstract data. (Perloff, 2003) suggested empirical data is hard to argue against. Contrariwise, narrative evidence references specific people and events, which is subjective (Dahlstrom & Ho, 2012). A meta-analysis found that statistical evidence is often more persuasive than narrative evidence (Allen & Preiss, 1997), but some scholars doubt the persuasion effects relevance (Winterbottom, Bekker, Conner & Mooney, 2008). Building on this, current research focuses on the interaction between message framing or evidence type and another factor, such as message framing and behavior type (prevention vs. promotion behaviors) (Lee & Aaker, 2004), media channels (Lee & Cho, 2017), consideration of future consequences (CFC) (Liu, Yang & Chu, 2019) and so on. Evidence type has been combined with temporal framing (present-oriented vs. future-oriented messages) (Kim & Nan, 2019), narrative type (first-person or third-person) (Nan, Dahlstrom, Richards & Rangarajan, 2015), the recipients’ values (Slater & Rouner, 1996), etc. Although interaction research is the focus of current scholars, few studies have covered the interaction between message framing and evidence type. This research, therefore, aims to explore how message framing, evidence type and the inter-
acts to impact younger adults in OHCs, to determine what type of messages work best for persuasion in relation to the HPV vaccination.

2 Conceptual Background

2.1 Evidence Type

Previous studies have found that including favorable arguments in the information content can enhance persuasion (Reinard, 1988) namely, statistical evidence that emphasizes objective, abstract data and narrative evidence that reflects subjective, concrete experience (Perloff, 2003). For example, the 2018 global cancer statistics report found the highest incidence of lung cancer was (31.5%) and mortality (27.1%) in men, this report utilizes empirical data. However, an example of narrative messaging would be if, a woman with breast cancer detailed her personal experience, supported by background, characters, events, expressing her emotions, and providing advice. This sense of personal identity doesn't exist in statistical evidence (Kazoleas, 1993). The persuasion effect of these two types of messages is different; the narrative evidence is more instructive (Rothman & Schwarz, 1998). However, some studies believe that the persuasiveness effect depends on the consistency of the information and the receiver's values, when consistent, the statistical evidence is more credible. Conversely, impactful narrative evidence results in better persuasion (Slater & Rouner, 1996).

The effects of evidence type on attitudes and intentions are also different. Narrative evidence is more effective than statistical evidence at changing risk perception and vaccination intention in gay men infected with Hepatitis B (de Wit, 2008) and women’s attitudes towards breast screening (McQueen, 2011). However, inducing female college students to change tanning bed behavior, statistical evidence is more persuasive (Greene & Brinn, 2003). But there is no difference when changing attitudes towards polio vaccination (Wilson, Mills, Norman & Tomlinson, 2005).

In this study, college students’ overall knowledge is relatively high, and the statistical evidence supported by hard data may hold more weight, so we propose the following hypothesis:

Hypothesis 1(H1): Evidence type affects HPV vaccination, and statistical evidence will lead to more favorable attitudes and intentions towards HPV vaccination than narrative evidence.

2.2 Message Framing

Message framing has a more significant persuasive effect when preventing behaviors, specifically gain-framed vs. loss-framed messages. Message framing falls under the prospect theory (Kahneman & Tversky, 1979), which suggests that when people are exposed to negative consequences of actions, they seek risks, but when exposed to the positive consequences, they are more risk-averse (Tversky & Kahneman, 1981). A literature review revealed that health behaviors are moderated by message framing. The loss-framed messages were more effective in promoting behaviors, while the
gain-framed messages were more favorable in preventive behaviors (Rothman, Salovey, Antone, Keough & Martin, 1993; Rothman, Martino, Bedell, Detweiler & Salovey, 1999; Rothman, Bartels, Wlaschin & Salovey, 2006). A meta-analysis found that gain-framed messages were more effective in areas such as skin cancer prevention and smoking cessation, and loss-framed messages were more persuasive in areas such as mammography and colorectal cancer screening (Gallagher & Updegraff, 2012; Lipkus et al., 2019). Overall, gain-framed messages where more convincing for people at lower risk, vice versa for loss-framed messages (Updegraff, Brick, Emanuel, Mintzer & Sherman, 2015).

The effect of message framing on vaccination has a differing result. One view being, vaccination is a preventive behavior, therefore is more convincing on attitudes and intentions to emphasize gain-framed messages of vaccination than the impact of loss-framed messages on non-vaccination (Nan, 2012). On the other hand, some argue that vaccination is relatively high risk (Ball, Evans & Bostro, 1998), in which case loss-framed messages have a strong effect on intentions surrounding the HPV vaccination, especially when the participants were more sexually active. (Gerend & Shepherd, 2007; Nan, 2012). Equally, some studies have found that neither the gain nor loss-framed messages have a significant effect on intentions of receiving the influenza vaccination in the elderly (McCaul, Johnson & Rothman, 2002). Regarding, the HPV vaccine, college students tend to be cautious despite, the safety of the vaccine being the focus of the world health organization. In conclusion, we propose the following hypothesis:

Hypothesis 2(H2): Message framing affects HPV vaccination, and loss-framed messages will lead to more favorable attitudes and intentions towards HPV vaccination than gain-framed messages.

2.3 Interaction of Evidence Type and Message Framing

Evidence type and message framing make for mixed results on attitudes/intentions. However, the literature review indicates that there is a potential interaction between the two. Construal level theory (CLT) is a psychology theory, which states that individuals have differences in psychological distance, (comprised of time and social distance). A person’s thinking is abstract or concrete, determined by psychological distance. Abstract plans/thoughts are complex and unstructured and demand high distance thinking, vice versa for simple and structured goals (Liberman & Trope, 1998; Trope & Liberman, 2000). Studies suggest narrative evidence involves events, characters emotions, which is correlated with low-level construal thinking. Whereas, statistical evidence contains abstract data, which requires high-level construal thinking (Kim & Nan, 2019). High-level construal thinking is related to long-term goals and abstract results, while low-level construal thinking looks at immediate temptations and concrete details (Fujita, Trope, Liboman, Levinsagi, 2006; Szeles, 2016). For example, individuals with high-level construal are more willing to choose apples, while those with low-level construal tended to choose high-calorie candies for short-term satisfaction (Fujita & Han, 2009).
We can tentatively conclude, therefore, that gain-framed messages imply vaccination prevents an HPV infection, individuals have an immediate outcome, which is low-level construal. Loss-framed messages emphasize the cost of no vaccination, namely cervical cancer, therefore thinking in future terms, which is a high-level construal’s view. According to the research conclusion of interaction between message framing and other factors such as behavioral frequency, racial identity, media choice, temporal framing and so on (Lee & Aaker, 2004; Lee & Cho, 2017; Gerend, Shepherd & Monday, 2008; Liu, Yang & Chu, 2019; Seoa & Park, 2019; Lucas, Manning, Hayman & Blessman, 2018), it indicates that the matched conditions resulted in better persuasion. As such, we hold that matching statistical evidence with loss-framed messages will lead to more favorable persuasive outcomes, and matching narrative evidence with gain-framed messages should lead to greater persuasive effects, so we propose the following hypothesis:

Hypothesis 3 (H3): Evidence type and message framing will interact such that (a) for gain-framed message, narrative evidence will lead to more favorable attitudes and intentions to get HPV vaccination than statistical evidence and (b) for loss-framed message, statistical evidence will lead to more favorable attitudes and intentions to get the HPV vaccination than narrative evidence.

In addition, studies have found that evidence type and message framing can affect health beliefs, for example, statistical evidence can change beliefs demonstrated by (Baesler & Burgoon, 1994), hybrid evidence leads to higher perceived risk, and the first-person narrative type has a stronger effect on perceived risk than the third-person (Nan, Dahlstrom, Richards & Rangarajan, 2015), and the interaction of temporal framing and evidence type affect perceived efficacy and perceived severity of the HPV vaccine (Kim & Nan, 2019). For message framing, has a role in perceived susceptibility, perceived efficacy, anticipated regret, anticipated anxiety and so on (Nan, Maddena & Richardsb, 2016; Kim, Pjesivac & Jin, 2019; Kim, 2019). However, it is unclear, if or how the interaction between evidence type and message framing would impact specific health beliefs. And previous literature focused on attitudes and/or intentions as indicators of persuasive outcomes. No previous study has examined the interactive effects of evidence type and message framing on health beliefs. So our research question is:

Research Question 1 (RQ1): will evidence type interact with message framing to influence specific health beliefs including perceived susceptibility, perceived seriousness, perceived benefits, and perceived barriers of the HPV vaccination?

3 Research Design

3.1 Participants and Procedure

The study uses a 2×2 (statistical vs. narrative evidence /gain-framed vs. loss-framed message) quasi-experimental design. For the sample selection, we recruited college students who self-identify as using OHCs and haven’t received the HPV vaccine. We will tell them about the purpose of the study and brief knowledge around HPV before
the experiment begins. Since there are four separate questions, the participants are randomly assigned to one of the four experimental conditions.

The questionnaire is divided into three parts. The first part is personal information, the second part, included an interface that reflects HPV knowledge in online health communities, and in order to avoid the extraneous influence, such as authority bias, names and institutions will be hidden during the experiment presentation. After reading this message, participants need to answer some questions about health beliefs. The last part is about attitudes and intention surrounding the HPV vaccination. It took about 15 minutes for participants to complete the study.

3.2 Message Stimuli

According to the characteristics of evidence type and message framing and combining the form and structure of the HPV paper from online health communities, as well as acknowledging prior studies (Gerend & Shepherd, 2007; Kees, 2011; Nan, Maddena & Richardsb, 2016), we designed four kinds of message stimuli. At the same time, in order to avoid the impact of the amount of information, the number of words was controlled at 284-294 words.

3.3 Key Measures

All variables were adapted from prior studies. (1) Attitude towards HPV vaccination was adapted from Orbell (2004). (2) Intention towards HPV vaccination adapted from Fishbein & Ajzen (2010). (3) Health beliefs. Four specific health beliefs were measured, which were adapted from Champion (1985), Champion (1999), McRee & Brewe(2010).

So the three dependent variables are attitudes, attentions and health beliefs. The five core control variables are gender, age, education, whether they had heard of HPV and whether they had heard of the HPV vaccination. To address the hypothesis and research question, we plan to conduct a series of analysis of covariance (ANCOVA). Partial results can be referred to the Appendix.

References

43. Szeles, S. Self-control & construal-level in food-related decisions of female college students. Towson University (2016).

Appendix

**Table 1.** Means and Standard Deviations Related to the interactions for attitudes and intentions

<table>
<thead>
<tr>
<th>Message Framing Type</th>
<th>Evidence Type</th>
<th>Attitudes M (SD)</th>
<th>Intentions_free M (SD)</th>
<th>Intentions_pay M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gain</td>
<td>Statistical 5.522(0.883)* 0.017</td>
<td>5.807(0.745)* 0.034</td>
<td>4.753(1.200) 0.395</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative 5.630(0.679)*</td>
<td>6.113(1.019)*</td>
<td>5.261(1.422)</td>
</tr>
<tr>
<td></td>
<td>Loss</td>
<td>Statistical 6.140(0.730)* 0.000</td>
<td>6.433(0.897)* 0.000</td>
<td>6.009(0.736)* 0.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Narrative 5.225(0.185)*</td>
<td>5.474(1.363)*</td>
<td>4.564(1.349)*</td>
</tr>
</tbody>
</table>

**Table 2.** Means and Standard Deviations Related to the interactions for health belief

<table>
<thead>
<tr>
<th>Message Framing Type</th>
<th>Evidence Type</th>
<th>Susceptibility M (SD)</th>
<th>Seriousness M (SD)</th>
<th>Benefits M (SD)</th>
<th>Barriers M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gain</td>
<td>Statistical 3.657(1.396) 0.607</td>
<td>5.498(1.332) 0.756</td>
<td>5.272(1.084)**</td>
<td>4.651(0.930)* 0.079</td>
</tr>
<tr>
<td></td>
<td>Narrative 4.160(0.931)</td>
<td>5.547(0.867)</td>
<td>5.470(0.555)**</td>
<td>4.895(0.895)*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loss</td>
<td>Statistical 4.302(1.405) 0.369</td>
<td>6.045(0.931)**</td>
<td>5.977(0.685)**</td>
<td>5.230(1.295)**</td>
</tr>
<tr>
<td></td>
<td>Narrative 3.915(1.341)</td>
<td>5.555(1.136)**</td>
<td>5.532(0.842)**</td>
<td>4.113(1.019)**</td>
<td></td>
</tr>
</tbody>
</table>