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**VACCINE RISK PERCEPTION, RISK
COMMUNICATION AND DECISION-MAKING**

PHD THESIS ABSTRACT

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CLUJ-NAPOCA
2017

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Keywords: vaccination, vaccine risk perception, vaccine decision making, vaccine hesitancy, vaccine communication, message framing, educational interventions, mass media coverage, human papillomavirus (HPV) vaccine, seasonal flu vaccine.

CHAPTER 1. INTRODUCTION

General Aspects about Vaccines

Vaccines are a major tool for controlling and eliminating infectious diseases (World Health Organization [WHO], 2017d) and one of the most cost-effective health care developments (Bloom & Lambert, 2016; Bloom, Marcuse, & Mnookin, 2014).

Immunization programs eradicated smallpox, decreased poliomyelitis cases by > 99% and reduced the burden of other diseases (CDC, 2014; WHO, 2017b, 2017c). Vaccination is credited to save between 2 and 3 million lives annually (WHO, 2017d). However, the continued success of vaccines depends on the maintenance of a sufficiently high vaccine coverage level.

Rationale for the Present Thesis: the Problem of Suboptimal Vaccination Rates

Vaccine adoption requires not only facilitated access, but also acceptance (Thomson & Watson, 2012). Whereas a majority of persons accepts at least some routinely recommended vaccines, a notable number of persons decline immunization. Vaccine hesitancy can be found in most countries, and it was defined as “the delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines” (MacDonald & the Strategic Advisory Group of Experts [SAGE] Working Group, 2015, p. 1).

Insufficient vaccine coverage can lead to outbreaks of vaccine-preventable diseases as it was the case with the recent measles outbreak recorded in Romania (Ministry of Health, 2017). Since January 2016 until 28 April 2017, 5.119 measles cases, including 23 deaths, had been reported, compared to only 7 cases reported in 2015 (Ministry of Health, 2017). Furthermore, Romania has had a large decrease in DTP vaccine coverage (i.e., DTP3=diphtheria, tetanus, and pertussis third dose) between 2009 and 2013 (de Figueiredo et al., 2016). An example of exceptionally low uptake stems from the human papillomavirus [HPV] vaccination program. Although HPV vaccination was included in a free national campaign, the coverage rate in the target population in 2009 was only 2.57% (Ministry of Health, 2009). Seasonal flu vaccine coverage shows a decreasing trend as well, for example uptake rates among healthcare workers decreased from almost 98% in 2008 until 29.4% in 2014 (ECDC, 2015b; ECDC, 2016).

A fundamental question, and one that prompts the present thesis, refers to how one can reduce vaccine hesitancy and increase vaccination acceptability and uptake (Betsch, Böhm, &

Korn, 2013; MacDonald, Smith, & Appleton, 2012; Poland & Brunson, 2015). In order to answer such questions, recent years have seen an increase in research related to vaccine risk perception, decision-making and communication (Larson, Leask, Aggett, Sevdalis, & Thomson, 2013).

Theoretical Approaches on Vaccination Decision-Making and Communication

The most prominent conceptual frameworks for explaining vaccine decisions and behaviors are the Health Belief Model ([HBM], Abraham & Sheeran, 2015; Rosenstock, Strecher, & Becker, 1988) and the Theory of Planned Behavior ([TPB], Ajzen, 1991; Conner & Sparks, 2015) and, more recently, their extensions that incorporate additional constructs. Prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1981) is also commonly used in the attempt to test the effectiveness of framed messages in promoting vaccination.

Figure 1, reproduced from Betsch, Böhm and Chapman (2015, p. 63), illustrates an integrative model of determinants of vaccine decision-making.

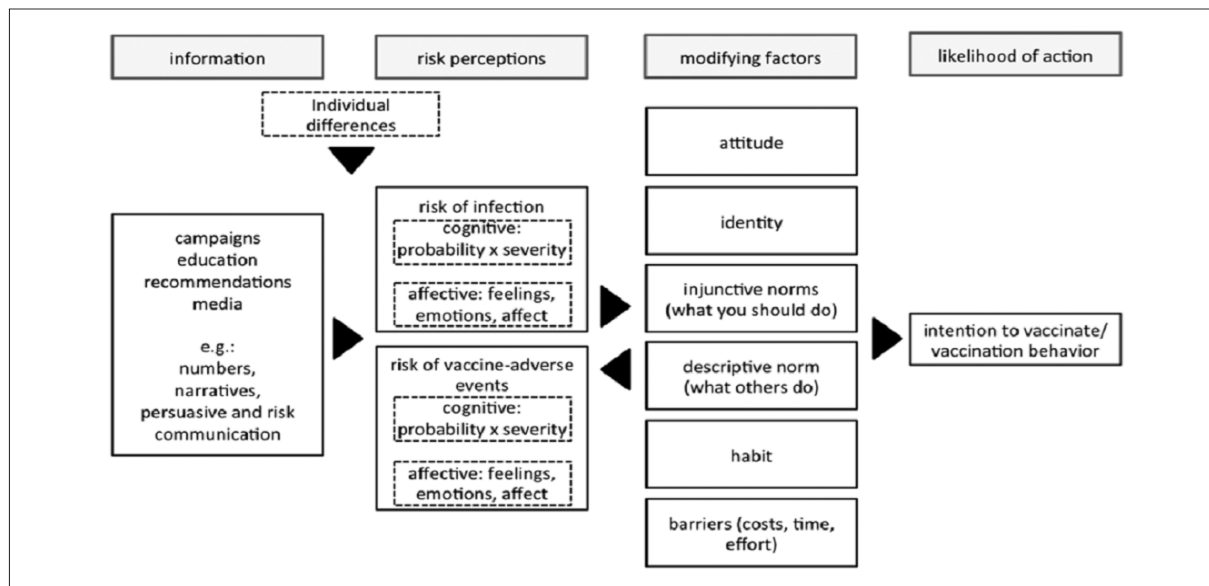


Figure 1. Determinants of vaccine decision making.

Taken together, theories are placing risk beliefs (i.e., cognitive risk estimates regarding perceived likelihood of contracting infection and perceived severity of infection) at the core of vaccination acceptance (Brewer & Fazekas, 2007; Liao, Wong, & Fielding, 2013). It was acknowledged that not only cognitive risk constructs matter in decisions, but also affective components (Kahneman, 2011; Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2007), and this account is reflected in some of the vaccination decision-

making literature that has been published in the past decade (Chapman & Coups, 2006; Liao et al., 2013; Weinstein et al., 2007). Importantly, information received through various sources (e.g., media, online forums) contributes to a subjective representation of risk (Reyna, 2012). Individual differences (e.g., knowledge), cognitive biases (e.g., narrative bias: Betsch, Renkewitz, & Haase, 2013; availability bias: Tversky & Kahnemann, 1973) can influence perceptions of risk, intentions and behavior. Prior attitudes, social norms, past vaccination behavior and structural barriers also contribute to vaccine decisions and behavior (Betsch et al., 2015). We refer to this model as a guide for the present thesis.

The Present Thesis: Directions for Research and Main Aims of the Thesis

The present thesis addresses the topics of vaccine risk perception, risk communication and decision-making. The thesis consists of seven chapters, which are organized around the five studies that we have conducted.

We outline five main aims of the present thesis:

1. To explore the content and quality of HPV vaccine media coverage in Romania (Study 1);
2. To explore the public's representations of the HPV vaccine as they were expressed on Internet discussion forums (Study 2);
3. To explore vaccine-related risk appraisals, knowledge levels and information needs and practices and to identify the psychological determinants of HPV vaccine and seasonal flu vaccine acceptability in a national sample of young adults (Study 3);
4. To provide a systematic review of published, peer-reviewed empirical studies that examined the effectiveness of gain- versus loss-framing in the context of vaccine communication (Study 4);
5. To examine the interplay of goal framing and outcome appeals (i.e., individual versus collective appeals) in influencing young adults' vaccination intentions and risk perceptions (Study 5).

CHAPTER 2.

STUDY 1. MASS MEDIA COVERAGE OF HPV VACCINATION IN ROMANIA: A CONTENT ANALYSIS*¹

Romania has the highest cervical cancer burden in Europe (Bruni et al., 2017). Despite the implementation of two national human papillomavirus (HPV) vaccination programmes, with the aim of preventing cervical cancer, vaccine uptake remained extremely low (Ministry of Health, 2009) and the programmes were discontinued.

It was proposed that mass media -as a commonly used source of vaccine information- might influence public risk perceptions and decisions about vaccination (Betsch et al., 2010; Haase et al, 2015). To our knowledge, no content analyses investigating media's representations of the HPV vaccine have been performed in Eastern European countries, particularly in those countries with high HPV-related cancer rates. The purpose of the present study was to address this gap by exploring the content and quality (accuracy of information) of HPV vaccine media coverage in Romania.

Our main research questions are:

1. What is the tone of media materials toward HPV vaccination?
2. Do the media provide complete and accurate information about the HPV vaccine?

Method

Using Google search engine, we selected 271 Romanian media reports related to the HPV vaccine. The following four online media outlets were considered eligible: newspapers, magazines, videos (audio visual information) and informational websites.

Coding Instrument, Procedure and Data Analysis

The analytic strategy included codes from previous media analysis research (Bodemer et al., 2012; Calloway et al., 2006; Habel et al., 2009; Kelly et al., 2009) and codes that were created by the authors after a subsample of 70 national media materials was examined.

¹ This study was published: Pența, M. A. & Băban, A. (2014). Mass media coverage of HPV vaccination in Romania: A content analysis. *Health Education Research*, 29, 977–992. doi:10.1093/her/cyu027. In the thesis we provide the integral text as published, with only minimal additions or changes to the original text.

The coding instrument tracked the following variables: the tone of the media material, vaccine label, information about HPV infection, cervical cancer and HPV vaccines and concerns regarding the vaccine. Other characteristics such as readability of the material, sources cited, direct recommendation and focus on personal testimonies were also covered. The content was considered accurate if it respected evidence-based guidelines from the following official institutions: Centers for Disease Control and Prevention [CDC], National Cancer Institute [NCI] and the Romanian Ministry of Health.

Every media material was coded manually, through a pen-and-paper method. Inter-coder reliability as measured by Krippendorff's alpha was 0.89 across all categories.

The data were entered into SPSS and descriptive statistics were run to assess the frequencies and crosstabs. Pearson's chi-square test was also conducted.

Findings

General Characteristics of the Sample and Tone

Table 1
Characteristics of the sample

	<i>n</i>	%		<i>n</i>	%
Media outlet			Tone		
Newspaper	92	34.0	Extremely positive	1	0.4
Magazine	25	9.2	Positive	63	23.2
Website	122	45.0	Neutral	85	31.4
Video	32	11.8	Mixed	46	17.0
Total^a	271	100	Negative	39	14.4
Year of publication			Extremely negative	37	13.6
2007	11	4.1	Label		
2008	51	18.8	HPV Vaccine	166	61.2
2009	70	25.8	Cervical cancer vaccine	81	29.9
2010	26	9.6	STD/STI vaccine	1	0.4
2011	81	29.9	Gardasil	22	8.1
2012	8	3.0	Cervarix	1	0.4
Not mentioned	24	8.9	Language		
Type of material			Easy to understand	268	98.9
Informative	249	91.8	Difficult to understand	3	1.1
Argumentative	13	4.8			
Interview	8	3.0			
Discussion	1	0.4			

^aFor each of the variables (media outlet, year of publication, type of material, tone, label, language) *N* = 271.

Results indicated that 31.4% of the materials were neutral toward the HPV vaccine (neither promoting nor opposing vaccination), 17% were mixed (contained both disapproving and approving statements), 28% were negative or disparaging, whereas 23.6% were positive (Table 1).

Some negative titles include: “Adolescent girl died after getting cervical cancer vaccine” (Neagu, 2009) or “A 12-year-old girl became paralysed after being injected with the controversial vaccine” (Gandul, 2008a). One example of positive tone is the following title: “Cervical cancer vaccine, a success” (Nistor, 2011). Neutral reports provided factual information, such as: “Ministry of Health will continue the national vaccination campaign” (HotNews.ro, 2009).

Information about the Vaccine

Most reports failed to provide information about key topics such as efficacy, duration and dosing (Table 3). Only 18.5% of the sample correctly presented information about vaccine’s efficacy. Negative reports presented more incorrect facts about efficacy ($\chi^2(6) = 35.04, p < .001$). Media omitted information about vaccine’s extent of protection in > 86% of reports.

Table 3
Accuracy of vaccine information

Vaccine information	Accurate		Not accurate/incomplete		Not mentioned		Total ^a
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Efficacy	50	18.5	51	18.8	170	62.7	271
Dosing	75	27.7	3	1.1	193	71.2	271
Duration	23	8.5	14	5.2	234	86.3	271
Target age	76	28.0	71	26.2	124	45.8	271
Non-living materials	17	6.3	4	1.5	250	92.2	271

^a*N* = 271, representing 100% of the total sample.

Information about HPV and Cervical Cancer

Only 16.6 % of the sample provided data about HPV prevalence, whereas < 5% addressed the limited effectiveness of condoms in preventing HPV (Table 4). Positively-toned reports were more likely to provide information about HPV prevalence compared with negatively-toned ones ($\chi^2(3) = 17.36, p < .001$).

Table 4
HPV and cervical cancer information

HPV and cervical cancer facts	Mentioned ^a	
	<i>n</i>	%
HPV Prevalence	45	16.6
HPV sexual transmission	79	29.2
Other means of transmission	17	6.3
HPV asymptomatic	13	4.8
HPV short-lived	25	9.2
Condom limited effectiveness	12	4.4
HPV Types	60	23.2
Link HPV-cervical cancer	144	53.1
Statistics cervical cancer	111	41.0
Pap test still necessary	45	16.6

^aThis table presents the frequencies (from the total sample of 271 materials) and the corresponding percentages that included HPV and cervical cancer information.

Concerns Surrounding the Vaccine

The two most frequent concerns were side effects (discussed in 36.9% of the sample) and insufficient testing (19.2%) (Table 5).

Table 5
Concerns regarding HPV vaccination

Concerns	Mentioned ^a	
	<i>n</i>	%
Side effects	100	36.9
Insufficient testing	52	19.2
Big Pharma	30	11.1
Financial interests	25	9.2

^aThis table presents only the frequencies (from the total sample of 271 materials) and the corresponding percentages that mentioned concerns regarding HPV vaccination.

About one-third of the items reported parents' views on vaccination, and 91.4% of these were presented as having a negative attitude.

Sources Cited and Direct Recommendation

Direct quotes from doctors, researchers, or public figures were constantly used (35.1%) both by supportive and by disparaging reports in order to reinforce the credibility of the message.

A total of 9.2% ($n = 25$) of the sample focused on vivid, personal testimonies in order to provide stronger messages. Only three testimonies were positive towards the vaccine, as the others

had a negative valence, presenting particular cases of girls from other countries who suffered serious side effects after receiving the vaccine, such as paralysis or death. A small number of the media stories (2.2%) made direct recommendation in favour of vaccination, whereas 4.8% made recommendation against it.

Discussion

Our analysis indicated that the readers were provided mostly with neutral and negative reports about the vaccine. Often, worries were raised about vaccine's reported efficacy and safety, with media reporting about girls from Europe and United States who suffered serious damages shortly after vaccination. This is problematic, given that fast-paced communication on online platforms and news sharing makes it probable for negative vaccine messages to be disseminated quickly to a large number of persons.

Analysis indicated that most media reports failed to provide even elementary information on HPV and HPV vaccines, which might have led to several unanswered questions. Furthermore, in some occasions, media represented the HPV vaccine incorrectly, leading to misinformation. We found that negatively-disposed reports were more likely to contain some inaccuracies and less likely to provide comprehensive information about the vaccine and HPV-related diseases. Given that many adults get vaccine-related news from the media, this might be particularly detrimental to vaccination-related knowledge and acceptability.

We identify two major areas for improvement:

1. Future educational interventions are crucial in order to support people in making informed decisions about immunization. Efforts should be directed at supplying more information about vaccines, as well as about HPV. In this way, people might be more likely to understand vaccine's utility and to gain confidence in the vaccination programme.
2. The results highlight the need for more rigorous standards when communicating about vaccines. Improving communication between health officials and mass media (Payne & Schulte, 2003; WHO, 2017a) might represent a useful strategy.

CHAPTER 3.
STUDY 2. DANGEROUS AGENT OR SAVIOUR? HPV VACCINE
REPRESENTATIONS ON ONLINE DISCUSSION FORUMS IN ROMANIA*²

A significant number of people turn to the Internet to locate HPV vaccine information (Hughes et al., 2009; McRee et al., 2012). Given the expansion of Web 2.0 technology (Betsch et al., 2012; Betsch & Sachse, 2012; Kata, 2012), discussion forums have become an important source of vaccine information (Nicholson & Leask, 2012). A consistent body of research has shown that negative vaccine-related information on the Internet might impact knowledge, risk-perception and decision making (e.g., Betsch, 2011; Betsch et al., 2010; 2012; 2013; Nan & Madden, 2012). Therefore, it is important to identify the type of vaccine representations evoked in the online environment.

To our knowledge, no studies have examined the way the HPV vaccine has been represented in online discussion forums. This paper aims to explore HPV vaccine-related conversations posted on discussion forums and to provide in-depth insight into people's perspectives and particularities of communication about the vaccine.

Method

Using an inductive approach (Braun & Clarke, 2006), we conducted a thematic analysis (Braun & Clarke, 2006) with a focus on language.

Through Google we identified Romanian discussion forums relating to HPV vaccine. The search terms were “discussion forum”, “HPV vaccine” and “cervical cancer vaccine”. Twenty forums, with a total sample size of 2,240 comments (2007-2012), were included in the study.

Findings

Characteristics of Participants and Characteristics of the Discussions

Findings are presented in three subsections, corresponding to the global types of forum participants and are organized into main themes, accompanied by relevant data extracts.

² This study was published in an international journal: Pența, M. A. & Băban, A. (2014). Dangerous agent or saviour? HPV vaccine representations on online discussion forums in Romania. *International Journal of Behavioral Medicine*, 21, 20–28. doi:10.1007/s12529-013-9340-z. In the thesis we include the integral text as published, with minimal additions to the original text.

1. Information-seekers – to Vaccinate or Not to Vaccinate?

This category of participants asked for others' opinions about the vaccine and had few interventions in later discussions. They presented themselves as seeking answers and as having little knowledge on the subject. Generally, their messages expressed hesitancy: *“Should I believe doctors or rumours?”* (F, 2009).

2. Opponents - How is the HPV Vaccine Constructed as Harmful?

Dangerous vaccine.

A major category of users stated that they would not accept vaccination, as they considered the HPV vaccine *“more dangerous than the disease”* (NS, 2010). They expressed concern over side effects, claiming that vaccination was associated with mortality and morbidity worldwide.

Participants made use of drama and vivid narratives in order to motivate their position. The following quotes are illustrative: *“Have you seen the recent case in England concerning the girl who died only a few hours post-vaccination? Everyone knew the girl full of energy until after autopsy when they said that- supposedly- she was terribly ill. She was only 14 years old”* (F, 2009). Some went from expressing their opinion, to vigorously trying to persuade others to reject the vaccine and presented dreadful consequences of immunization: *“Do not vaccinate your daughters OR you will risk their lives! A lot of vaccinated girls died or became paralysed or they ended up so ill they need to take tons of medicines for the rest of their lives.”*(NS, 2009). *“This vaccine is extremely dangerous! ... Could you live with the guilt of causing permanent harm to your child? What if your own child becomes paralyzed?”*(Male [M], parent, 2008). Misinforming statements were also encountered: *“This vaccine was banned in America, Canada and Austria because it has caused 25 deaths!?”*(M, 2008). Anti-vaccine users presented vaccines as unnatural: *“vaccines’ cumulative effect is like a bomb, with every vaccine you interfere with nature, it’s a step further for serious diseases and death”* (M, 2009).

The policy regarding parental consent was raised as an argument in order to support the belief that the vaccine is risky: *“If there are no dangers, then why do they ask for our consent in writing?”* (F, parent, 2008).

Another concern related to vaccine's dangerousness arose from what was perceived to be insufficient testing: *“Too many unknown facts. Neither one of the vaccines has been tested enough...even producers have no idea about its effects. ...”* (F, 2009).

References to other parents' and doctors' attitudes or practices were frequent: *"In my son's class, all parents refused vaccination"* (F, parent, 2008) and *"I talked to doctors and professors and ABSOLUTELY ALL of them said that they wouldn't vaccinate"* (NS, 2008).

Conspiracy theories.

A subcategory of people postulated that the vaccine is deliberately promoted with the intention to exterminate part of the population: *"Some guys out there consider we are too many on this earth! ...They want us dead."* (NS, 2009). They frequently mentioned words such as *"genocide"*, *"Masonic vaccine"*, *"experiment"*, *"sterilizing vaccine"* and they considered vaccination as *"the biggest crime against humanity"*.

They raised accusations of genocide, claiming that the vaccine might cause abortion and sterilization, as illustrated by the following excerpt: *"This vaccine 'helps' girls so that they will not be able to have children. It's unknown whether vaccinated girls will give birth to healthy babies or to monsters. The Ministry of health has become the Ministry of sterilization"* (M, 2008).

Romania's position is frequently compared to Western countries and is described in a negative light: *"We have become the guinea pigs for the entire world! Have there been such vaccinations in other countries? Every nation makes fun of us. They [US and Western European countries] refused the vaccine, that's why they sent it here"* (F, 2008).

Lack of trust and discontent with the national health system.

The trustworthiness of pharmaceutical companies, Government, doctors and medical establishment is contested. The vaccine was seen as a questionable business, instead of a protective agent. Most participants used irony or sarcasm to express their views: *"The Health Minister was so preoccupied with our best interest, the money they've received had nothing to do with them pushing the vaccine."* (M, 2008).

Participants provided their views about the reasons underneath pharmacological industry's actions: *"...Who doesn't remember the H5n1 scare? Someone made a huge profit then... Big pharma release 'wonder-anti cancer products' to make profits. They are only interested to sell and are like a snake that would go through any lengths to manipulate the public. They created a 'scary' campaign to make mothers afraid and make them buy the vaccine. They come up with statistics about cervical cancer deaths only to convince you that if you do not vaccinate you have all the chances to get a 'terrible disease'"* (NS, 2010). *"Cancer produces money! They play with*

your perceptions and fears. They know your reactions. Thing is that these are doubtful vaccines that they stick on our throat...HPV vaccine is nothing but a big scam” (M, 2009).

Many commenters suggested that institutions suppress information about vaccine risks and endorsed the idea that scientific data about vaccines cannot be trusted: *“who guarantees us that the data from the studies are not falsified as was the case with previous vaccines?” (F, 2009).*

Dissatisfaction with the health system was commonly encountered, as some participants stated: *“I find suspicious the rush with which the vaccine was launched in a country where the health system does nothing for people. Most hospitals are on the verge of collapsing and they spend money on a vaccine that just might be efficient” (NS, 2008).*

HPV vaccine as “an injectable condom”.

Discourses of morality emerged and a notable concern refers to the vaccine as promoting promiscuity in girls: *“The Ministry of Sin sends the message that by getting vaccinated girls can sin as long as they want. ‘Do I vaccinate my daughter and give her a green light to promiscuity or do I educate her to be only with her husband?’ ...Why should a child, a 4th-grade school girl, become a prostitute? (F, parent, 2009).*

HPV vaccine as useless technology.

The vaccine was presented as unnecessary. Some underestimate the prevalence of HPV-related diseases: *“No one needs the vaccine. I’ve recently heard that in Romania 5 women die of cervical cancer every day. Personally I’ve never heard about this disease. I bet your statistics are fake, in my whole life I’ve never heard about any woman dying of cervical cancer in my town ...” (M, 2008).* Furthermore, cervical cancer is presented by some as a disease affecting mostly a certain category of women: *“As far as I know, only prostitutes are at risk. Women will not get cervical cancer if they will make love (not sex) with one partner only.... Parents who educate their girls can relax and can sign the refusal form” (M, 2008).*

Many people endorse alternative protective methods, such as screening, sexual education, homeopathic medicine, diet or belief in God, claiming that: *“Epidemics have passed without vaccines. ...Our ancestors were well-known for their vitality and they treated themselves with natural plants only...” (F, 2009).*

3. Supporters - How is the HPV Vaccine Constructed as Beneficial?

Helpful discovery.

People who reported to have had personal experiences with HPV or cervical cancer described the vaccine as a helpful discovery and as a “*life-saver*”. They presented powerful first-person accounts: “*Personally, I’ve had only one sexual partner in my life. I was a good girl and I’ve waited for the right man for 20 years. I always took care of my health and look what happened to me... I have a high-risk HPV strain and had two resections of the cervix uteri. If I’d had the possibility to get the vaccine, I would have done it*” (F, 2008).

“The normal thing to do”.

Science-oriented commenters endorsed vaccination and evidence-based medicine in general. According to them, HPV vaccination is safe, effective, important and is described as “*the normal thing to do*”.

They criticized rumours and “*fight against obscurantism and primitivism*” (M, 2008), as they called it, was a recurrent subtheme. They were critical and took an educative role: “*Maybe you did not know, but today, diseases such as polio have been eradicated precisely with the help of vaccines. With regards to HPV vaccine, the list of potential side effects is known: dizziness, redness, faintness. None of them affects children’s health. It’s not me who says that, but the institutions who monitor vaccines. So what do we have here? Youtube versus FDA*” (M, 2009).

Finally, these participants expressed concern about the negative effects of the anti-vaccine lobby: “*You might not realize that, but by spreading your ideas you might actually harm many innocent people.*” (M, 2009).

Discussion

Our results indicated that positive discourses around vaccination relying on evidence-based arguments or life experience with HPV-related diseases battled with negative discourses that focused mainly on pseudo-scientific evidence, subjective interpretation of medical reports and rejection of epidemiological information. In short, vaccine opponents described HPV vaccine as dangerous, disseminated conspiracy allegations, considered that health system, pharmacologic companies and officials are untrustworthy, raised moral concerns regarding promiscuity and made efforts to convince others that the vaccine was unnecessary. On the other hand, supporters considered the vaccine as helpful, warning that anti-vaccine messages might have deleterious effects on other people’s decisions. In terms of communication techniques, science-oriented discussants presented evidence-based data and statistics. Opponents and supporters with a personal

or familial experience with HPV or cancer made use of affective strategies. For example, opponents presented salient cases of girls experiencing dreadful post-vaccination consequences and sent “Don’t do it, or you will regret it!” warnings. Therefore, one strategy seems to be the elicitation of negative emotions such as anxiety or regret. Findings should be interpreted in light of research that has documented the role of emotion in decision-making (Loewenstein et al., 2001; Slovic et al., 2005; Ziarnowski, Brewer, & Weber, 2009) as well as the superiority of narratives over statistics in raising risk perception (Betsch et al., 2011; Haase, et al., 2015) and the negative effect of exposure to negative vaccine information and conspiracy theories (Betsch et al., 2010; Jolley & Douglas, 2014)

In conclusion, these findings could be viewed as making a call to action. Educational interventions are necessary if we aim to promote well-informed decisions.

CHAPTER 4.

STUDY 3. PREDICTORS OF HPV VACCINATION AND SEASONAL INFLUENZA VACCINATION ACCEPTABILITY AMONG YOUNG ADULTS

Although the last years have seen a major increase in research on the topic of HPV vaccine acceptability (Brewer & Fazekas, 2007; Christy et al., 2016; Krawczyk et al., 2012; Rosenthal et al., 2011), few studies were conducted in countries with a high burden of disease morbidity, as it is the case with cervical cancer in Romania. At the same time, it is acknowledged that directions to address gaps in vaccine coverage should be context dependent (Larson et al., 2014). However, no research has investigated the psychosocial factors that predict intentions to get vaccinated among Romanian non-expert young adults. Little is known, at a national level, about the vaccine-knowledge and risk beliefs of young adults and about the predictors of vaccine acceptability.

The present study addresses this gap and focuses on HPV and seasonal influenza vaccination acceptability among young adults (18–26-year-old). An extended version of the health belief model (HBM) provided the main theoretical framework for this study.

This study aims to: (1) assess attitudes toward vaccines in general; assess knowledge and risk perceptions about HPV and the HPV vaccine and about flu and the flu vaccine in a sample of young adults eligible for vaccination; (2) identify predictors of HPV and flu vaccine acceptability; and (3) identify the most used and most trusted sources of information about vaccines.

Method

Participants and Procedure

A total of 401 participants aged 18-26 completed the theory-based survey and were included in analysis.

Measures

The survey included measures derived from published scales used in previous vaccine acceptability and acceptance research (Brewer & Fazekas, 2007; Cameron et al., 2013; Fazekas, Brewer, & Smith, 2008; Gilbert, Brewer, Reiter, Ng, & Smith, 2011; Hughes et al., 2009; McRee, Brewer, Reiter, Gottlieb, & Smith, 2010; Reiter, Brewer, Gottlieb, McRee, & Smith, 2009; Reiter, Brewer, & Smith, 2010).

The survey included: (a) demographic and health-related variables; (b) general vaccine attitudes and beliefs; (c) Flu and the flu vaccines: knowledge, beliefs (HBM-based constructs: perceived susceptibility to disease, perceived severity of disease, perceived vaccine effectiveness, perceived vaccine safety and side effects, cues to action, perceived barriers), anticipated emotions (anticipated inaction regret, anticipated worry) and vaccination intentions; (d) HPV and HPV vaccines: awareness, knowledge, beliefs (HBM constructs), anticipated emotions and vaccination intentions; (e) Sources of health-related information and informational needs on vaccines. The main outcome variables were intentions to be vaccinated against HPV and the seasonal flu (i.e., vaccine acceptability). Details of the measures are provided in the extended version of the thesis.

Data Analyses

We used descriptive statistics to assess vaccine-related acceptability, risk perceptions, attitudes and knowledge. We used bivariate correlations (and Point-Biserial correlations) and hierarchic linear regression to identify correlates and predictors of participants' intentions to get vaccinated. All analyses were performed using SPSS, v 20.

Findings

Characteristics of Participants

Mean age was 21.49 years ($SD = 2.41$; range 18–26) and 79% of the sample were women. Approximately 28% of respondents reported that they had refused at least one routinely recommended vaccine. Participants' characteristics are presented in Table 1.

Table 1
Sample characteristics

Variables	<i>n</i> (%)	Mean (<i>SD</i>)
Age		21.49 (2.41)
18-20	179 (44.6)	
21-23	127 (31.6)	
24-26	95 (23.6)	
Sex		
Female	317 (79.1)	
Male	84 (20.9)	
Relationship status		
Single	189 (47.1)	
Currently in a relationship	175 (43.6)	
Married	24 (6.0)	
Other/No response	13 (3.2)	
Have had at least one sexual experience		
Yes	320 (79.8)	
No	69 (17.2)	
Previous history of vaccine refusal		
Yes	113 (28.2)	
No/Don't know	288 (71.8)	
Ever heard of HPV		
Yes	221 (55.1)	
No / Don't know	173 (43.1)	
Ever heard of HPV vaccine		
Yes	185 (46.1)	
No / Don't know	210 (52.3)	
Prior HPV diagnosis		
Yes	17 (4.2)	
No/Don't know	377 (94.0)	
Provider recommended HPV vaccine		
Yes	15 (3.7)	
No/Don't know	379 (94.5)	
Provider recommended Flu vaccine		
Yes	86 (21.4)	
No/Don't know	305 (76.0)	
HPV-related knowledge score		6.52 (5.15)
Flu -related knowledge score		6.15 (2.29)
General vaccine attitude score		20.73 (4.56)

Note. *N* = 401. Totals may not add to 100 % due to missing data or rounding

Information-Seeking Practices, Cues to Action and Vaccine-related Knowledge

When asked about which information source they would *most often use* for vaccine information, 43% of participants answered Internet / websites and 39.7% listed doctors. The *most trusted* source were doctors (63.3%), but only 3.7% and 21.4% reported having received a health care provider recommendation to get the HPV vaccine and the seasonal flu vaccine, respectively.

Overall, flu-related knowledge was moderate, revealing some misconceptions. About 55% of the sample reported having heard of HPV. Almost half of the sample knew that HPV can cause cervical cancer, but less than a third knew that it can also cause some types of cancer in men. Around 20% falsely believed that condoms provide complete protection against HPV (Table 2).

Table 2
HPV knowledge items (selected items)

HPV knowledge items (Accurate response: True/False)	True (Participant response – %)	False	Not sure
HPV can cause genital warts (T)	27.9	6.0	64.3
HPV can cause cervical cancer (T)	48.4	2.7	47.1
HPV can cause cancer in men (T)	26.7	8.7	62.8
Only women can have HPV (F)	12.2	35.9	50.1
The best way to prevent disease caused by HPV is to have Pap smears performed (T)	50.9	6.7	40.6
HPV can be passed from the mother to baby(T)	24.7	8.7	64.6
HPV is related to HIV/AIDS (F)	8.0	36.2	54.1
Most sexually active people will get HPV at some point in their life (T).	17.5	20.9	59.9
In most cases, HPV goes away on its own (T)	5.0	45.9	47.4
Condoms provide complete protection against HPV (F)	20.7	34.2	43.4
Often, HPV has no symptoms (T)	44.1	6.5	47.6
HPV infection is rare (F)	5.5	40.1	52.6

Note. Accurate answers (%) are marked with bold.

4.4.7. Correlations between Study Variables and Vaccination Intentions

Anticipated inaction regret, perceived vaccine effectiveness, perceived vaccine safety were significantly correlated with vaccination intentions (all $ps < .01$). Table 4 presents the bivariate correlations among all the flu-related variables of interest.

Table 5 presents the correlations among the HPV-related variables.

Table 4

Correlation matrix for the flu vaccine data

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Intention	1														
2. Attitudes	.576**	1													
3. Knowledge	.406**	.512**	1												
4. Previous refusal	-.346**	-.349**	-.201**	1											
5. Perceived susceptibility	.237**	.232**	.239**	-.141**	1										
6. Perceived severity	.204**	.131**	.146**	-.174**	.364**	1									
7. Anticipated worry	.251**	.158**	.159**	-.172**	.175**	.590**	1								
8. Perceived vaccine effectiveness	.636**	.623**	.450**	-.279**	.234**	.232**	.289**	1							
9. Perceived vaccine safety	.584**	.661**	.419**	-.314**	.206**	.164**	.208**	.608**	1						
10. Perceived side effects	-.433**	-.607**	-.285**	.257**	-.118**	.006	-.011	-.414**	-.595**	1					
11. Anticipated regret	.663**	.429**	.315**	-.270**	.102*	.312**	.408**	.558**	.465**	-.346**	1				
12. Worry infecting others	.310**	.265**	.330**	-.050	.207**	.413**	.330**	.330**	.340**	-.228**	.403**	1			
13. Doctor recommendation	.170**	.056	.142**	-.010	.063	.036	-.046	.206**	.085*	-.024	.127**	.162**	1		
14. Have friends who got vaccinated	.158**	.041	.115*	-.016	.061	.021	-.020	.130**	.090*	-.018	.104*	.098	.365**	1	
15. Sex	.007	.000	-.027	-.064	-.205**	-.092*	-.048	.004	.090*	-.043	.018	.013	.113*	-.024	1

Note. * $p < 0.05$; ** $p < 0.01$. Previous refusal was coded as 0 = no or don't know and 1 = yes; Doctor recommendation was coded 0 = no or don't know and 1 = yes; Have friends who got vaccinated was coded as 0 = no or don't know and 1 = yes; Sex was coded as 0 = women and 1 = men.

Table 5
Correlation matrix for the HPV vaccine data

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Intention	1																
2. Attitudes	.498**	1															
3. Knowledge	.150**	.204**	1														
4. Previous refusal	-.270**	-.349**	-.007	1													
5. Perceived susceptibility	.254**	.081*	.129*	-.004	1												
6. Perceived severity	.182**	.099*	.036	-.086*	.046	1											
7. Anticipated worry	.143**	.157**	.094*	-.113*	.024	.642**	1										
8. Perceived vaccine effectiveness	.527**	.548**	.119**	-.221**	.112*	.269**	.230**	1									
9. Perceived vaccine safety	.500**	.566**	.116**	-.215**	.101*	.145**	.145**	.551**	1								
10. Perceived side effects	-.339**	-.466**	.043	.196**	-.042	.069	.019	-.337**	-.480**	1							
11. Anticipated regret	.592**	.467**	.049	-.205**	.106*	.197**	.236**	.579**	.478**	-.271**	1						
12. Worry infecting others	.302**	.266**	.020	-.075	.222**	.411**	.465**	.198**	.312**	-.148	.239**	1					
13. Sex	-.167*	.000	-.162**	-.064	.008	-.129**	-.176**	.054	.075	-.124**	.048	-.021	1				
14. Age	-.002	.167**	.310**	-.173**	.028	-.083*	-.118	-.004	.077	-.030	-.059	-.106	-.018	1			
15. Awareness HPV	.126**	.196**	.711**	.030	.084*	.014	.052	.101*	.117*	-.012	-.001	.066	-.114*	.261**	1		
16. Ever had sex	-.143**	-.083*	-.132**	.105*	-.225**	.012	.029	-.022	-.013	.096*	-.004	-.130*	-.047	-.239**	-.074	1	
17. No. of sexual partners	.137*	.056	.168**	-.035	.258**	-.094*	-.196**	.040	.061	-.032	-.019	.039	.199**	.364**	.137**	-.601**	1

Note. *p < 0.05; **p < 0.01. Previous refusal was coded as 0 = no or don't know and 1= yes; Sex was coded as 0 = women and 1= men; Prior awareness of HPV was coded as 0 = no or don't know and 1= yes; Ever had sex was coded as 0 = yes and 1= no.

Predictors of Vaccination Intentions

The regression models are based on an extended version of the HBM because of its proven relevance to vaccine acceptance (e.g., Brewer & Fazekas, 2007; Christy et al., 2016).

With respect to the model predicting flu vaccine acceptability, previous vaccine refusal and vaccine-related knowledge were entered in the first step of the equation; the HBM-derived variables were added in the second step; followed by anticipated inaction regret in the third step. Anticipated inaction regret ($\beta=.42, p <.001$), perceived vaccine effectiveness ($\beta=.24, p <.001$), perceived vaccine safety ($\beta=.19, p <.001$), previous vaccine refusal ($\beta=-.10, p <.01$) and perceived susceptibility to infection ($\beta=.10, p <.01$) were significant predictors of flu vaccine acceptability. Overall, the model explained 60% of the variance in intentions (Table 6).

Table 6
Multiple regression analyses of flu vaccine intention in relation to study variables

Predictor	ΔR^2	<i>B</i>	SE <i>B</i>	β	<i>p</i>
<i>Step 1</i>	.24				
Previous vaccine refusal (0 = no, 1 = yes)		-2.08	0.34	-.28***	.000
Knowledge		0.53	0.07	.35***	.000
<i>Step 2</i>	.25				
Previous vaccine refusal		-0.99	0.30	-.13**	.001
Knowledge		0.12	0.06	.08	.063
Perceived Susceptibility		0.20	0.16	.05	.209
Perceived Severity		0.12	0.11	.02	.621
Perceived Effectiveness		1.53	0.19	.39***	.000
Perceived Safety		1.00	0.18	.26***	.000
<i>Step 3</i>	.11				
Previous vaccine refusal		-0.74	0.26	-.10**	.005
Knowledge		0.09	0.05	.06	.114
Perceived Susceptibility		0.39	0.14	.10**	.006
Perceived Severity		0.25	0.13	.07	.052
Perceived Effectiveness		0.91	0.18	.24***	.000
Perceived Safety		0.72	0.17	.19***	.000
Anticipated inaction regret		1.45	0.15	.42***	.000
Total $R^2 = .60$					
Total Adjusted $R^2 = .595$					
$N = 389$					

With respect to the model predicting HPV vaccine acceptability, gender and sexual history were entered in the first step; previous refusal and HPV-related knowledge were entered in the second step; HBM variables were entered in the third step and anticipated regret in the fourth step. Anticipated regret ($\beta=.38, p <.001$), perceived vaccine safety ($\beta=.22, p <.001$), gender ($\beta=-.17, p <.001$), perceived susceptibility ($\beta=.16, p <.001$), previous vaccine refusal ($\beta=-.15, p <.001$), perceived vaccine effectiveness ($\beta=.13, p <.05$) and sexual history ($\beta=-.09, p <.05$) predicted HPV vaccine acceptability. The model explained ~ 51% of the variance in intentions (Table 7).

Table 7
Multiple regression analyses of HPV vaccine intention in relation to study variables

Predictor	ΔR^2	<i>B</i>	SE <i>B</i>	β	<i>p</i> value
<i>Step 1</i>					
	.028				
Gender (0 = women, 1 = men)		-0.87	0.38	-.11*	.023
Ever had sex (0 = yes, 1 = no)		-1.14	0.43	-.13**	.009
<i>Step 2</i>					
	.087				
Gender		-0.88	0.37	-.12*	.019
Ever had sex		-0.79	0.40	-.09	.062
Previous vaccine refusal (0 = no, 1 = yes)		-1.92	0.33	-.28***	.000
Knowledge		0.07	0.03	.11*	.031
<i>Step 3</i>					
	.315				
Gender		-1.22	0.31	-.16***	.000
Ever had sex		-0.66	0.35	-.08	.059
Previous vaccine refusal		-1.10	0.28	-.16***	.000
Knowledge		0.31	0.24	.02	.659
Perceived Susceptibility		0.72	0.17	.17***	.000
Perceived Severity		0.08	0.12	.01	.876
Perceived Effectiveness		0.57	0.09	.32***	.000
Perceived Safety		1.16	0.19	.29***	.000
<i>Step 4</i>					
	.081				
Gender		-1.26	0.28	-.17***	.000
Ever had sex		-0.74	0.32	-.09*	.023
Previous vaccine refusal		-1.00	0.26	-.15***	.000
Knowledge		0.02	0.01	.02	.545
Perceived Susceptibility		0.68	0.16	.16***	.000
Perceived Severity		0.05	0.08	.01	.923
Perceived Effectiveness		0.23	0.09	.13*	.014
Perceived Safety		0.90	0.18	.22***	.000
Anticipated inaction regret		1.17	0.15	.38***	.000
Total $R^2 = .511$					
Total Adjusted $R^2 = .500$					
<i>N</i> = 388					

Discussion

This research provides information on the theory-based factors that guide acceptability of the HPV vaccine and of the seasonal flu vaccine among a national, non-expert sample of unvaccinated young adults. It provides insights into participants' attitudes, knowledge, risk perceptions, as well as their vaccine-related information needs and usage.

Whereas a majority of respondents reported overall favorable attitudes toward vaccines in general, our findings are indicative of the existence of vaccine hesitancy. In particular, there were high levels of uncertainty regarding vaccine-related risks.

For both decisional contexts, anticipated inaction regret predicted intentions above and beyond the role of traditional risk beliefs constructs (HBM-derived constructs). This finding is consistent with prior studies that found anticipated regret as a predictor of flu vaccination acceptability (Liao et al., 2013; Weinstein et al., 2007) and of HPV vaccine acceptability among parental samples (Brewer et al., 2011; Hofman et al., 2014; Ziarnowski et al., 2009) and extends this finding to young adults. This is the first study to show that anticipated regret is a predictor of HPV vaccination intentions in a mixed sample of young adults. As expected, other theory-based factors that showed a significant contribution for both vaccination decisions included perceived vaccine effectiveness and safety, perceived susceptibility to disease and past vaccination behavior.

With respect to knowledge and information sources, the Internet and online outlets are commonly used for information about vaccines. Whereas the majority of participants reported that healthcare providers are their most trusted information source, only a minority have received a recommendation to vaccinate from their doctor. Thus, one future direction would be to train health care providers to take a more proactive role regarding vaccination-related communication. Taken together, future information campaigns, if well-designed and evidence-driven, appear warranted.

In conclusion, this study is the first to examine, in one setting, acceptability of both HPV and seasonal influenza vaccination among young adults. The study contributes to our understanding of young adults' perspectives on vaccines and points to an array of factors that appear to guide vaccine-related decisions, offering a starting point for future communication activities.

CHAPTER 5.

STUDY 4. MESSAGE FRAMING IN VACCINE COMMUNICATION: A SYSTEMATIC REVIEW OF PUBLISHED LITERATURE³

One popular approach applied to vaccine communication is message framing. According to prospect theory ([PT], Kahneman & Tversky, 1979; Tversky & Kahneman, 1981), the framing effect occurs when two logically equivalent options lead to distinct preferences and decisions, depending on whether they are described in terms of either gains or losses. The theory states that when the messages are gain-framed, people are risk-averse, but when the messages are loss-framed, they are risk-seeking (Tversky & Kahneman, 1981).

Levin, Schneider, and Gaeth (1998) discerned among three types of framing: “risky choice”, “attribute” and “goal framing”. In the present review we focus on goal framing, which is commonly used in persuasive communication studies and holds that gain-framed messages would present the positive consequences of performing a behavior, whereas loss-framed messages would present the negative consequences of not performing the behavior (Levin et al., 1998).

A considerable body of empirical research on message framing in the context of vaccination has accumulated. A meta-analysis (O’Keefe & Nan, 2012) found no significant difference in the persuasiveness of gain- versus loss-framed messages but highlighted that further evidence is needed, pointing toward the need to identify significant moderators.

This article aims to provide a review of the current state of published literature that has examined the effectiveness of goal framing in the context of vaccine communication and to propose new study directions, with an eye toward implications for theory and practice.

Method

Search Strategy

³ This study was published: Pența, M.A. & Băban, A. (2017). Message Framing in Vaccine Communication: A Systematic Review of Published Literature, *Health Communication*. Advance online publication. doi.org/10.1080/10410236.2016.1266574. In the thesis we provide the integral text as published, with only minimal additions or changes to the original text.

To locate studies, we examined the reference list from the latest meta-analytic review (O’Keefe & Nan, 2012), we conducted systematic database searches (EBSCO Academic Search Complete, PubMed, PsycINFO, Web of Science—All Databases) to identify subsequent studies, and we manually searched the references of included articles. We used the following search terms: *message fram**, *gain fram**, *loss fram**, *goal fram**, *positive fram**, *negative fram**, *vaccine*, *vaccination*, *immunization*, *immunisation*, and *inoculation*, which were combined with the Boolean operators. The search was restricted to papers published since 2011 (because the last review would have identified studies published prior to this) through July 2016⁴. Database searches yielded 1,103 records (Academic Search Complete = 53, PubMed = 27, PsycINFO = 62, Web of Science = 961), which were screened for inclusion in the current review.

Inclusion and Exclusion Criteria

Studies selected had to meet five criteria. First, the studies had to compare gain- and loss-framed (i.e., goal-framed) messages using (quasi-) experimental designs. Second, the messages had to focus on vaccination. Third, the studies had to be published in English and, fourth, in scholarly, peer-reviewed journals. Lastly, the articles had to measure behavior, intention, or attitude as outcomes.

Coding Procedure

For each study, we systematically recorded information about the following characteristics:

1. Study identification: author(s), publication year, country;
2. Participants: target group, sample size, mean age, gender composition, allocation;
3. Study characteristics: design; type of outcome; presence of a control group; self or other vaccination; particular vaccine of focus; characteristics of the intervention: outcome appeal/point of reference, message content, message format; pre-exposure measurement of participants’ attitudes toward vaccines or personal beliefs regarding vaccination; pre-exposure measurement of participants’ knowledge about the advocated vaccine and related preventable disease (other than mere awareness);
4. Main results.

⁴ The final search was conducted on July 31, 2016

Results

Study Characteristics

We included 34 studies in the review, with sample sizes varying between 70 and 9,780.

The majority of studies (23) included university students, 9 targeted parents or non-parental adults, and 2 targeted older adults. Fourteen studies focused on HPV vaccines, 9 on flu/influenza vaccines, 5 on fictitious vaccines/diseases, 2 on West Nile, 2 on MMR, 1 on Hepatitis B, and 1 on pertussis.

The majority of the interventions were delivered in the form of print materials. Most interventions (25) emphasized gains or losses for the self. A single study compared the effectiveness of individual-versus collective-oriented appeals (Yu & Shen, 2013).

Thirty one studies measured intentions (10 also measured attitudes), 4 measured behaviors, and 1 measured solely attitudes. Five between-participants design studies had a control (no frame) group. Seven studies measured participants' pre-exposure attitudes or beliefs regarding vaccines, and hardly any studies measured participants' pre-exposure vaccine-related knowledge.

Main Effects of Framing

A sizeable body of literature reported no significant main or interactive effects of framing. Across the studies included, 12 found that neither gain- nor loss-framing elicited higher uptake (Frew et al., 2014; Gerend & Shepherd, 2012; Hayles, Cooper, Wood, Sinn, & Skinner, 2015; McCaul et al., 2002), intentions (Fahy & Desmond, 2010; Frew et al., 2014; Gainforth et al., 2012; Gainforth & Latimer, 2012; Haydarov & Gordon, 2015; Rothman, Martino, Bedell, Detweiler, & Salovey, 1999; Shen & Dillard, 2007; Van't Riet et al., 2014, study 6), or attitudes (Abhyankar et al., 2008; Fahy & Desmond, 2010; Gainforth et al., 2012).

Four studies have found a main framing effect on intentions (Abhyankar et al., 2008; Gerend et al., 2008; Nan, 2012b; Van't Riet et al., 2014, study 5), reporting a loss-framed advantage over gain-framed alternatives, but in two of these studies, the advantage held only for a subset of individuals (Gerend et al., 2008; Nan, 2012b).

5.4.3. Moderator Variables of Framing Effects

The majority of studies indicated that framing affected vaccination acceptability under specific conditions, providing evidence that framing effects are moderated by preexistent characteristics of the participants, perceived risk, or situational factors (Table 3).

Table 3

Summary of findings on proposed moderators within the domain of vaccination

Category/Name and operationalization of moderator	Moderator x Frame interaction Direction (reported results)	Outcome	Study
Preexistent characteristics of the message recipients			
Motivational orientation/Approach-avoidance motivation (BIS/BAS)	L > G for avoidance-oriented participants (high BIS) L = G for approach-oriented participants (high BAS)	I	Gerend & Sheperd (2007); Nan (2012a)
	NS	I, A	Shen & Dillard (2007) (some details are reported only in Shen, 2005)
Time orientation (CFC)	L > G for present-minded participants L = G for future-minded participants	I	Nan (2012b)
	NS ($p = .08$, pattern was similar to the one observed for intentions)	A	
Need for cognition (NFC)	NS	I	Rothman et al. (1999), Study 1
Personal relevance operationalized in terms of risky sexual behavior: number of sexual partners and frequency of using STI protection	L > G for participants with greater number of sexual partners L = G for participants with lower number of sexual partners L > G for participants with infrequent use of condoms L = G for participants with frequent use of condoms	I	Gerend & Sheperd (2007)
Personal relevance in terms of involvement with alcoholism; mood	L > G for participants with high personal relevance and in a positive mood L = G for participants with high personal relevance and in a negative mood L = G for participants with low personal relevance, regardless of mood	I	Wirtz, Sar, & Ghuge (2015)
Personal relevance operationalized as offspring status/ with vs. without children	NS	I, A	Abhyankar et al. (2008); Haydarov & Gordon (2015)
Women's Pap test history	NS	I	Gainforth & Latimer (2012)
Past vaccination decision	L > G: the loss-frame advantage was amplified for mothers who vaccinated their children previously	I	Abhyankar et al. (2008)
Ethnic group; framing order*	Marginally significant three-way interaction ($p = .06$) L > G in non-Hispanic African-American and Hispanic group (for Hispanics in order to obtain the effect, frames should be used in a specific order: G followed by L) L = G in non-Hispanic white group	I	Lechuga et al. (2011)
Gender/Sex	NS	I	Nan (2012a); Broemer (2004); McCormick & Seta (2016), Study 2
Gender (sex of the parent; sex of the child)	NS	I, A	Gainforth et al. (2012)

Perceived behavioral control	NS	I	Abhyankar et al. (2008)
Subjective norms	NS	I	Abhyankar et al. (2008)
Attitudes (post-intervention)	NS	I	Abhyankar et al. (2008)
Education	NS	I	Lechuga et al. (2011)
Insurance	NS	I	Lechuga et al. (2011)
Perceived risk			
Perceived procedural risk (perceived vaccination-related risks such as side-effects)	L > G for high-risk participants (participants who perceive vaccination as risky) L = G for low-risk participants (participants who perceive vaccination as safe)	I	Ferguson & Gallagher (2007)
Perceptions of short-term, non-serious risks and perceptions of long-term, serious risks associated with vaccination	Short-term, non-serious risk: L > G for low-risk participants L = G for high-risk participants Long-term, serious risk: NS	I	Van't Riet et al. (2014), Study 2
Response cost/Perceptions of vaccine risks (manipulated by indicating that vaccine was either heavily tested in clinical trials or less tested)	NS	I	Gainforth & Latimer (2012)
Perceived vaccine safety	NS	I, A	Nan et al. (2012)
Perceived vaccine effectiveness (outcome uncertainty – manipulated as effective for 90% vs. 60% of the population)	L > G in the low effectiveness condition G marginally > L in the high effectiveness condition (did not reach statistical significance, $p < .08$)	I	Bartels et al. (2010), Study 1
	L = G in the low effectiveness condition G > L in the high effectiveness condition	A	
Perceived vaccine effectiveness (outcome uncertainty - effective for 90% vs. 60% of the population)	NS	I	Van't Riet et al. (2014), Study 5
Perceived vaccine efficacy	L > G for participants who perceived low vaccine efficacy L = G for those who perceived high vaccine efficacy	I	Nan et al. (2012)
	NS	A	
Perceived vaccine effectiveness (outcome uncertainty - likelihood that vaccine will work 90% vs. 60%) + possibility of side effects	NS	I	Van't Riet et al. (2014), Study 6
Personal outcome effectiveness (perceived effectiveness of vaccination in protecting the person)	NS	I	Ferguson & Gallagher (2007)

Perceived outcome efficacy (perceptions of vaccination outcomes: certainty about health status, relief, reassurance)	NS	I	Abhyankar et al. (2008)
Perceived likelihood and severity of disease (manipulated as high or low)	L > G in the high perceived likelihood and severity condition G > L in the low perceived likelihood and severity condition	I, A	Park (2012)
Perceived likelihood that one's child is at risk of contracting disease (susceptibility); vaccine cost	In the cost condition: L > G when perceived susceptibility was low G > L when perceived susceptibility was high In the free of cost condition: NS	I	Nan et al. (2016)
Other/Situational factors			
Behavioral frequency operationalized as the number of vaccine shots required	L > G in the one-shot condition L = G in the six-shots condition	I	Gerend et al. (2008)
Color /color combination	L > G for participants primed with red L = G for participants primed with grey	I	Gerend & Sias (2009)
	L with white background, black text > L with red background, white text G with white background, black text = G with red background, white text	I	Chien (2011b)
	L with red background, white text > L with blue background, white text G with red background, white text = G with blue background, white text	I	Chien (2011a)
	L > G in the red background, white text condition L = G in the other two color combination conditions	I	Chien (2013)
Individualistic vs. collectivistic appeals (cultural appeals)	US participants: L collectivistic > L individualistic G individualistic = G collectivistic Hong Kong participants: L collectivistic > L individualistic G individualistic marginally > G collectivistic (did not reach statistical significance, $p = .06$)	I	Yu & Shen (2013)
	US participants: L collectivistic > L individualistic G individualistic = G collectivistic Hong Kong participants: L collectivistic marginally > L individualistic (did not reach statistical significance, $p = .08$) G individualistic = G collectivistic	A	
Temporal distance (present- vs. future appeals); prior awareness of vaccine*	For participants with no prior awareness of vaccine: L-future appeal > L-present appeal G-present appeal > G-future appeal For participants with prior awareness of vaccine: NS	I	Wen & Shen (2016)
Activation of the processing style of the left or right	L > G when RH processing was enhanced L = G when LH processing was enhanced	I	McCormick & Seta (2016), Study 1

hemisphere through voice
frequency manipulation

Activation of the processing style of the left or right hemisphere through voice frequency manipulation; relationship status*	Marginally significant three-way interaction ($p = .08$) For participants engaged in a relationship: L > G when RH processing was enhanced G > L when LH processing was enhanced For participants not in a relationship: NS	I	McCormick & Seta (2016), Study 2
Ease of symptom imagination; severity of symptoms*	Minor symptoms condition: L > G when symptom imagination was easy G marginally > L when symptom imagination was difficult (did not reach statistical significance, $p < .09$) Serious symptoms condition: G > L	A	Broemer (2004), Study 3

Note: L = loss frame; G = gain frame; I = behavioral intentions; A = attitude toward the vaccine; NS = no significant interaction.

* Despite pertaining to different categories, these moderators were presented together, in a single place, because there were connections among them (they formed three-way interactions). Some moderators could be placed in more than one category.

For clarity, we presented the names of the moderators as they were used in the original studies. When papers reported an advantage for either gain or loss frame that “approached statistical significance” / was “marginally significant”, we provided the direction of results together with the reported p -value.

Discussion

Whereas the question surrounding mediators has remained largely unresolved, over half of the studies reported that framing effects depend on the preexistent characteristics of the participants, perceived risk, or situational factors. However, most proposed moderators received little, mixed, or contrasting evidence, which precludes firm conclusions and calls for future rigorous research.

The current synthesis identified two major directions for future research: (1) the need to continue to investigate moderators and mediators and (2) the need to place greater attention toward methodological characteristics, which can influence the former direction.

Moderators and mediators.

Most moderators were tested by a single experiment (time orientation, behavioral frequency, individualistic vs. collectivistic appeals, temporal distance, ease of symptom imagination, mood, need for cognition), whereas others (perceived risk, color) received mixed patterns of results from different (and sometimes even from the same) research groups. Overall, given the limited work, the inconsistent findings, or the heterogeneity (operationalization of perceived risk), many of the proposed factors may be plausible candidates for further testing.

An interesting direction would be to further investigate the interactive effect of framing and individual versus collective appeals (Yu & Shen, 2013). For example, are framed messages differentially persuasive if they present collective consequences involving close others (family, friends) versus unknown others?

As suggested previously (Updegraff & Rothman, 2013; Van't Riet et al., 2014), there is a persistent need to identify the mediators of observed effects. For example, drawing on findings showing that anticipated regret predicts vaccination decisions above and beyond traditional cognitive risk constructs (e.g., Ziarnowski et al., 2009), one might propose anticipated regret as a candidate to explore in this context.

Attention to intervention and methodological characteristics.

Adding to previous recommendations regarding adequate statistical power (O'Keefe & Nan, 2012), we suggest the following points: (a) control for individual differences/pre-exposure characteristics of participants (e.g., vaccine-related attitudes, knowledge); (b) inclusion of a control condition; (c) greater attention to message content and consistency; (d) comprehensive description of methods, particularly of framed interventions and procedure (including timing of measurement); (e) inclusion of behavioral outcomes when possible; (f) targeting understudied populations and (g) future meta-analytic studies might set to run separate analyses for each outcome reported.

Limitations

We did not use meta-analytic techniques, and we acknowledge the limitations associated with a qualitative synthesis of empirical evidence. However, whereas a primary focus of this review was on moderators, the number of studies was insufficient for several moderators of interest, and some other variables that were not tested in empirical studies (related to message content) could not be examined through moderator analyses given the limited availability of information. Furthermore, the heterogeneity in terms of operationalization of certain constructs could have made comparisons less reliable. As research expands, future work could set to examine the impact of these factors through moderator analyses.

Conclusion

Taken together, in terms of practical implications, it should not be assumed that a generic emphasis on gains or losses will, by itself, have a major impact on outcomes and will solve the challenge of vaccine communication. Nonetheless, framing still may prove as an effective strategy, particularly if integrated into carefully tailored messages. This synthesis served to integrate

findings and propose guided research directions. By describing and analyzing the existing literature, we underscored the progress of the field, but also the inconsistency of some effects, as well as the paucity of research concerning several potential moderating and mediating variables. Addressing such directions with fine-tuned methods would constitute an important step in advancing understanding of the effective application of message framing outside of research settings.

CHAPTER 6.

STUDY 5. THE EFFECTS OF MESSAGE FRAMING AND INDIVIDUAL VERSUS COLLECTIVE APPEALS ON VACCINE ACCEPTABILITY

The operationalization of framing in the vaccine literature typically highlights the gains or losses for the self. Nonetheless, in reality, the consequences associated with individual vaccination decisions involve not only the decision-maker, but also many other people (Betsch, Böhm, & Korn, 2013; Böhm, Betsch, Korn, & Holtmann, 2016). Additional experimental work is warranted to investigate whether, and in which conditions, reference to others could constitute an effective tool for increasing immunization acceptability.

Essentially, one communication strategy would be to emphasize that getting vaccinated protects not only the self, but also close others (family, household members or friends) or unknown others to whom the transmissible disease could be spread (people with whom that person comes into casual contact) (Kelly & Hornik, 2016). Alternatively, one could emphasize that not getting vaccinated might entail costs not only for self, but also for others. We can also refer to these types of appeals (individual vs. collective) as reference points (Loroz, 2007) or cultural appeals (Yu & Shen, 2013).

The primary aim of this study is to examine the interplay of goal framing (gain vs. loss) and outcome appeals (individual vs. collective close others vs. collective unknown others) in influencing young adults' vaccination intentions and vaccine-related risk perceptions, while accounting for their pre-existent attitudes. The second aim is to examine potential mechanisms underlying message effects.

Method

Participants and Exclusion Criteria

Undergraduate students recruited from a variety of national faculties took part in the pen and paper-administered experiment in classroom settings. The final sample consisted of 512 unvaccinated participants (85% women). Mean age was 19.85 years ($SD = 1.70$; range 18–33).

Design

The study employed a 2 x 3 between-subjects factorial design, with an additional control group, resulting in a total of 7 conditions (ns between 70 and 77). Specifically, participants were randomly allocated to one of two message frames (gain, loss) and one of the three outcome appeal conditions (self, close others, unknown others), or to a control condition.

Procedure and Materials

First, they completed the pre-intervention measures of attitudes towards vaccines (Fazekas et al., 2008), vaccine-related knowledge (Cameron et al., 2013) dispositional affect (PANAS, Watson, Clark, & Tellegen, 1988) and other control variables in order to ensure that the groups did not differ on these important baseline variables.

Thereafter, all participants read a 1-page information text that provided basic information about seasonal flu and the flu vaccine, which was drawn from the CDC website and from previous similar papers (Ferguson & Gallagher, 2007). For participants assigned to experimental groups, the text also contained either a gain-framed or a loss-framed paragraph, such that the gain-framed message focused on the advantages of getting vaccinated and the loss-framed message focused on the disadvantages of not getting vaccinated. The emphasis was either on the gains/losses of the decision on the self, on close others or on unknown others.

After reading the assigned text, all participants completed a post-manipulation survey that assessed vaccination intention (with 3 items measured on 5-point Likert scale; Cronbach's $\alpha = .90$), flu and flu vaccine-related beliefs (the HBM-derived measures, items based on Fazekas et al., 2008), anticipated emotions and message evaluation (based on Cox et al., 2014). Lastly, participants completed measures of motivational orientation (BIS/BAS scales, Carver & White, 1994; Sava & Sperneac, 2006), demographic variables and manipulation checks. Details of the measures are provided in the extended thesis.

Data Analysis

We compared the demographics and other control variables across the study conditions with Pearson chi-square tests for categorical variables and one-way analysis of variance (ANOVA) for continuous variables. We used factorial ANOVA followed by post hoc tests to investigate the

effects of the experimental factors on the dependent variables. We reported partial eta squared to characterize effect sizes. With respect to mediation analyses, we used bootstrapping approaches with the PROCESS macro for SPSS, version 2.16 (Hayes, 2016). Analyses were conducted using SPSS v. 20.0.

Findings

Randomization Check

We performed a comparison of the experimental groups and the control group on the pre-intervention and control variables. There were no statistically significant differences, thus we can conclude that the randomization was successful.

Effects of Interventions on the Primary Outcome Variable

Results indicated no significant main effects of framing on intention, $F(1,505) = 0.620, p = .431, \eta_p^2 = .001$ and of type of appeals on intention, $F(2,505) = 1.140, p = .321, \eta_p^2 = .004$.

The interaction between the two independent variables was not significant either, $F(2, 505) = 1.056, p = .349, \eta_p^2 = .004$ (see Figure 1), suggesting that the effect of frame did not depend on whether the message highlighted individual or collective outcomes.

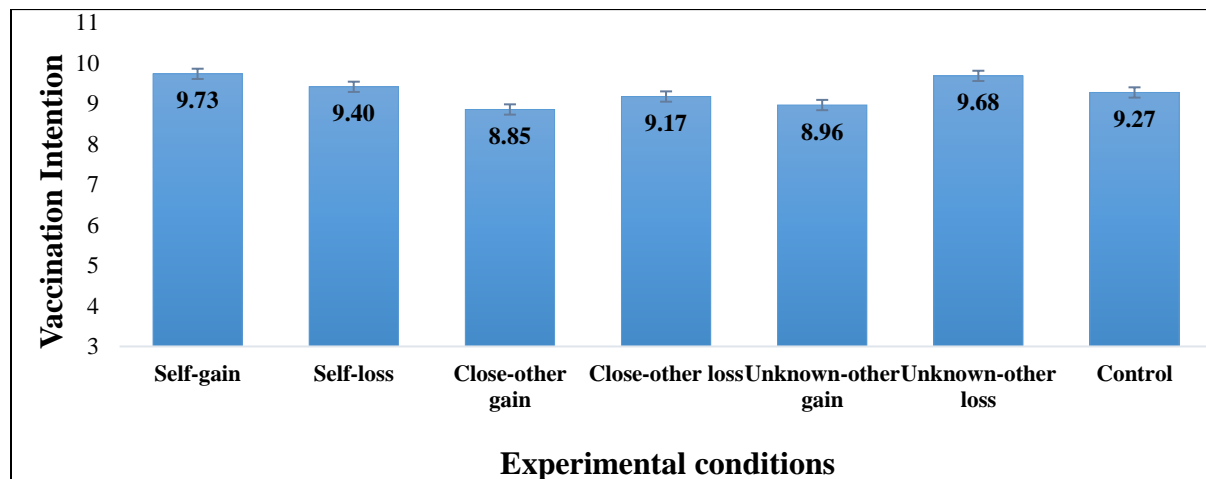


Figure 1. Vaccination intention by experimental condition.

To test for the moderating effect of pre-existent attitudes we performed a median split on attitudes' scores, which resulted in one dichotomous factor (negative versus positive attitudes). We then explored the interaction separately for the two vaccine attitude groups (see Figures 2 and 3).

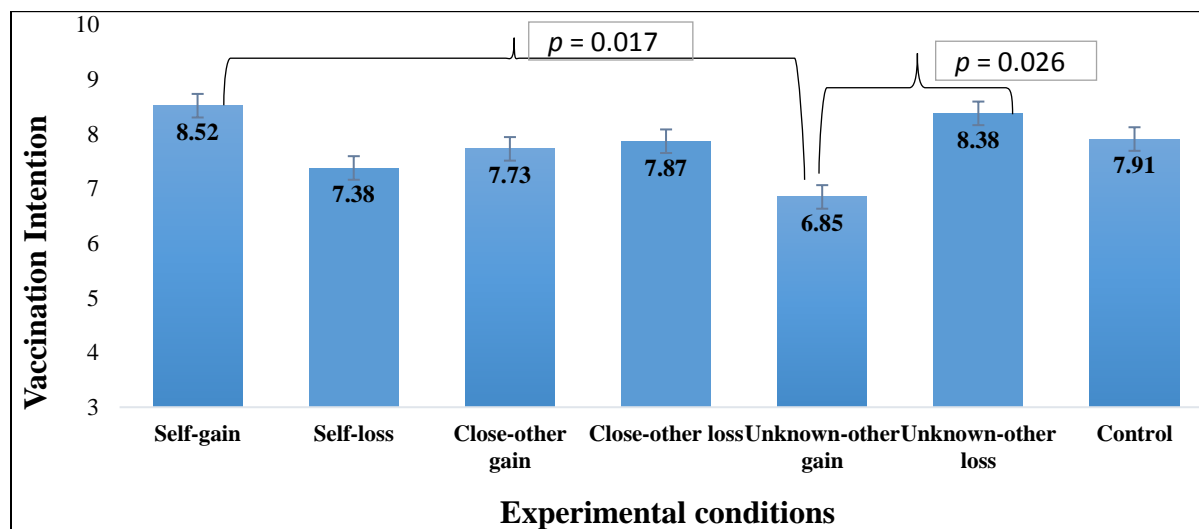


Figure 2. Vaccination intention by experimental condition among participants with pre-existent negative attitudes

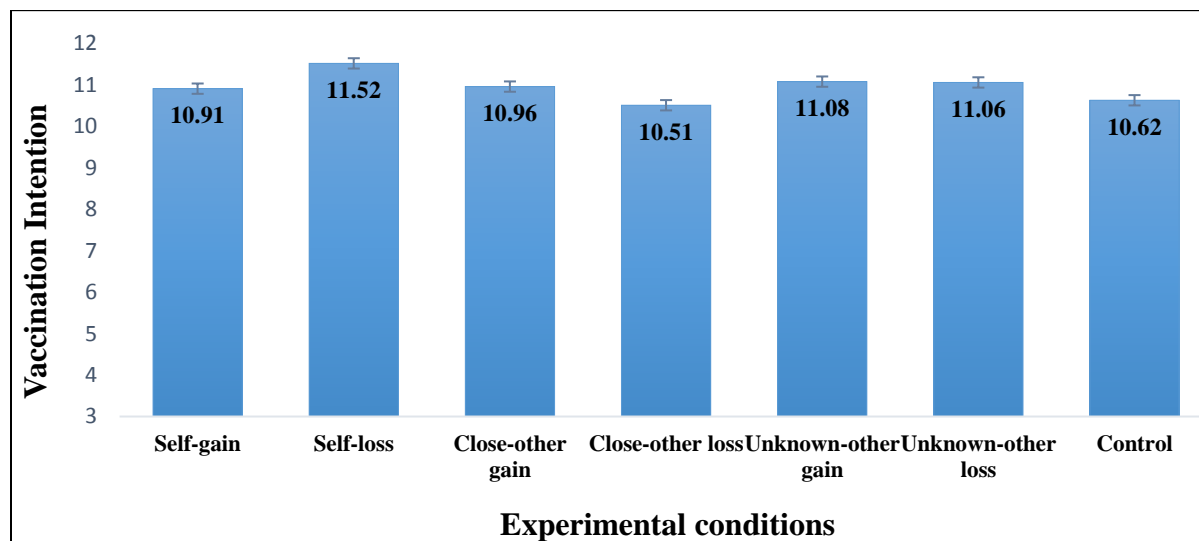


Figure 3. Vaccination intention by experimental condition among participants with pre-existent positive attitudes

The Frame x Appeals interaction was significant for participants with pre-existent negative attitudes ($F(2,263) = 4.185, p = .016, \eta_p^2 = .032$), but did not reach statistical significance for participants with prior positive attitudes ($F(2,235) = .693, p = .501, \eta_p^2 = .006$).

For participants with pre-existent negative attitudes, unknown other-loss messages ($M = 8.38, SD = 3.05$) were significantly more effective than unknown others-gain messages ($M = 6.85,$

$SD = 2.60, p = .026$). Self-gain messages ($M = 8.52, SD = 2.73$) were also more effective than unknown other gain-messages ($M = 6.85, SD = 2.60, p = .017$).

Effects of Interventions on Secondary Outcome Variables

Effects on message evaluation.

Outcome appeals had a significant main effect on message evaluation, $F(2, 505) = 4.653, p = .010, \eta_p^2 = .019$, such that messages focusing on unknown others were better evaluated compared to messages focusing on self ($M_{\text{unknown others}} = 8.20, SD = 1.37; M_{\text{self}} = 7.72, SD = 1.34$, Bonferroni's test $p = .019$).

Effects on anticipated inaction regret.

Overall, results revealed no significant main or interactive effects on anticipated regret (all $ps > .21$).

However, the Frame x Outcome appeals interaction was significant for participants in the positive attitude group ($F(2, 235) = 6.153, p = .002, \eta_p^2 = .050$). For participants with prior positive attitudes, the Scheffé *post-hoc* test revealed that those in the collective close-others gain condition ($M = 3.72, SD = 0.94$) expressed higher anticipated regret compared with those exposed to control ($M = 2.94, SD = 1.05, p = .015$) or close others loss messages ($M = 2.89, SD = 1.10, p = .010$). Participants exposed to the self-loss message also reported higher regret ($M = 3.53, SD = 0.98$) compared with those exposed to close-others loss ($M = 2.89, SD = 1.10, p = .028$) or control messages ($M = 2.94, SD = 1.05, p = .048$). Among participants with negative attitudes, those exposed to unknown other-loss messages showed higher anticipated regret compared with those exposed to unknown other-gain messages ($M = 2.51, SD = 0.88$ vs. $M = 1.99, SD = 1.11, p = .035$).

Effects on perceived severity of infection.

The main effects of framing and outcome appeals on perceived severity were not significant ($ps > .30$), but there was a significant Frame x Appeals interaction on perceived severity of flu infection ($F(2, 505) = 3.678, p = .026, \eta_p^2 = .014$). Pairwise comparisons with Scheffé adjustment revealed that self-loss messages led to marginally higher perceptions of severity than self-gain messages ($M_{\text{self-loss}} = 3.25, SD = 0.81$ vs. $M_{\text{self-gain}} = 2.86, SD = 0.80; p = .081$).

Effects on perceived vaccine effectiveness.

Framing had a significant main effect on perceived vaccine effectiveness, $F(1, 505) = 4.504, p = .034, \eta_p^2 = .010$, such that gain messages resulted in slightly lower perceptions of vaccine

effectiveness compared with loss messages ($M_{\text{gain}} = 3.27$, $M_{\text{loss}} = 3.49$ $p = .036$). There was also a significant two-way interaction between framing and appeals among participants with pre-existent negative attitudes, $F(2,263) = 2.307$, $p = .035$, $\eta_p^2 = .050$; unknown other gain messages resulted in lower perceived vaccine effectiveness compared with self-gain and control messages (all $ps < .05$).

Effects on perceived vaccine safety.

There was a significant main effect of framing on perceived vaccine safety, $F(1, 505) = 6.099$, $p = .014$, $\eta_p^2 = .012$; gain-framed messages resulted in lower perceptions of vaccine safety compared to loss-framed messages ($M_{\text{gain}} = 3.22$, $M_{\text{loss}} = 3.43$, $p = .033$).

There was also a significant interaction between framing and appeals among participants with negative attitudes, $F(2,263) = 3.705$, $p = .026$, $\eta_p^2 = .027$; unknown other gain messages resulted in lower perceptions of vaccine safety compared to unknown other-loss messages ($p = .024$).

Mediation Analyses

Given that the Frame x Appeals interaction significantly influenced intention only in the negative attitude group, it was most relevant to test for mediation effects in this group. We explored the potential mediating effects using a bootstrapping procedure conducted with the PROCESS macro for SPSS using 5,000 bootstrap samples (Hayes, 2016). This procedure states that if the 95% bias-corrected confidence interval does not include zero, then this supports the claim that mediation has occurred.

For participants with pre-existent negative attitudes, there was a significant (negative) indirect effect of exposure to unknown other gain messages (relative to unknown other loss messages) on flu vaccination intention through perceived vaccine effectiveness, $ab = -0.56$, BCa CI [-1.11, -0.10], $P_M = .36$, anticipated inaction regret, $ab = -0.42$, BCa CI [-0.85, -0.06], $P_M = .27$, and perceived vaccine safety, $ab = -0.29$, BCa CI [-0.69, -0.05], $P_M = .18$. (Figure 4).

There was also a significant indirect effect of exposure to unknown other gain messages relative to self-gain messages on intention through perceived vaccine effectiveness, $ab = -0.67$, BCa CI [-0.21, -1.20], $P_M = .39$ and perceived vaccine safety, $ab = -0.24$, BCa CI [-0.13, -0.58], $P_M = .15$. Finally, there was a significant negative indirect effect of exposure to close-other gain

messages (relative to unknown other loss messages) on vaccination intention through perceived vaccine safety, $ab = -0.27$, BCa CI [-0.65, -0.04] (data not shown).

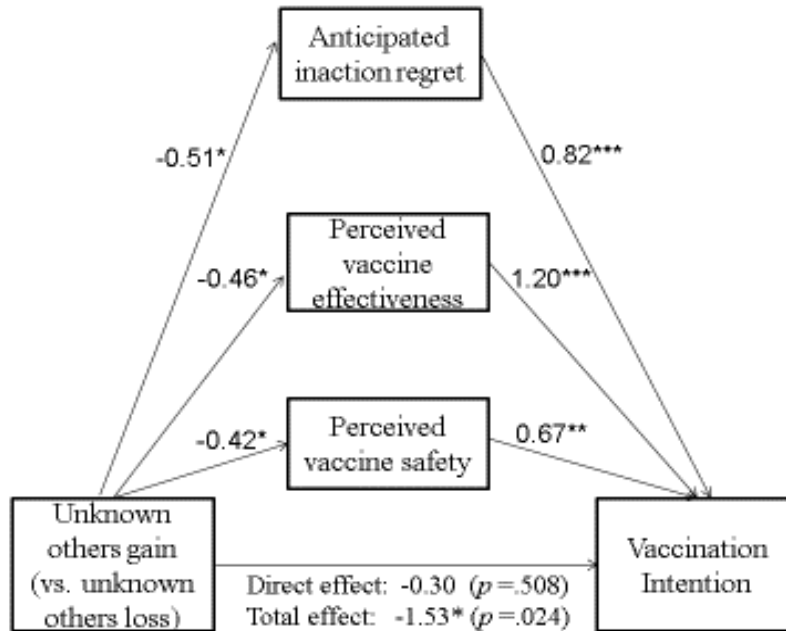


Figure 4. Mediation analyses for the negative attitude group

Discussion

The study adds to the body of evidence regarding the use of framing in vaccine messages and extends prior findings by adding an understudied concept, type of appeals (operationalized as individual, collective close others, or collective unknown others) and by accounting for participants' pre-existent attitudes toward vaccines.

As predicted, findings showed variations in the impact of frames only across certain levels of outcome appeals and pre-existent attitudes. Participants with negative attitudes responded better to unknown others-loss or self-gain messages as compared with unknown other-gain messages. Thus, appealing either to the threat of non-vaccination to unknown others (potential harms caused to other people) or to self-gains obtained from vaccination might be useful strategies when communicating with participants who hold rather unfavorable attitudes toward vaccines. These messages could heighten perceptions about vaccine effectiveness, safety and anticipated inaction regret which will, in turn, improve vaccine acceptability.

To conclude, this study contributes to the literature in several ways. First, it provides evidence on the interactive effects of framing, individual vs. collective appeals and pre-existent attitudes on vaccine acceptability. It extends prior findings by manipulating the social distance in the collective-oriented messages and by exploring the application of interventions to two different vaccine attitude groups, pointing out that communication is more likely to be effective if tailored. Second, the study also explored and identified some of the mechanisms behind message effects. In particular, to our knowledge, this work is the first to explore anticipated regret as a potential mediator. The study has practical implications in terms of informing future communication activities. Yet, further investigation of vaccine messaging interventions, particularly in a field setting, is needed before we can make clear-cut, evidence-based recommendations.

CHAPTER 7.

GENERAL DISCUSSION

In light of insufficient vaccine coverage, addressing the phenomenon of vaccine hesitancy is a priority. Motivated by this argument, the present thesis has tackled the topics of vaccine risk communication, risk perception and related decisions. We approached these topics in five studies that answered several key questions and addressed some of the gaps in the literature.

Specifically, **Study 1** aimed to investigate the content, accuracy and tone of national media reports on HPV vaccine, which was the most frequently discussed vaccine in the media at the time when the study was conducted.

In terms of original contributions, this study is the first to explore media coverage of the HPV vaccine in a country that has a major imbalance between the high cervical cancer morbidity and mortality on the one hand, and the extremely low vaccine uptake on the other. In this way, the study answers the call for research on understudied areas with a high burden of disease (Brewer & Fazekas, 2007; Larson et al., 2013). This investigation adds to the growing literature in which representations of the HPV vaccine in the media were investigated in the United States (e.g., Habel et al., 2009), Canada (Abdelmutti & Hoffman-Goetz, 2009), Australia (Cooper Robbins et al., 2012), United Kingdom (e.g., Forster et al., 2010), Germany, Spain (Bodemer et al., 2012) and Italy (Tozzi et al., 2010).

Study 2 aimed to extend the findings from Study 1 by exploring HPV vaccine-related messages posted on online discussion forums and by providing in-depth insight into public' views

regarding vaccination. Using an inductive approach we conducted a thematic analysis of 2,240 comments, obtaining a nuanced portrayal of vaccine representations.

In terms of original contributions, this is the first study in the literature to investigate the way HPV vaccines were represented on online discussion forums and one of the first studies to investigate vaccine representations on social media.

Taken together, the first two studies included in this thesis provide an account on vaccine messages in the online environment and findings could be viewed as making a call to action. At a time when online information spreads rapidly, and a growing number of studies found detrimental effects of exposure to negative vaccine stories and conspiracy theories (Betsch et al., 2010, 2011, 2012; Haase et al., 2015; Jolley & Douglas, 2014), targeted action is warranted. The data presented here are essential in understanding vaccine views and communication practices and could be seen as an initial step towards intervention.

Study 3 aimed to identify the psychological predictors of HPV and seasonal flu vaccine acceptability among young adults. Guided by an extended version of the health belief model (HBM) and including a sample of 401 participants, this cross-sectional study pointed to a number of factors that could be targeted in future interventions aimed at enhancing vaccine acceptance.

In terms of original contributions, this study is the first to examine, in one setting, the theory-based factors that guide acceptability of both HPV and seasonal influenza vaccination among adults. To our knowledge, this study shows for the first time that anticipated regret is a key predictor of HPV vaccination acceptability in a mixed sample of young adults and extends prior studies that found anticipated regret as a predictor of flu vaccination acceptability (Liao et al., 2013; Weinstein et al., 2007). Furthermore, the study answers previous calls that stressed the need to explore vaccine acceptability by specific socio-cultural context (Betsch et al., 2016; Brewer & Fazekas, 2007; MacDonald, 2015), providing data from the Romanian context. Taken together, findings from this study and from the previous two studies described in the thesis hold implications in terms of crafting culturally sensitive educational interventions.

Study 4 aimed to provide a systematic review of published, peer-reviewed empirical studies that examined the effectiveness of goal framing in the context of vaccine communication. The study included 34 studies in the synthesis.

In terms of contributions, this review comes at a time when the number of studies has more than doubled since the last review, warranting an investigation of the literature. This study

contributes to the field by: (a) systematically reviewing the current state of the framing literature, updating the previous review, (b) differentiating between outcomes - as prior meta-analytic reviews combined behavior, intentions, attitudes and other indices of persuasion, (c) enhancing understanding of moderators and mediators, (d) placing particular emphasis on the methodological characteristics of the studies and (e) providing guided suggestions for future work.

Whereas the first three studies presented in this thesis highlighted the need for effective communication about vaccines, this study contributed by providing evidence of the relative effectiveness of message framing in vaccine communication.

Study 5 aimed to explore the interplay of message framing (gain vs. loss) and individual versus collective appeals (individual vs. close others vs. unknown others) on young adults' intentions of receiving the seasonal flu vaccine. A second goal was to explore the mechanisms behind message effects on vaccination acceptability. The study included 512 participants who were randomly allocated to one of six experimental groups or to the control group. We also accounted for participants pre-existent attitudes toward vaccine.

In terms of original contributions, the study indicated that the effect of goal framing is moderated by the type of outcome appeals conveyed in the message and by participants' pre-existent attitudes toward vaccines. The study leads to an understanding of some of the mechanisms behind the observed effects. To our knowledge, this is the first study to investigate and show that anticipated regret mediated the message effects on intention. The fact that this study pointed towards certain messaging approaches that might be useful when communicating with people who have unfavorable attitudes toward vaccines, is a notable contribution to the field and could have implications from a public health perspective. Yet, one should note that these messaging strategies alone will not constitute a sufficient solution for solving the problem of vaccine hesitancy.

Taken together, whereas the first four studies presented in this thesis provided an understanding on vaccine sentiment in the online environment, identified theory-based factors that guide vaccination decisions and reviewed the message framing literature, this fifth study contributed by providing experimental evidence of the comparative effectiveness of different variations of framed messages in vaccine communication and by revealing some of the mechanisms underlying their effects. All in all, this thesis not only provided unique and needed insights on these areas of interest within a Romanian context, but also made a contribution to the broader literature on vaccine acceptability, extending the existent body of research.

The studies included in this thesis have a number of limitations, which were discussed throughout the thesis. In our view, the most important limitation is the use of intention instead of behavior as the primary outcome variable. Considering that the ultimate goal of interventions is to generate meaningful effects on vaccination behavior, measuring only effects on intention must be acknowledged as a caveat. In this regard, we note that this caveat is overwhelmingly encountered in the broad literature as well, for example nearly 90% of the experimental studies that tested the effectiveness of framed messages did not measure vaccination behavior as the primary outcome. In a similar vein, we employed self-report measures and sometimes single-item measures to assess certain variables of interest (e.g., anticipated inaction regret). This approach, again, reflects a practice used in several studies in the vaccine acceptability literature. A third limitation of this thesis is that we were necessarily selective in terms of the samples included in our studies. For example, we did not focus on parental samples, older adults, healthcare professionals or pregnant women, all of which represent eligible groups for vaccination. Future studies could set to explore these groups and to extend the investigation to other types of vaccines as well.

Notwithstanding the aforementioned limitations, the findings presented here have relevant practical implications for addressing vaccine hesitancy, and ultimately, for reducing the rates of vaccine-preventable diseases. Yet, in order to obtain sustained changes in vaccination acceptance, there is a continuous need to rigorously explore interventions that are most effective at reducing hesitancy and promoting vaccination. In the face of recurrent controversies and insufficient uptake rates, vaccine risk perception, risk communication and decision-making remain important topics for future research.

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