Communication Issues Associated with the Likelihood of HPV Vaccine Acceptance Among College Students

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Abstract

Background. The purpose of this honors thesis is to examine the knowledge, attitudes, and behaviors of a key target audience for the HPV vaccine – college undergraduates (particularly female) – to determine what factors may be influencing its acceptance of the HPV vaccine. This study is based on the framework of Elaboration Parallel Processing Model and also looks into other risk perception issues such as optimistic bias.

Methods. 269 Cornell undergraduates returned a survey regarding sexual history, sexual health practices, understanding of the HPV vaccine, and attitudes toward the HPV vaccine. All participants were assured anonymity, and no identifying information was connected to their survey responses. The survey used a modified risk diagnostic scale in order to measure mindsets toward the HPV vaccine. The survey also used measures for optimistic bias and knowledge.

Results. Among key findings was a significant relationship between optimistic bias, perceived susceptibility, and perceived severity. Specifically, as optimistic bias increases, perceived susceptibility and perceived severity decrease. On the other hand, discriminating value scores increase as optimistic bias increases. General knowledge of HPV showed significant positive correlations with perceived severity, response-efficacy, self-efficacy, and perceived susceptibility. Exploratory analysis examined other factors for statistical significance

Conclusions. The use of the risk diagnostic scale appears useful for understanding issues involved in acceptance and receiving of the HPV vaccine. Furthermore, by looking into key attributes such as knowledge, discriminating value, optimistic bias, and vaccine rates, the investigation was able to come up with concrete results that may be of use to health communicators and practitioners.

Introduction

Cervical cancer is the third most common cancer in women worldwide with over 370,000 cases per year and a death rate of around 50% (Taira, Neukermans, Sanders, 2004). Cervical cancer, though, is unique in that it has one common etiology: HPV (Schiller & Lowy, 2006). The Human Papillomavirus (HPV) is the most common STD in the United States (Sussman et al., 2007). The number of Americans infected with HPV is staggering, with almost 50% of sexually active young women and adolescent girls being affected (Gonik, 2006).

Although these statistics may seem daunting, a vaccine to prevent HPV has recently been created. The HPV vaccine is revolutionary and fundamental in a number of important ways. First, it is one of the only vaccines commercially available to fight against an STD. Additionally, it is one of the first vaccines designed with the specific goal of preventing a cancer. The HPV vaccine has been extremely effective in trials of preventing the subsequent infection (Franco & Harper, 2005).

The HPV vaccine has been commercially available since 2006 and is FDA approved for women between the ages of 9-25 (Centers for Disease Control and Prevention, 2006). Although the vaccine has only recently been commercially produced, much attention has been given to promoting vaccine uptake. Despite this, there is still a great deal of work to do in examining how young people are responding to the HPV vaccine. This leads to the vital question of what is driving young people's decisions to get vaccinated? The goal of this honors thesis is to examine the knowledge, attitudes, and behaviors of a key target audience for the HPV vaccine – college undergraduates (particularly female) – to determine what factors may be influencing their acceptance of the HPV vaccine.

Disease Background

Before looking at communication issues related to the HPV vaccine, it is important to understand HPV, its consequences, and the vaccine more comprehensively. This will help to put the communication issues into appropriate context.

Cervical Cancer

Cervical cancer is a devastating disease. In the United States in 2006, 9,700 women were diagnosed with invasive cervical cancer with 3,700 deaths (Saslow et al., 2007). Worldwide, around 500,000 women a year are diagnosed with cervical cancer, and almost 300,000 women die annually from this disease. Treatment for cervical cancer traditionally includes a hysterectomy and often chemotherapy. When the disease has spread beyond the uterus, approximately 33% will die despite treatment (Hoover, Carfioli, and Moench, 2000).

Other HPV Related Conditions

It is important to note that although cervical cancer is the most publicized and well-understood condition associated with HPV, anal cancer has also been linked to a strain of HPV (Frisch et al., 1997). Each year approximately 4,000 people are diagnosed with anal cancer of which 80-90% is caused by HPV (Saslow et al., 2007). Vulvar cancer and penile cancer were also linked to HPV (Parkin, 2006). This suggests that a treatment for HPV will not only help prevent cervical cancer but may also prevent other cancers as well.

HPV

HPV is a virus that is generally spread through skin-to-skin contact that occurs during sexual intercourse. In some cases, nonpenetrative sexual contact can also lead to HPV infections (Winer et al., 2003). There are over 30 different strains of HPV with 20 that are believed to be a cause of cervical cancer (Hoover et al., 2000). Although there are many different types of HPV,

strains 16, 18, 31, 33, and 45 are generally associated with most cases of cancer (Winer et al., 2003). As the disease spreads, cervical tissue becomes more and more malignant.

Genital warts are the most common symptom of HPV. They generally appear between one and three months after infection with HPV. They can take many different forms in terms of color, size, and shape. Although genital warts are associated with HPV, they do not always appear in someone infected with HPV, and these people may still transmit the disease (Beutner, Reitano, Richwald, Wiley, 1998).

There are certain risk factors that have been shown to make an individual more at risk for having HPV. HPV is positively associated with younger age, Hispanic or African-American ethnicity, an increased number of vaginal-sex partners, alcohol consumption, anal sex, and having a partner who has had a large number of lifetime partners (Ho, Bierman, Beardsley, Chang, & Burk, 1998).

HPV and Cervical Cancer Prevention

Traditionally, there were very few ways to reduce the risk of contracting HPV. Even the highly encouraged view of consistent condom use as a method of STD prevention has been thought to do little to prevent the spread of HPV infection (Manhart & Koutsky, 2002); however, a recent study has shown that consistent condom use might actually be an effective barrier to spreading HPV (Winer et al., 2006). Some efforts have been focused on behavioral changes such as reducing the amount of sexual partners one has and choosing sexual partners who have less risk of having HPV (Centers for Disease Control and Prevention, 2008).

Other efforts have focused on early detection. Oftentimes, precancerous lesions that have been infected by HPV can be seen through a Pap smear. A Pap smear is a test for changes in cervix cells. These precancerous lesions may potentially lead to cervical cancer. Once these

precancerous lesions are seen, increased vigilance is required. Although Pap smears have reduced the incidence of fatal cervical cancer, (Sigurdsson, 1999) they cannot detect all cervical cancers, and many women do not get regular Pap smears (Calle, Flanders, Thun, & Martin, 1993). There is also some question regarding the benefits of Pap smears in preventing cervical cancer compared to the negative effects of false positives (Raffel et al., 2003).

HPV Vaccine

The latest efforts have focused on prevention of cervical cancer through the HPV vaccine. The HPV vaccine can be viewed as an STD vaccine, a cancer prevention vaccine, or both (Davis, Dickman, Ferris, and Dias, 2004). The vaccine has been shown to be almost completely effective in preventing cervical precancerous lesions (Franco & Harper, 2005). It is estimated that if the vaccine were to be mandatory for all 12-year-old girls, it would reduce the amount of cervical cancer cases a year by 61.8% (Taira et al., 2004).

Some discussion has focused on who should receive the vaccine. At the current time, the HPV vaccine is only FDA-approved for females. Furthermore, it is estimated that vaccination for males would only reduce cervical cancer rates by 2.2% and would not be as cost-effective as the female-only vaccine, although this is only true if coverage of females is high. If many females do not receive the vaccine, then it may be wise to expand the coverage to men and boys; however, the better solution would still be to try to increase the amount of females receiving the vaccine. A viable and more cost-effective method may be to give the vaccine only to males who have a high risk of getting or spreading HPV (Taira et al., 2004).

Although, the benefits of a widespread vaccine program seem clear, currently there are practical barriers that may contribute to people deciding not to receive the vaccine. For example, the HPV vaccine is expensive and somewhat of a burden to receive. It costs $360 for three doses

and requires recipients to return to the doctor's office on three separate occasions over a period of six months. It is also not covered by most insurance companies (Centers for Disease Control and Prevention, 2008). Thus, in some cases, people may want to get the vaccine but are unable due to financial or time constraints.

Another reason people might be choosing not to receive the vaccine is that common knowledge about vaccines in general is often lacking or incorrect (Gellin, Maibach, & Marcuse, 2000). In particular, one study found that HPV is known by less than 1/3 of the population in the United States and much less well known than other, less common STDs. Furthermore, knowledge of risk factors, the associated risk of cancer, and screening procedures is often lacking (Anhang, Stryker, Wright, & Goldie, 2004).

The popular press has likely aided in these misconceptions. While the media have been quick to show controversies regarding the HPV vaccine, scientific studies have shown many of these controversies to be extremely minor and fringe. An example includes the idea that there is a strong contingency of parents who refuse to vaccinate their children (Pollack & Saul, 2007). This has been shown to be almost completely false in peer-reviewed journals. The fact is that most parents are strongly in favor of having their children vaccinated with the HPV vaccine (Zimet, 2005). The wide acceptance of the Hepatitis B vaccine might prove to be a better way to understand the HPV vaccine rather than treating the new vaccine as something completely unique.

Furthermore, the news media may also play a negative role in the transmission of knowledge about HPV. Anhang et al. (2004) showed in 2002 that news stories about HPV and associated issues were often lacking information that women want to know about preventing HPV, the transmission of HPV, and treatments of HPV.

On the other hand, the media may play a role in disseminating positive and appropriate information regarding the HPV vaccine. An example of this may be Merck's Gardasil campaign. Gardasil is one of the commercially available HPV vaccines. Recently, Merck has been using a campaign, known as the "one less" campaign, to encourage young women to receive the vaccine. The campaign features widespread print, television and online advertisements. No current information or studies have been done to determine the effectiveness of this marketing strategy. Although not the central focus of my study, by investigating people's recall of media messages, I will to a small extent examine the effectiveness of this campaign.

College Students

Another possible barrier to vaccine uptake is the attitudes of the target audience – in this case – college students. There is a vast field of research that indicates that college students have a large perceived feeling of invincibility driven by sensation seeking and are likely to engage in risky behavior. Many of them participate in dangerous behaviors that other segments of the population would not, including driving while drinking, substance abuse, and unsafe sex. This reckless behavior decreases with age (Arnett, 1992). Sexual activities of college students are also prevalent and poorly managed compared to the rest of the population (Cooper, 2002). This increased chance of taking risks and the increased sexual behavior could all lead to HPV and cervical cancer, while also a decreased tendency to adopt protective behaviors, such as the vaccine. Given this information it is not surprising that there is a very high risk of exposure to HPV in the college environment (Ho et al., 1998).

Theory Background

In an effort to increase vaccine uptake, research on health campaigns may offer some strategies. Although in general health campaigns have a long and checkered past, some have

done a remarkable job of preventing risky health behaviors. There are definite methods prescribed in the literature that seem to lead to effective health campaigns (Rice & Atkin, 2001), such as the use of fear in message appeals (Soames Job, 1988).

One theory that offers a framework for investigating attitudes toward the HPV vaccine and thus the effectiveness of fear appeals is the Extended Parallel Processing Model (Witte, Cameron, McKeon, Berkowitz, 1996); see Figure 1. This model emphasizes that there are two general responses to health and risk messages. People can adopt a "Danger Control Process" (DCP) in which they work to lower danger and fear by, for example, receiving the vaccine or stopping risky practices. This behavior indicates a cognitive process. On the other hand people may choose to adopt the "Fear Control Process." (FCP) When people adopt this process, they attempt to minimize the associated problem by, for example, saying that the problem has been blown out of proportion. This is considered an emotional response.

Optimistic bias of health hazards is a particularly common FCP and needs specific methods to combat it. In order to understand the best way to handle the HPV vaccine issue, we have to understand the role that optimistic bias plays. Optimistic bias explains the phenomenon that people are more likely to think that their own personal risk of a particular danger is less than that of their peers (Weinstein, 1989). The obstacle of optimistic bias can, in many cases, be difficult to overcome (Weinstein & Klein, 1995).

Optimistic bias has been shown to be a factor in a number of different health risks. For example, both adolescents and adults who smoke were shown to believe that addiction and death were problems for most people who smoke but felt that they had a much lower risk of those outcomes (Arnett, 2000). Another study of high school and college students showed that there was a

significant amount of optimistic bias regarding one's own chances of contracting HIV (Hardeman, Pierro, & Mannetti, 1997).

Some factors that may lead toward an optimal DCP include response-efficacy, the perception that the actions a person takes can minimize a threat, and self-efficacy, meaning the idea that people believe they are able to perform the recommended actions. Factors that may lead toward the less desirable FCP include perceived severity and susceptibility. If you believe that the danger is severe and unavoidable, you are more likely to adopt an FCP. These different processes are vital in determining whether a specific health campaign is likely to be effective. To aid in predicting FCP or DCP, Witte and colleagues developed a specific scale: the Risk Behavior Diagnosis Scale (RBD) (Witte et al., 1996). I plan to use a modified version of this scale to determine whether FCPs and DCPs are likely and, depending on the results, suggest methods for effective HPV campaigns.

The modified RBD scale works by measuring perceived threat (perceived susceptibility and severity) and perceived efficacy (perceived self and response efficacy) on a number of standard scale items. Then perceived threat score and perceived efficacy scores are standardized. By subtracting the perceived threat value from the perceived efficacy value, a discriminating value score is determined. If this score is positive, it indicates that the given population is likely to engage in DCPs. If the score is negative on the other hand, people are likely to engage in FCPs. This scale was shown to hold content, construct, and predictive validity (Witte et al., 1996). Depending on the discriminating value scores, an appropriate communication campaign can be suggested.

As noted above, the goal of my thesis is to can gain more insight about college students' health decisions and their understanding of the HPV vaccine. The outcomes of this research may

serve to answer the following questions. Are there particular ways to target HPV campaigns to focus on the concerns and health behaviors of college students? Can HPV campaigns utilize methods shown to be effective in other health campaigns?

Research Hypotheses and Research Questions

Hypothesis 1

Based on the research of Witte et al. (1996), I hypothesize that high discriminating value scores will positively relate to danger control behaviors with regard to avoiding the HPV (in this study receiving the HPV vaccine). That is, people who perceive that they can control their exposure to the HPV and that the recommended options for controlling their exposure would work will be more likely to adopt the recommended actions, in this case receiving the vaccine.

Hypothesis 2

Also drawing on the work of Weinstien (1989), I hypothesize that perceived susceptibility to HPV will negatively relate to optimistic bias. That is, people who perceive themselves at greater risk will also display less optimistic bias with regard to their personal risk of contracting the virus.

Hypothesis 3

Finally, I hypothesize that HPV knowledge will positively relate to perceived severity of HPV. That is, people who are more informed about HPV will be more likely to view it as a greater risk.

Other Research Questions

Given that I have not found any study that examines optimistic bias together with the Extended Parallel Processing Model, I pose a research question to examine the relationship

between key variables of self-efficacy, response efficacy, perceived susceptibility, optimistic bias, knowledge, and perceived severity in the context of the HPV. I also will examine whether those who have received the HPV vaccine have higher rates of optimistic bias than those who have not.

To get a better understanding of college students' health and sexual decisions, I will also answer some questions that may have less theoretical value but could have practical implications for HPV communication. These questions include: Do students see a need to receive the HPV vaccine on their own, or is this health decision still directed by parents? Where do college students receive health information? How effective are current health campaigns? Are views about HPV different by gender?

Methods

Overview

This study was conducted by designing a survey to measure a number of different factors including HPV awareness, acceptance, perceived acceptance, perceived susceptibility, perceived response-efficacy, perceived self-efficacy, optimistic bias, risk behaviors, sources, and levels of HPV knowledge. Due to the sensitive nature of the material being surveyed, approval from Cornell's IRB was obtained prior to data collection. Survey results were analyzed using regression analysis and SPSS software.

Procedure

To determine the college students' acceptance and understanding of the HPV vaccine, 269 Cornell students were surveyed. Using a convenience sample, most data were collected from a number of large introductory lecture courses in Communication although other student

organizations unrelated to the subject matter were also surveyed. All the students in the class were given an option to receive a survey. The basic goal and aims of the survey were verbally explained to the students with an option of opting out. In some cases the course professor offered extra credit.

Students were also assured anonymity. The students would be asked to place the completed questionnaires in a bin while a consenting cover letter with identifying information was placed in a separate bin. No identifying information was placed on the surveys themselves.

Participants

Both men and women were included in the sample to allow for a comparison of attitudes. Fifty-three percent of survey respondents were male while 47% of the survey respondents were female. Nintey five percent of the respondents were between the ages of 18-22. Seventy-eight percent of respondents identified themselves as being White, 11% Asian, and the other 5% African American, and the other 6% some other race.

It is also important to understand current vaccination rates in order to determine if increased or better vaccination programs are needed. Twenty-five percent of the females surveyed had received all three doses of the HPV vaccine, while 44% had received at least one dose. No males had received the vaccine. Participants were sexually active with 45% having sex in the last two weeks and 80% have had sex in their lifetime.

In terms of HPV prevalence, only two people surveyed said they had been diagnosed with having HPV. Five people surveyed had previous sexual partners who were HPV positive, and 13% noted that they knew at least one other person who was HPV positive. This would seem to indicate that knowledge that one is HPV positive is lacking due to the extremely high rate of sexually active young people who are HPV positive in the general population. It is also

interesting to note that students significantly underestimated the percentage of sexually active young women and adolescent girls who are sexually active. Seventy-nine percent of those surveyed underestimated the prevalence of HPV in that population by more than 10% with 62% underestimating the prevalence by more than 20%.

Survey Details

Survey questions addressed sexual history, sexual health practices, understanding of the HPV vaccine, and attitudes toward the HPV vaccine. Other risk behaviors such as condom use and substance abuse were also included. The reason for including questions about other risk behaviors is to see if risky behavior is positively correlated with non-vaccination rates. Another issue that may be addressed is perceptions of Cornell University, Gannett Health Services, and HPV care. Also, the perception of HPV campaigns at Cornell and elsewhere was examined.

Measures

As noted above, the questions used on the survey were designed using a modified Risk Behavior Diagnosis scale (Witte et al., 1996) to measure feelings of self-efficacy, response efficacy, severity, and susceptibility using a five-point scale. These questions were designed to determine the likelihood of FCPs or DCPs. Questions were also asked in order to determine whether optimistic bias is playing a role in thoughts and actions regarding the HPV vaccine.

Cronbach's alpha was used to determine the reliability of the different measures looked at in my study. Although Witte et al. (1996) have shown these measures to be reliable, it is important to demonstrate their reliability in my study as well. Also, it is important to test the other multiple-item measures used in this paper, such as optimistic bias, for reliability as well.

Perceived severity, perceived susceptibility and perceived threat. The three measures of perceived severity received a Cronbach's alpha of .584. It should be noted that one of my

measures was written slightly differently than the standardized scale. Instead of having “I believe that threat of HPV is significant,” I instead had, “I believe the threat of getting HPV is significant.” If this item is deleted, the two items have a reliability of .698.

The three values of perceived susceptibility from the RBD scale are reliable with a Cronbach’s alpha of .810. Taken together to get an overall perceived threat score (the value used in the calculation of discriminating value), the scale has a Cronbach’s alpha of .676.

Perceived self-efficacy, perceived response-efficacy, and perceived-efficacy. Cronbach’s alpha values for perceived self-efficacy based on the RBD scale were not as clear as for perceived threat scores. Perceived self-efficacy has a Cronbach’s alpha of .449.By looking only at females, the scale reliability score jumped to .515. This jump from males to females may be due to the fact that men are under the impression that it is impossible for them to get the HPV vaccine.

Other measures of self-efficacy were included in this survey that are not in the original RBD scale. These include the questions, “I know how to go about getting an HPV vaccine,” “I have time to get the HPV vaccine,” and “I can afford to get the HPV vaccine.” When these measures of self-efficacy are included, the Cronbach’s alpha increases to .768.

Finally, response-efficacy scores were checked for reliability. This scale item had a reliability score of .689. When taken together to get an overall perceived-efficacy score (the value used in the calculation of discriminating value), the scale has a Cronbach’s alpha of .826 if the additional measures of self-efficacy are included. If they are not included the perceived-efficacy score is .745. Due to the fact that the RBD scale requires the same total amount for perceived-efficacy and perceived-threat, the self-efficacy without additional measures is used from here forward. This is valid because the perceived-efficacy reliability score is still high.

Discriminating value. Taken that all the scale items were shown to be fairly reliable, a discriminating value score was then calculated for the target population. Discriminating values ranged from high danger control process (discriminating value score of 14) to high fear control processes (discriminating value score of -10). The mean was 2.3 with a standard deviation of 4.6.

When these tests were attempted for women only, the scores were somewhat higher indicating more likelihood of DCPs. This makes sense due to the fact that women are the target of vaccination campaigns and programs and are much more likely to believe they can get the vaccine. The range was from -5 to 14, with a mean score of 3.6 and standard deviation of 4.1.

Discriminating value scores were than standardized. The overall mean value was -.0586 with a standard deviation of 1.27. When looking at women only, the mean value was .305 with a standard deviation of 1.15. When looking at men only, the mean value was -.4386 with a standard deviation of 1.28. This indicates that men are more likely to engage in FCPs while women are more likely to engage in DCPs.

Optimistic Bias. Optimistic bias was measured using five questions. The first question asked whether the respondent thought they might have HPV. The other four questions each asked the respondent to compare the average chances of members of the general public having HPV with people progressively further removed from the survey participant. The items turned out to be reliable, with a Cronbach's alpha of .786. Also, as further evidence that the measure seems to be capturing the nature of optimistic bias, which decreases as the person of comparison is less known to the respondents, people believe the chances of themselves having HPV (M = 1.58, SD=.90) is less than the chances of them getting HPV (M = 2.16, SD = .91), is less than the chance of a sexual partner having HPV (M = 2.20, SD = .95), is less than the chance of a friend having HPV (M = 2.78, SD = .87) is less than the chance of a random Cornell student having

HPV (*M* = 2.89, *SD* = .80). A total optimistic bias score was taken by adding together all of the measures of optimistic bias. The lower the total score, the higher the optimistic bias.

Knowledge. Knowledge scores were measured in two different ways. The first was to see if survey respondents could identify correct symptoms of the disease and correct associated conditions. Each correct answer was worth a point, and each incorrect answer was worth nothing. The total score was used as an indicator of knowledge with the higher total score indicating a higher level of knowledge. This will be called specific knowledge score. The mean specific knowledge score was 10.9 (*SD* = 2.0). This is out of a total possible knowledge score of 16.

An additional knowledge score was obtained by asking survey respondents if they agreed with five general statements about HPV "I can only spread genital warts if I am experiencing symptoms," "HPV is associated with other medical conditions beyond the symptoms of the disease," "Only males can get genital HPV," "HPV has more severe health implications for men than women," and "It is possible for there to be no visible symptoms of HPV." In cases where agreeing with the statement indicates a lack of knowledge, scores were reverse coded. The five items were then summed to get another knowledge score. This will be called the general knowledge score. The mean general knowledge score was 20.6 (*SD* = 2.4). This is out of a maximum knowledge score of 25.

Source of Health Information. Students were also asked about their likelihood of relying on a number of different sources for health information. Each item on the list was rated on a four point scale (1=very unlikely, 2=somewhat unlikely, 3=somewhat likely, and 4= very likely).

Results

Hypothesis 1

The first hypothesis proposed that discriminating value scores will positively relate to danger control behaviors with regard to avoiding the HPV. In this case, the behavior is receiving the vaccine. Since only women have received the vaccine, only women were looked at in this respect.

The mean standardized discriminating value score for those who received the vaccine was .376 (*SD* = 1.25) compared to a mean value of .251 (*SD* = 1.07) for those who hadn't received the vaccine. Although the discriminating value was higher for people receiving the vaccine, this difference was not significantly different $t(117) = .584$, $p = .439$. Thus, Hypothesis 1 was not supported.

Hypothesis 2

The second hypothesis proposed was that as perceived susceptibility increases, optimistic bias will decrease. There was a significant positive correlation ($t(227) = .453$, $p < .000$) between optimistic bias and perceived susceptibility showing that when perceived susceptibly was higher, optimistic bias was lower. Thus, Hypothesis 2 was supported.

Hypothesis 3

The third hypothesis is that as knowledge of HPV increases, perceived severity will increase. The perceived severity score used in this relationship included all three scale items from the RBD scale. This hypothesis held to be partially true. For general knowledge scores, there was a significant positive correlation with perceived severity ($t(259) = .363$, $p < .000$), but there was no significant correlation between specific knowledge scores and perceived severity ($t(253) = .097$, $p = .121$).

Other Research Questions

The data suggest some interesting relationships. First, there is positive correlation between optimistic bias and perceived severity ($t(227) = .148$, $p < .05$), meaning when perceived severity goes up, optimistic bias goes down. This relationship is not nearly as strong as the relationship between optimistic bias and perceived susceptibility found in Hypothesis 2.

The general knowledge score also had significant positive correlation with response-efficacy ($t(225) = .440$, $p < .000$), self-efficacy ($t(257) = .346$, $p < .000$, $t(211) = .428$, $p < .000$ with additional measures), and perceived susceptibility ($t(258) = .126$, $p < .05$). The more general knowledge you have the greater you believe the HPV vaccine is effective and obtainable. Also, the higher your general knowledge, the more susceptible you believe you are. This relationship is not as strong as that between perceived severity and knowledge.

The difference between optimistic bias among females who received at least one does of the vaccine and those who had not received the vaccine was also investigated. The mean optimistic bias for those who received the vaccine was 12.22 ($SD = 3.17$) compared to a mean of 11.69 ($SD = 3.36$) for those who didn't receive the vaccine. This suggests that in general women who received the vaccine demonstrate less optimistic bias than those who did not. This relationship did not reach the level of statistical significance though, $t(98) = .810$, $p = .562$.

The research did come up with one counterintuitive relationship. Optimistic bias is negatively correlated to standardized discriminating values ($t(200) = -.297$, $p < .000$). This means that the more optimistic bias you have, the more likely you are to be using danger control processes. One might expect this relationship to exist because of the influence of those who have already received the HPV vaccine not believing they are susceptible. In fact, this relationship holds true even if you remove those people who have received all three doses of the HPV vaccine ($t(177) = -.287$, $p < .000$) or one dose of the vaccine ($t(160) = -.310$, $p < .000$).

The survey also produced answers to some of the other practical questions I posed. A majority of students felt that they make their own health care decisions (67% agreeing or strongly agreeing and only 14% disagreeing or strongly disagreeing) and make their own choices about getting vaccinations (65% agreeing or strongly agreeing and only 14% disagreeing or strongly disagreeing).

College students viewed themselves as most likely to rely on their hometown physician as a source of health information (M = 3.55, SD = .67) and also likely to rely on their parents (M = 3.13, SD = .98). This was followed by friends (M = 2.9, SD = .81), Gannett physician (M = 2.8, SD = .90), nurse or other health professional from Gannett (M = 2.7, SD = .84), health website ($\underline{M}$ = 2.68, SD = .81), magazine (M = 2.44, SD = .80), television commercial (M = 2.15, SD = .81), faculty or staff member (M = 2.13, SD = .95), other website (M = 2.12, SD = .83), newspaper (M = 1.95, SD = .83), Cornell Daily Sun (M = 1.8, SD = .79), Internet support group ($\underline{M}$ = 1.75, SD = .82), and resident advisor (M = 1.54, SD = .74).

Current HPV campaigns seem to be moderately effective in reaching their targets. Most people have seen commercials (M = 3.34, SD = 1.47) or other campaigns (M = 3.44, SD = 1.37) that advertise for the HPV vaccine, although as noted before most people do not rely heavily on media sources for health information. Most students felt that Gannett did a poor job of providing information about the HPV vaccine (M = 2.68, SD = .96) although most were able to recognize that they were able to get the vaccine at Gannett (M = 3.69, SD = .85).

Discussion

This study investigated common risk communication issues using the theoretical framework provided by the Extended Parallel Processing Model and optimistic bias in the

context of HPV and the HPV vaccine. The results of this study should provide a source of information for those who are interested in the state of understanding and communication of the HPV virus and the HPV vaccine. Although only two of my hypotheses were confirmed, the other hypothesis along with the research questions provided interesting insight

Before looking into each of my hypothesis one at a time, it is important to outline the current state of DCPs and FCPs in the target population. The study indicated that males tended to use FCPs while, on the other hand, females tended to use DCPs. Overall, the population had a slight tendency toward DCPs. This is not surprising considering very few males were aware that they even had the ability to receive the HPV vaccine if they wanted to. Taken together, this indicates that there may be some necessity to increase the message that the HPV vaccine can be given off label to high risk males in order to increase their perceived efficacy scores. The current FCP state does not indicate that messages aimed at males should try to increase fear. Meanwhile, messages aimed at females should continue to increase perceived threat and perceived efficacy in order to further increase vaccination rates.

Hypothesis 1

Hypothesis 1 proposed that those who are vaccinated will have higher discriminating value scores than those who were not vaccinated. Investigation of Hypothesis 1 did show the relationship that females who have received the vaccine have higher discriminating value rates meaning they were more likely to engage in danger control processes. Although this relationship was shown through the difference in means between those who received the vaccine and those who did not, it did not reach the level of statistical significance. Perhaps if there were more female survey participants this relationship might have had stronger support.

If this relationship were to hold under further investigation, it indicates clear direction for health communicators or practitioners who are trying to increase the number of females getting vaccinated. They must create their messages to highlight the efficacy of the HPV vaccine so that it overcomes the level of fear people have of HPV. This would help people to have a positive discriminating value, which in turn, could lead to increased vaccine penetration.

Hypothesis 2

Hypothesis 2 was that as perceived susceptibility went up, optimistic bias would go down. Investigating Hypothesis 2 showed very strong correlation between optimistic bias and perceived susceptibility. As perceived susceptibility goes up, optimistic bias goes down. This relationship is not surprising. People who do not believe they are susceptible to the disease also believe that themselves, their sexual partners, and their friends are also are not likely to be susceptible.

On the same note, one of my research questions looked into the relationship between optimistic bias and perceived severity. There was once again a correlation: as perceived severity goes up, optimistic bias goes down. This relationship was statistically significant, though not as strong as that between optimistic bias and perceived susceptibility.

It is important to point out that this relationship is a correlation, so no causality can be assumed; however, this relationship may still be useful for health communicators and practitioners. It may prove that health communicators or practitioners should work to decrease the high prevalence of optimistic bias about HPV by increasing feelings of susceptibility first and less importantly, severity.

Hypothesis 3

The third hypothesis was that as knowledge of HPV goes up, perceived severity goes up as well. This hypothesis held true for general knowledge scores but not for specific knowledge scores. This indicates that all that may be needed for a feeling that HPV is a significant threat is a more general knowledge of the virus, as opposed to really understanding what associated conditions it causes and what its symptoms are. This would indicate that to increase the perceived severity of HPV, health communicators and practitioners should not worry as much about educating about the facts of HPV and instead focus on raising general knowledge of the virus.

In fact, in looking into my research questions, general knowledge of HPV has a wide range of effects. As general knowledge increases, perceived efficacy and perceived susceptibility go up as well. Due to the finding that many people underestimate the threat of HPV, and there is still a high non-vaccination rate, health communicators and practitioners should focus much of their effort on increasing general HPV knowledge. An increase in general HPV knowledge seems to have a wide range of beneficial effects.

Research Questions

One research question looked into the relationship between optimistic bias and the standardized discriminating value. It showed that the higher the tendency to engage in DCPs, the higher the tendency to have optimistic bias. Common sense would seem to dictate that optimistic bias is just another form of FCP. The findings of this survey suggest that optimistic bias is not a true fear control process but instead is a different mental paradigm.

There does seem to be some relationship between getting the vaccine and optimistic bias, although it did not reach the level of statistical significance. Those who have received the vaccine feel less optimistic bias than those who have not received the vaccine. This means that

people who feel they are as likely as anyone else to get HPV are also more likely to receive the vaccine. This relationship is particularly strong when you consider the fact that you would expect those who received the vaccine to have more optimistic bias. The fact that people who received the vaccine show less optimistic bias compared to those who have not received the vaccine despite the fact that they actually have much less chance of getting HPV seems to suggest the power of decreasing optimistic bias.

Analysis of other research questions also provided important information that could be useful to health communicators and practitioners. First, students felt that they are in charge of their own health and vaccination decisions, although they report still relying on their parents as sources of health information. This indicates that future health campaigns should focus on directing vaccination messages not only at the college students themselves but also their parents. Another person who could likely influence someone to get the HPV vaccine is, not surprisingly, their doctor.

Most people believe that they have seen HPV vaccine commercials or HPV campaigns. They also felt that Gannett was not doing a good job of providing information about the HPV vaccine. Given the powerful relationship between knowledge scores and perceived-efficacy, it is important for these campaigns to continue to increase their prevalence.

Limitations

The first limitation of my study is that the population studied was a convenience sample limited to a very specific segment of the population. Those I surveyed were all members of a well-educated Ivy League university. This may mean that they are particularly well educated to health risks or have the ability to pay for the vaccine. Some relationships may prove to hold true

to my population that might not hold true for other populations, particularly those that rely on knowledge scores.

A large portion of those I surveyed were also Communication majors. This may mean that they have more natural tendency to pay attention to media and health messages. This may cause the data that questions awareness and understanding of different health messages to be different from those of the general population.

Also, certain relationships found in this data did not reach statistical significance. This may be due to the fact that my sample size was not particularly large. Further dissemination of this survey could strengthen some of the relationships that were hinted at in the results. For example, the relationship between receiving the vaccine and discriminating value scores and the relationship between receiving the vaccine and optimistic bias score might be evident with a larger sample size.

Finally, some may question why men were included in this study if only females can receive the vaccine. There are a number of reasons. First, more knowledge is gained about the current state of understanding and attitudes toward HPV by including men. Second, men do play a significant role in the transmission of HPV; therefore, ways to decrease things like optimistic bias for males so they are more careful and knowledgeable about their own sexual health may be useful for preventing the spread of the disease. Third, the HPV vaccine may be FDA-approved for men in the near future, and some physicians do offer the HPV to men off label. For these reasons, including men in my study may actually be one of its strengths. Still, it is important to point out that men were only included in the analysis where appropriate and when it made sense to include them. In some places, where indicated, the results are shown strictly for women.

Conclusion

This investigation sought to examine the knowledge, attitudes, and behaviors of a key target audience for the HPV vaccine – college undergraduates – to determine what factors may be influencing their acceptance of the HPV vaccine. The investigation, by looking into key attributes such as knowledge, discriminating value, optimistic bias, and vaccine rates, was able to come up with concrete results that may be of use to health communicators and practitioners.

First, by finding standardized discriminating value scores, health practitioners can use a standardized survey given to their patients to determine whether they are engaging in DCPs or FCPs. Depending on the results of the survey, a specific health message can be aimed at their patients.

Second, this research gives a clear course of recommended actions for those who are planning an HPV vaccine campaign:

1: Males tend to be in FCPs and females in DCPs. This indicates that messages designed at males need to increase feelings of perceived efficacy as opposed to increasing fear. On the other hand, females tend to engage in DCPs, so increased fear and efficacy in messages are both warranted.

2. Increasing feelings of susceptibility and severity may decrease feelings of optimistic bias. This decrease in optimistic bias may play a role in increasing vaccination rates.

3. Health campaigns should focus on increasing general knowledge education as well as promoting the uptake of HPV. This may lead to increased feelings of perceived-threat and perceived-efficacy.

4. Health campaigns should focus on parents as well as students. Despite the fact that students feel they make their own decisions, parents are often relied upon as a source of knowledge.

5. Optimistic bias and discriminating values seem to be completely separate phenomena that may need to be handled differently from fear appeals and the RBD scale. The interesting relationship between optimistic bias and discriminating value needs to be further investigated.

In sum, the findings contribute to the research community's understanding of the HPV vaccine, HPV attitudes and knowledge, and health communication issues in general. Specifically, this study looks at a key target of HPV vaccines and a group at high risk: college students. This study is also one of the first to attempt to unify the concepts of optimistic bias and those concepts established in the EPPM. This is also among the first studies to examine knowledge in relation to optimistic bias and the EPPM. By looking into these communication issues, I identified a number of key findings about the target audience and were able to provide a number of practical suggestions.

Future Research

Although this study has looked into a large number of communication theories and issues, more work is needed. First, this study should be applied to a larger and more diverse community in order to help tease apart many of the relationships indicated and some that were merely hinted at in this study's results. Also, the relationship between discriminating value scores and optimistic bias needs further investigation. Will increased optimistic bias positively correlate with increased danger control processes for other health behaviors? Finally, as the future brings new developments such as increased dissemination of vaccination campaigns and

changes in vaccination laws, pricing, dosages and possible FDA approval, further research will be needed to properly reflect the ever changing landscape of the American health scene.

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Appendix

Scale Items

Perceived Threat

Perceived Severity	1.) I believe the HPV is severe. 2.) I believe that HPV is not serious.* 3.) I believe the threat of getting HPV is significant.
Perceived Susceptibility	1.) I am at risk for getting HPV. 2.) It is not likely that I will contract HPV.* 3.) It is possible that I will contract HPV.

Perceived-Efficacy

Perceived Self-Efficacy	1.) I am able to the vaccine to prevent getting HPV. 2.) An HPV vaccine is not easy to obtain.* 3.) Getting the HPV vaccine in order to prevent HPV is convenient.
Additional measures of Perceived Self-Efficacy	1.) I know how to go about getting an HPV vaccine. 2.) I have time to get the HPV vaccine. 3.) I can afford to get the HPV vaccine.
Perceived Response-Efficacy	1.) The HPV vaccine is effective in preventing certain types of HPV. 2.) The HPV vaccine is not effective in preventing HPV.* 3.) If I get the HPV vaccine, I am less likely to get HPV.

Optimistic Bias

1.) I believe I may have HPV.
2.) What do you believe is the chance of you getting HPV?
3.) What do you believe is the chance of one of your sexual partners having HPV?
4.) What do you believe is the chance of a friend at Cornell having HPV?
5.) What do you believe is the chance of a random Cornell student having HPV?

Knowledge

Specific Knowledge	1.) Fever*** 2.) Headache*** 3.) Cramps*** 4.) Pain Urinating*** 5.) Milky Discharge *** 6.) Large Cauliflower-like Warts** 7.) Small Soft, Moist, Pink Warts**

	8.) Irritation** 9.) Itching** 10.) Bleeding ** 11.) Precancerous Lesions** 12.) Hypertension*** 13.) Anal Cancer** 14.) Breast Cancer*** 15.) Cervical Cancer** 16.) Lung Cancer***
General Knowledge	1.) I can only spread warts if I am experiencing symptoms.* 2.) HPV is associated with other medical conditions beyond the symptoms of the disease. 3.) Only males can get HPV.* 4.) HPV has more severe health implications for men than women.* 6.) It is possible for there to be no visible symptoms of HPV.

* For data analysis, starred questions are reverse coded.
** Considered a symptom or associated condition
*** Not considered a symptom or associated condition

Figure

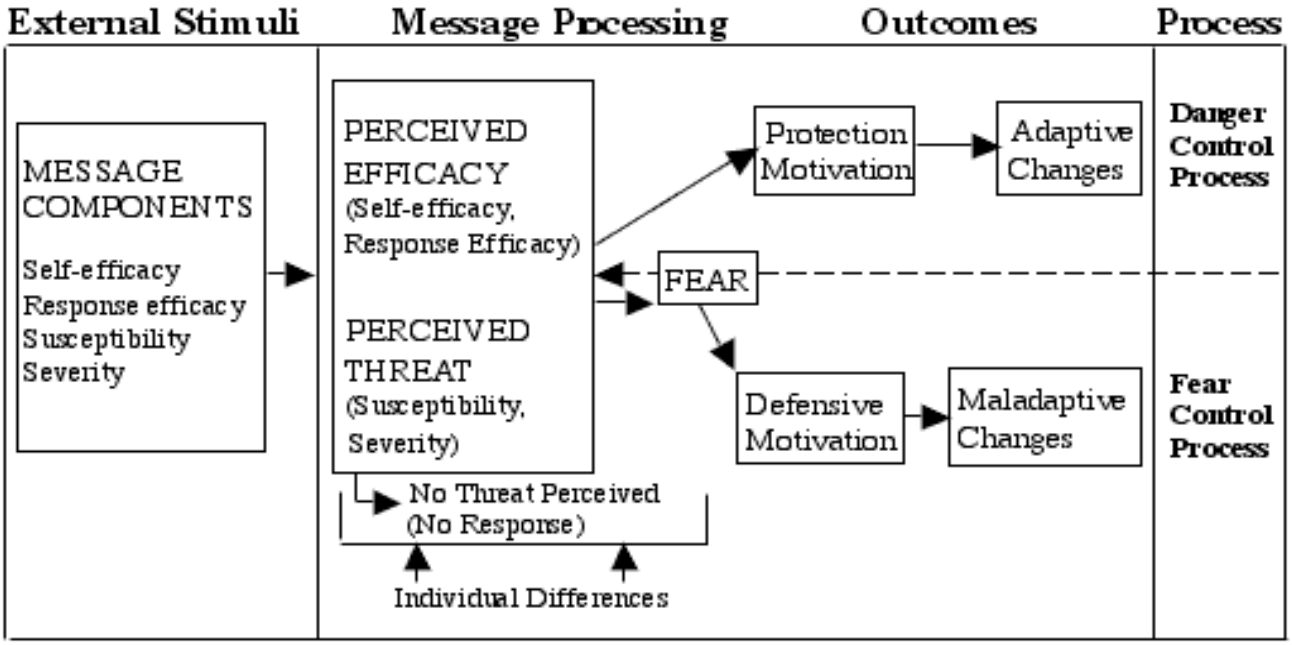

Figure 1. The Extended Parallel Processing Model (Witte et al., 1996).