Health Communication

A Serial Mediation Model of Message Framing on Intentions to Receive the Human Papillomavirus (HPV) Vaccine: Revisiting the Role of Threat and Efficacy Perceptions

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Previous research has yielded mixed findings regarding the potential for message framing to influence HPV vaccine-related intentions. Drawing on the Extended Parallel Process Model (EPPM), the current study focuses on the role of threat and efficacy as serial mediators linking message framing and HPV vaccine-related intentions. College-age females and their parents participated in a between-subjects, posttest only experiment to investigate whether behavioral intentions to talk to a doctor about the HPV vaccine differ as a function of framing messages in terms of disease prevention. For young women, framing messages as preventing genital warts (as compared to cancer prevention) significantly increased perceptions of self-efficacy, which enhanced response efficacy perceptions that, in turn, increased intentions to talk to a doctor about the HPV vaccine. There were no effects of message framing among parents. However, response efficacy was a significant mediator of self-efficacy and behavioral intentions for both the college-age females and their parents. The results of this study suggest new approaches for considering the relationship among EPPM constructs.

The human papillomavirus (HPV) is the most common sexually transmitted infection in the United States (Dunne et al., 2007). It is estimated that nearly 20 million individuals are currently infected with HPV and that 6.2 million new cases of HPV will occur each year (Pichichero, 2007). HPV is associated with a range of adverse health outcomes, including genital warts, as well as anal, penile, scrotal, vulvar, vaginal, and some head and neck cancers (Pichichero, 2007). In June 2006, the U.S. Food and Drug Administration (FDA) approved a vaccine for females ages 9–26 years that prevents the types of human papillomavirus (HPV) infections that cause most cases of cervical cancer (Markowitz et al., 2007).

Despite the optimism surrounding the arrival of the HPV vaccine, its ability to effectively reduce negative health outcomes is inconsequential if young females do not opt to receive the vaccine. Further, young females' decisions to become vaccinated largely depend on the extent to which their parents support HPV vaccination (Dempsey, Abraham, Dalton, & Ruffin, 2009). Unfortunately, the United States lags behind many other industrialized countries regarding the number of females who receive the vaccine. In 2008, fewer than 20% of adolescent females were vaccinated against HPV, as compared to countries such as Australia and the United Kingdom where 75–80% of 12–13 year old girls have been vaccinated. Hence, there is a need for research-based strategies to communicate information about the HPV vaccine more effectively to both parents and female adolescents (Sherris et al., 2006).

The purpose of the current study is to fill this gap by exploring the potential contributions of communication

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efforts to improve HPV vaccine rates. This is accomplished in two ways. First, the theoretical contributions of the Extended Parallel Process Model (EPPM) for understanding intentions to talk about the HPV vaccine are considered and a new approach for testing the associations of threat and efficacy with health behavior is proposed. Second, the potential contributions of message framing for influencing intentions of both older adolescent females and their mothers to talk about the HPV vaccine are examined. Although previous research has touched on the role of message framing in this context, the current study answers the call of Sperber, Brewer, and Smith (2008) to identify potential mediators of the relationship between the framing of disease outcome (i.e., genital warts versus cervical cancer prevention) and intentions related to obtaining the vaccine.

BACKGROUND AND NEED

Although the human immune system typically clears most types of HPV infection, roughly 45% of women do not develop protective immunity against HPV infection (Huh, Kendrick, & Alvarez, 2007). These women are vulnerable to infection of low-risk and high-risk types of HPV. Two low-risk HPV types include HPV 6 and 11, which can lead to the development of anogenital warts and other genital abnormalities (Pichichero, 2007). High-risk types of HPV are associated with various types of cancers (e.g., penile, head, neck), including cervical cancer. Cervical cancer is the second most common type of cancer, with HPV found in 99.7% of cervical cancers, and approximately 70% of cervical cancers resulting from the two most common types of HPV, 16 and 18 (Huh et al., 2007).

The FDA has approved a quadrivalent vaccine that stimulates immunity against the four types of HPV that cause almost all cases of genital warts (i.e., HPV 6 AND 11) and most cases of cervical cancer (i.e., HPV 16 and 18) (Twombly, 2006). The vaccine is currently approved for females and males between the ages of 9 and 26 years (Pichichero, 2007). It is estimated that vaccination in addition to proper screening will decrease the number of cervical cancer cases by approximately 66% (Pichichero, 2007).

The ability of the HPV vaccine to reduce cervical cancer morbidity and mortality, however, depends on public acceptance of the vaccine (Dempsey et al., 2009). Studies have found that parents of female adolescents generally report positive attitudes and intentions toward vaccinating their daughters against HPV (Allen et al., 2010; Barnack, Reddy, & Swain, 2010). However, the parental decision to vaccinate a daughter or for a young woman to decide to be vaccinated is complex and may be influenced by a number of factors.

Factors that influence parents' vaccine acceptability include parental perceptions that the vaccine is effective in preventing HPV infection, the recommendation of a physician, and perceptions that their daughter will likely be infected with HPV (Dempsey, Zimet, Davis, & Koutsky, 2006). Other studies report that most parents lack knowledge about HPV and are concerned about sexual health issues that would arise as part of HPV vaccine education (Brabin, Roberts, Farzaneh, & Kitchener, 2006). Additional barriers include cost and concerns that the vaccine would promote sexual behavior (Brewer & Fazekas, 2007). Given that the majority of these critical concerns are about the efficacy of the vaccine and the potential threat posed by HPV, the Extended Parallel Process Model (EPPM) offers a theoretical perspective for understanding how efficacy and threat perceptions should influence behavioral intentions of both parent and personal decision-making regarding the HPV vaccine.

THE EXTENDED PARALLEL PROCESS MODEL

The EPPM was developed to resolve inconsistencies in the fear appeal literature by clarifying and expanding the role of emotion in understanding how health risk messages are processed (Witte, 1992). Two theoretical perspectives that were influential in the developed of the EPPM include Leventhal's parallel process model (1971) and Rogers's Protection Motivation Theory (PMT; 1975; 1983). The EPPM is considered an extension of the parallel process model because it distinguishes between cognitive and emotional processing of fear appeals (Leventhal, 1971). The EPPM also draws heavily on PMT (Rogers, 1975) to make predictions about how cognitive appraisals of perceived threat and perceived efficacy mediate the persuasive effects of health risk messages.

Perceived threat in the EPPM is conceptualized as a second-order unidimensional construct comprised of severity and susceptibility (Witte, 1992). Perceived severity of the threat refers to the seriousness of the consequences of a health risk. Perceived susceptibility (or vulnerability to a given threat) refers to the likelihood that the threat will occur. People are most motivated to reduce risk when both severity and susceptibility are high (Witte, 1992). For instance, in the health context of HPV, perceptions of the severity of HPV and personal susceptibility to the infection have been found to be associated with intentions to be vaccinated (Kahn et al., 2008). In some cases, an individual may perceive him- or herself to be at risk of a severe health threat (i.e., high perceived severity and susceptibility), but fail to engage in behavior to reduce that risk. The two primary barriers to reducing risk posed by a health threat are low levels of self and response efficacy (Witte, 1992).

Perceived efficacy, like threat, is also conceptualized by the EPPM as a second-order unidimensional construct comprised of self-efficacy and response efficacy (Witte, 1992). Self-efficacy beliefs, originally referred to as efficacy expectations, are perceptions of one's ability to perform or engage in a behavior (Bandura, 1977). The self-efficacy perceptions

discussed in most examinations utilizing the EPPM framework are in reference to behaviors recommended to manage or reduce the related health threat. Response-efficacy beliefs, originating from the concept of outcome expectancies, are perceptions that an intended outcome will result if one does perform or engage in a behavior (Bandura, 1977; Rogers, 1975). Self-efficacy and response-efficacy beliefs usually vary by context because a behavior is always task and situation specific (Strecher, DeVellis, Becker, & Rosenstock, 1986). In the case of the HPV vaccine, self-efficacy beliefs could include perceptions of one's ability to actually get the vaccine or simply one's ability to engage in the common recommended behavior of talking to a health care provider or one's own child about the vaccine. Perceived response efficacy related to the HPV vaccine could include beliefs about whether the vaccine will make you immune against HPV infections or whether talking to a health care provider or your own child about the vaccine will impact intentions to vaccinate.

The key theoretical advances proposed by the EPPM relate to how various combinations of threat and efficacy will influence outcomes associated with exposure to health risk messages. The predictions about the relationship between threat and efficacy focus on three general ideas. First, the EPPM maintains that when individuals are exposed to health risk messages, they first assess the severity of and their susceptibility to the health threat. If the health threat is deemed to be trivial or improbable, the message will not be processed further. However, if perceptions of threat are aroused, an individual appraises his or her own efficacy to enact the recommended behavior, as well as the efficacy of the action advocated by the message for alleviating the threat. Second, the EPPM proposes the idea of a threat threshold or a critical point where perceived threat exceeds perceptions of efficacy. When this critical point is reached, fear control or emotional processes dominate. However, when perceptions of efficacy meet or exceed perceptions of threat, danger control processes dominate and individuals are predicted to engage in adaptive health behaviors that reduce the risk of the health threat. Third, the relationship between threat and efficacy is hypothesized to be multiplicative such that high levels of perceived threat and perceived efficacy create a "magic cell." In other words, high levels of perceived threat and efficacy are suggested to be more effective in producing behavior change than when threat or efficacy is perceived to be low (i.e., high threat/high efficacy > low threat/high efficacy = high threat/low efficacy = low threat/low efficacy).

EMPIRICAL INVESTIGATIONS OF THREAT AND EFFICACY RELATED TO HEALTH RISKS

The propositions of the EPPM regarding the relationship between threat and efficacy have had a significant influence on the health risk literature (e.g., Roberto & Goodall, 2009;

Roberto, Meyer, Johnson, & Atkin, 2000). Since the inception of the EPPM, research has sought to test its predictions in various contexts in search of evidence that the interaction of threat and efficacy (i.e., the magic cell) results in risk messages having greater persuasive effects as compared to the additive model. The additive model, the approach advocated by PMT, suggests that the persuasive benefits of inducing threat and efficacy perceptions are equal to the simple sum of the benefits that would be expected from the total threat and efficacy induced (i.e., high threat/high efficacy > low threat/high efficacy = high threat/low efficacy > low threat/low efficacy). In other words, the differences between the magic cell and the additive model are primarily related to predictions about the performance of high efficacy/low threat and low efficacy/high threat health messages. Although previous studies have found some support for the magic cell prediction, a meta-analysis conducted by Witte and Allen (2000) found that the published data are more consistent with the additive model predication than the magic cell proposed by the EPPM.

Another common approach for testing the threat–efficacy relationship outlined in the EPPM has been to examine threat and efficacy as parallel mediators of the message exposure-to-behavior link (Goei et al., 2010; Witte, 1992; Witte, 1994). Previous research conducting such examinations, contrary to the conceptualizations in the EPPM, have analyzed threat and efficacy as independent constructs influencing behavioral outcomes (e.g., Cauberghe, Pelsmacker, Janssens, & Dens, 2009; Roskos-Ewoldsen, Yu, & Rhodes, 2004). Specifically, self-efficacy as well as unidimensional measures of efficacy (i.e., variables comprised of both self-efficacy and response efficacy) have been found to significantly mediate the exposure-to-intentions link (Goei et al., 2010; Roberto, Krieger, & Beam, 2009), however, there is a lack of evidence supporting response efficacy as a single mediator (Krieger, Kam, Katz, & Roberto, 2011; Krieger, Katz, Kam, & Roberto, 2011). Previous research examining severity and susceptibility perceptions as multiple parallel mediators has also resulted in inconsistent findings (Goei et al., 2010; Krieger, Kam, et al., 2011; Krieger, Katz, et al., 2011).

Reconceptualizing the Role of Threat and Efficacy Perceptions on Message Outcomes

Given the lack of empirical support for the "magic cell" hypothesis and inconsistent findings regarding the role of threat and efficacy as mediators, an investigation revisiting the relationships among the EPPM constructs is warranted. We propose reexamining Witte's (1992) decision to conceptualize threat as simply the sum of severity and susceptibility, and efficacy as the sum of self-efficacy and response efficacy. Instead, we suggest separating out the four constructs in an effort to reconsider how they might relate to one another. This move is supported by the early PMT literature (e.g.,

Rogers & Mewborn, 1976), as well as more recent studies that have found no correlation between susceptibility and severity, and only moderate correlations between self- and response efficacy (Cauberghe et al., 2009). Additionally, results from a confirmatory factor analysis on self- and response efficacy items demonstrate that these items load on separate dimensions (Choi, Krieger, & Hecht, 2012).

Now that the need for considering each of the four variables as unique constructs has been established, we consider the theoretical relationships among them. Previous research suggests that the relationship between the threat variables and efficacy variables is not multiplicative, and studies using all four variables as parallel mediators have found mixed results (Goei e al., 2010; Krieger, Kam, et al., 2011; Krieger, Katz, et al., 2011). However, it is possible that the predictions of the EPPM can be improved with a minor adaptation to the logic. Specifically, we propose reexamining predictions about the sequential processing of health risk messages. The EPPM (Witte, 1992) proposed that individuals initially appraise threat, then efficacy. This idea has been heavily critiqued (e.g., Cauberghe et al., 2009; Roskos-Ewoldsen et al., 2004). Instead of focusing on the sequential processing of threat and efficacy, it may be useful to consider the possibility of independent sequential processes that produce assessments of both self-efficacy and response efficacy (e.g., risk message exposure → self-efficacy → response efficacy → behavioral intention), as well as severity and susceptibility (e.g., risk message exposure → severity → susceptibility → behavioral intention). Indeed, the theoretical foundations on which the EPPM was developed suggest the potential for theses multiple-step (or serial) mediation relationships.

Bandura's social cognitive theory (1986), an extension of his earlier social learning theory (Bandura, 1977), is foundational to EPPM's conceptualizations of efficacy. Bandura (1986) originally introduced two types of efficacy as significant mechanisms that predict and explain behavior. According to Bandura, behavior greatly depends on (1) self-efficacy—one's own ability to perform a behavior— and (2) response efficacy—the probability of the expected outcome of a behavior (Bandura, 1977). Response efficacy encompasses both positive and negative expectations about physical, social, and self-evaluative outcomes (Bandura, 1986; 2006). While expectations about positive outcomes function as incentives and negative outcomes as disincentives, perceived outcomes largely depend on perceptions of how well one will perform or execute the behavior—perceptions of self-efficacy (Bandura, 2006). Bandura further claimed self-efficacy beliefs influence not only perceptions of response efficacy but also emotional reactions, goals and aspirations, and perceptions of barriers and opportunities (Bandura, 2004). This cognitive assessment influences decisions about a behavioral setting, the amount of effort expended on a task, and the amount of time spent attempting to achieve the task (Strecher et al.,
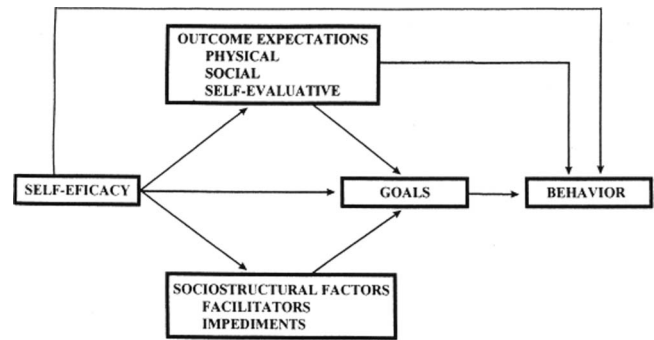

FIGURE 1 Causal model of the direct and indirect influence of self-efficacy on behavioral outcomes through response efficacy, adapted from Bandura (2004, p. 146).

1986). Therefore, self-efficacy beliefs influence behavior or behavioral intention outcomes both directly and indirectly through their effect on other determinants, including response efficacy.

The indirect effect of self-efficacy beliefs on perceptions of response efficacy is depicted in Figure 1 (adopted from Bandura, 2004, p. 146). This illustration outlines the causal model of direct and indirect influence self-efficacy has on goals and behaviors. For instance, high self-efficacy beliefs are likely to foster expectations of more favorable outcomes that would increase the likelihood of a behavior, while low self-efficacy should lead to more negative outcome expectancies that would decrease the likelihood of a behavior. This article uses this model as a framework to test the self-efficacy/response-efficacy relationship influencing behavioral intentions after exposure to a health risk message. Specifically, this study proposes that exposure to a health message should influence behavioral intentions to perform the behavior recommended by the message though both self-efficacy (first) and response efficacy (second).

The foundational literature that guided Witte's development of the EPPM helps generate a similar proposition for the relationship between the two components of threat as those suggested above for the relationship between the two components of efficacy. Although Leventhal (1971) and Witte (1992) never formally introduced or tested the idea that severity and susceptibility function as serial mediators, close examination of their theories reveals that serial mediation processes were integral to their thinking. In describing how to build effective health risk messages, Leventhal (1971) argues that effective messages must first focus on the severity of a threat. Once a person is convinced of the severity of a given health threat, then his or her susceptibility should be addressed. In other words, if the health threat is deemed as trivial, the individual will not be further motivated to make an assessment of his or her susceptibility. This logic was also apparent to Witte (1992, 1994). Specifically, she posited that if the perceptions of the severity of a health threat do not reach a minimum threshold, a person will be

unlikely to evaluate whether or not that person is at risk. The inherent sequence underlying discussions of the threat variables in the EPPM framework suggests that perhaps these variables also work as mediators in sequence: causally linking severity perceptions induced by a risk message to susceptibility perceptions that in turn impact behavior or behavioral intention outcomes.

Following this logic, this study reconsiders the use of self-efficacy, response efficacy, severity, and susceptibility as two composite variables (i.e., threat and efficacy; Goei et al., 2010; Witte, 1992; Witte, 1994) and as separate parallel mediators (Krieger, Kam, et al., 2011; Krieger, Katz, et al., 2011). Instead, it proposes that self- and response-efficacy perceptions function as serial mediators. Similarly, severity and susceptibility perceptions serve as a second pair of serial mediators leading to behavioral or behavioral intention effects. In the current study, we specifically examine self-efficacy and response efficacy, as well as severity and susceptibility, as serial mediators of the relationship between how health risk messages are framed and behavioral intentions. Next, we consider how message framing may influence cognitive assessments of threat and efficacy.

MESSAGE FRAMING

The EPPM predicts that women who perceive high threat (i.e., severity and susceptibility) associated with HPV will be more motivated to obtain the HPV vaccine provided that they also possess high response- and self-efficacy beliefs. Thus, one potential avenue for increasing HPV vaccine rates is to consider whether framing health risk messages in different ways can increase perceptions of threat and efficacy. Given that both college-age females and their mothers have a significant role in decision making about the vaccine, it is important to examine the potentially differential effects of message framing for both college students and their parents with regard to HPV vaccine-related intentions.

The importance of perceptions of threat and efficacy on behavioral intentions suggests that framing HPV vaccine messages to highlight these constructs has the potential to influence intentions to be vaccinated against HPV. To date, there have been only a handful of studies examining the influence of message framing on HPV vaccine intentions. Some have focused on different frames (i.e., gain/loss) for conveying the ability of the HPV vaccine to prevent cervical cancer (Gerend & Shepherd, 2007; Gerend, Shepherd, & Monday, 2008; Lechuga, Swain, & Weinhardt, 2011). Other studies have focused on comparing messages framed in terms of whether the vaccine prevents cervical cancer as compared to messages that frame the vaccine as preventing cervical cancer and genital warts (Juraskova, Bari, O'Brien, & McCaffery, 2011; Leader, Weiner, Kelly, Hornik, & Cappella, 2009). While Juraskova and colleagues

(2011) found no effects of framing, Leader et al. (2009) did find significant framing effects when messages included the information that the vaccine is available at little or no cost. Specifically, using a multi-age sample of women, Leader and colleagues (2009) showed that framing the HPV vaccine only in terms of cervical cancer prevention resulted in females reporting higher intentions to receive the HPV vaccine than messages that framed the HPV vaccine as preventing cervical cancer in addition to sexually transmitted infections (STIs; e.g., genital warts) or mentioned concerns associated with increased promiscuity.

The major focus of the literature to date has emphasized framing HPV messages in terms of the cervical cancer prevention benefits of the vaccine, and some support has been found for this approach (Leader et al., 2009). However, research has not yet considered comparing the effectiveness of messages framed as cervical cancer prevention only to messages framed as genital warts prevention. There is some reason to believe that such an approach might be warranted. Matters of sexual health are a primary concern of emerging adulthood (Lefkowitz & Gillen, 2006). It is unsurprising that a recent study found that college-age females who are aware that HPV causes genital warts are almost two times more likely to have received the HPV vaccine (Licht et al., 2010). Thus, the finding by Leader and colleagues may have been influenced by the fact that the mean age of the study sample was 49 years. Thus, a truer test of framing HPV messages as cervical cancer as compared to genital warts can be accomplished using a cohort of females in emerging adulthood for whom the FDA recommends vaccination.

Given the aversive response parents have to the association of STI information with HPV, it is likely that a cancer prevention frame should be more effective than a genital warts prevention frame for increasing parents' intentions to encourage their daughters to talk to a doctor about the HPV vaccine. Conversely, the literature demonstrates that college-age females are highly concerned about their sexual health as a function of their development. Thus, a genital warts prevention frame should be more effective than a cancer prevention frame for increasing female college students' intentions to talk to a doctor about the vaccine.

HYPOTHESES

Based on inconsistent research regarding the role efficacy and threat perceptions play as mediators in the relationship between message exposure and behavior/behavioral intentions, the present study suggests serial mediation processes for the pair of efficacy perceptions and the pair of threat perceptions. That is, self- and response-efficacy perceptions in this sequence mediate the messages' impact on behavioral intentions. Additionally, severity and susceptibility perceptions in this sequence mediate the same relationship. The current study also investigates the impact

of disease prevention frames on female students' intentions to talk to a doctor about the HPV vaccine and their mothers' intentions to encourage their daughters to talk to a doctor about the HPV vaccine. We propose that the genital warts prevention frame will be more effective at producing the serial multiple mediation models that result in the desired behavioral intentions for the female students and the cancer prevention frame will be more effective for the mothers. Therefore, we formally propose the following hypotheses:

H$_{1a}$: HPV vaccine messages framed as preventing genital warts will indirectly influence females' behavioral intentions to talk to a doctor about the vaccine through causally linked multiple mediators of self-efficacy and response efficacy.

H$_{1b}$: HPV vaccine messages framed as preventing cervical cancer will indirectly influence mothers' behavioral intentions to encourage their daughter to talk to a doctor about the vaccine through causally linked multiple mediators of self-efficacy and response efficacy.

H$_{2a}$: HPV vaccine messages framed as preventing genital warts will indirectly influence females' behavioral intentions to talk to a doctor about the vaccine through causally linked multiple mediators of severity and susceptibility.

H$_{2b}$: HPV vaccine messages framed as preventing cervical cancer will indirectly influence mothers' behavioral intentions to encourage their daughter to talk to a doctor about the vaccine through causally linked multiple mediators of severity and susceptibility.

METHOD

A between-subjects, posttest only, factorial experiment was conducted to investigate whether behavioral intentions to talk to a doctor (student message) or encourage a daughter to talk to a doctor (parent message) about the HPV vaccine differ as a function of framing messages in terms of disease prevention (i.e., genital warts versus cervical cancer). The experimental manipulations were accomplished through full-page, color print messages. Students were randomly assigned to one of two message conditions, with parents assigned to the same condition as their child. After being exposed to the message, all participants completed a questionnaire.

Participants and Procedures

Two hundred and eighty-six female undergraduate students enrolled in communication courses at a large, Midwestern university participated in a message design experiment for extra course credit. Students completed a research packet containing one of two health messages about HPV and a questionnaire in a controlled environment. After completing

the packet, participants were asked to address an envelope containing information about the HPV vaccine similar to what they had received and a brief, self-administered questionnaire about the HPV vaccine to their mother or female guardian. Two hundred sixty-four students voluntarily addressed the envelope containing the questionnaire to their mother or female guardian. Most daughters addressed the survey to their biological mother (96%). Among these, 192 mothers returned completed questionnaires (72% response rate). The mother and daughter questionnaires took approximately 10 and 20 minutes to complete, respectively. There was no compensation offered to mothers for participating in the study.

Ninety-eight (34%) of the female students and their corresponding mothers were removed from the data because the daughter had already received one or more doses of the vaccine. Hence, data from 188 female students and 115 corresponding mothers were used for the current analyses.

The mean age for student participants was 21.63 years ($SD = 4.99$), while the average age of the parents was 50.16 years ($SD = 4.98$). Most daughters self-identified as White (76%), followed by Black/African-American (12%), Asian (8%), and "other" (5%). The racial composition of the parent sample was similar, with mothers self-identifying as White (85%), Black/African-American (9%), Asian (5%), and "other" (1%).

Stimulus Materials

Two sets of HPV health messages were created, one set for students and one for their mothers. The two sets of messages were identical, except for minor adjustments to the mothers' messages to increase validity. The student messages recommended talking to a doctor about the HPV vaccine, and the parent messages recommended encouraging their daughter to talk to a doctor about the HPV vaccine.

Both sets of messages (i.e., parent and student) manipulated the presentation of the disease prevention benefits of the vaccine. This manipulation was accomplished through a large title at the top of the message that said either, "Prevent cervical cancer" or "Prevent genital warts." The manipulation was further reinforced through a text box located at the bottom of the message. The message copy included nine short sentences that included use of the term "cervical cancer" or "genital warts" three times. For example, one line of text stated, "There is a vaccine that prevents the types of HPV that commonly cause [cervical cancer/genital warts]."

Measures

Mothers' and students' perceived risk (i.e., severity and susceptibility) and efficacy (i.e., self-efficacy and response efficacy) were measured using items from Witte, Cameron, McKeon, and Berkowitz's (1996) Risk Behavior Diagnostic

(RBD) Scale. Behavioral intentions were measured using procedures outlined by Ajzen and Fishbein (1980) and Witte et al. (1996). In addition, students completed items assessing their general awareness of HPV, which included an HPV risk knowledge scale and whether or not they had heard of HPV from their health care provider, and their preexisting experiences related to HPV, which included questions as to whether they had HPV and whether their partner had an STI. Further, both students and mothers completed items assessing their attitudes and social norms regarding HPV. These items, although not central to the present study's examination, were necessary to take into account when testing the proposed hypotheses and thus, were included as covariates.

Susceptibility. To measure susceptibility, mothers reported the degree to which they perceived their daughter was susceptible to getting HPV by responding to three items: "My daughter is at high risk for getting HPV," "It is likely that my daughter will get HPV," and "There is a high chance that my daughter will get HPV" ($M_{mother} =$ 2.15, $SD = .83$; Cronbach's $\alpha = .87$). The responses were based on a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*). Students used a similar scale to report the degree to which they perceived themselves susceptible to getting HPV. They rated themselves on the following three questions: "I am at high risk for getting HPV," "I am likely to get HPV," and "My chances of getting HPV are high" ($M_{daughter} = 2.74$, $SD = 1.1$; Cronbach's $\alpha = .88$).

Severity. To operationalize severity, mothers reported the degree to which they believed it would be a serious threat to their daughter's life, health, and well-being if the daughter were to get HPV. Based on a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*), mothers responded to three items: "If my daughter were to get HPV it would be a very serious threat to her quality of life," "If my daughter were to get HPV it would be a very severe threat to her health," or "If my daughter were to get HPV it would be harmful to her well-being" ($M_{mother} = 3.16$, $SD = 1.1$; Cronbach's $\alpha = .86$). Daughters used the same 5-point scale and responded to three similar items: "HPV is a serious threat to my quality of life," "HPV would be a severe threat to my health," and "HPV would be harmful to my well-being" ($M_{daughter} = 3.96$, $SD = .88$; Cronbach's $\alpha = .81$).

Self-efficacy. Mothers reported the degree to which they believed how easy it would be to encourage their daughter to speak to a doctor about the HPV vaccine. Using a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*), mothers responded to three items: "It would be easy for me to encourage my daughter to talk to her doctor about the HPV vaccine," "It would be simple for me to encourage my daughter to talk to her doctor about the HPV vaccine," and "I would be comfortable encouraging my daughter to talk to her doctor about the HPV vaccine" ($M_{mother} = 3.96$, $SD = 1.1$; Cronbach's $\alpha = .93$). With the same 5-point scale,

daughters responded to three items: "It would be easy for me to talk to a parent/guardian about getting the HPV vaccine," "It would be simple for me to talk to a parent/guardian about getting the HPV vaccine," and "I would be comfortable talking to a parent/guardian about the HPV vaccine" ($M_{daughter} = 4.03$, $SD = 1.1$; Cronbach's $\alpha = .97$).

Response efficacy. To measure perceived effectiveness of encouraging their daughter to talk with a physician about the HPV vaccine, mothers used a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*) to respond to a scale containing three items ($M_{mother} = 3.70$, $SD = 1.2$; Cronbach's $\alpha = .89$). For example, one of the items stated, "Encouraging my daughter is an effective way to her to talk to her doctor about the HPV vaccine." Daughters also responded to three-item scale that assessed their perceived effectiveness of talking with a physician about the HPV vaccine ($M_{daughter} = 4.02$, $SD = .73$; Cronbach's $\alpha = .76$). The scale included items such as "Talking to my healthcare provider would help me make a good decision about whether or not to get the HPV vaccine."

Intention. Mothers reported the degree to which they intended to encourage their daughter to talk to a doctor about the HPV vaccine, whereas daughters reported the degree to which they intended to talk to a health care provider about the HPV vaccine. More specifically, mothers used a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*) to respond to three items: "I intend to encourage my daughter to talk to her doctor about the HPV vaccine," "I will encourage my daughter to talk to her doctor about the HPV vaccine," and "I plan to encourage my daughter to talk to her doctor about the HPV vaccine" ($M_{mother} = 3.11$, $SD = .98$; Cronbach's $\alpha = .95$). Further, daughters used the same 5-point scale to respond to three items: "I intend to ask my healthcare provider about the HPV vaccine," "I would be willing to ask my healthcare provider about the HPV vaccine," and "I plan to ask my healthcare provider about the HPV vaccine" ($M_{daughter} = 3.86$, $SD = 1.0$; Cronbach's $\alpha = .92$).

Measures for Covariates

Risk knowledge. Students' knowledge about being at risk for HPV was assessed using a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*) to respond to four items ($M_{daughter} = 3.69$, $SD = .87$; Cronbach's $\alpha = .86$). For example, one item stated, "If I had a high number of sexual partners, I would need the HPV vaccine."

Heard of HPV. Students reported whether or not they had heard of HPV from their health care provider. This was measured with a yes (= 1) or no (= 0) response to the item "Did you hear about HPV from a health care provider?" The mean for this item was .73 ($SD = .45$).

Preexisting history of HPV. Two items were asked to determine the level of contact students may have had with HPV. The first item measured students' personal experience with HPV with a yes (= 1) or no (= 0) response option to the question "Did your health care provider ever tell you that you had the human papillomavirus (HPV)?" ($M_{daughter} = .08$, $SD = .26$). The second item measured students' experience with partners who had any sexually transmitted infections with yes (= 1), no (= 0), and I don't know (= 0) response options to the question, "Have any of your present or previous partners been told that they had a sexually transmitted infection?" ($M_{daughter} = .06$, $SD = .23$).

Attitudes. Mothers' attitudes toward the outcome variable of encouraging their daughter to talk to her doctor about the HPV vaccine were measured with four 7-point semantic differential response scales to the item "I feel that encouraging my daughter to talk to her doctor about the HPV vaccine is:" ($M_{mother} = 6.28$, $SD = 1.32$; Cronbach's $\alpha = .95$). The endpoints of the four response scales were harmful/helpful, risky/safe, bad/good, and detrimental/beneficial. Students' attitudes toward the outcome variable of talking to their health care provider about the HPV vaccine were measured with the same four 7-point semantic differential response scales as the mothers to the item "I feel that asking my health care provider about the HPV vaccine is:" ($M_{daughter} = 6.45$, $SD = 1.05$; Cronbach's $\alpha = .93$).

Social norms. Social norms regarding the outcome variable for the mothers were measured using a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*) to respond to two items. These items were "My family would want me to encourage my daughter to talk to her doctor about the HPV vaccine" and "Most people where I am from (besides my family) would want me to encourage my daughter to talk to her doctor about the HPV vaccine" ($M_{mother} = 3.79$, $SD = .97$; Cronbach's $\alpha = .78$). The students' social norms regarding talking to their health care provider about the vaccine were measured using a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*) to respond to the following three items: "My family would approve of me talking to my healthcare provider about the HPV vaccine," "Most people where I'm from approve of me talking to my healthcare provider about the HPV vaccine," and "My close friends approve of me talking to my health care provider about the HPV vaccine" ($M_{daughter} = 3.62$, $SD = .84$; Cronbach's $\alpha = .78$).

RESULTS

Overview of Analyses

This study examined the four key constructs of the EPPM framework, self-efficacy and response-efficacy, and severity and susceptibility, and their mediating role in a message

frame's influence on behavioral intentions. Messages that framed the HPV vaccine as preventing genital warts as opposed to cervical cancer prevention were predicted to indirectly influence female college students' behavioral intentions to talk to a doctor about the HPV vaccine (H_1) and parents' behavioral intentions to encourage their daughter to talk to a doctor about the HPV vaccine (H_2) through the serial mediators of self-efficacy and response efficacy. Severity and susceptibility, as the threat perceptions, are suggested (H2) to serve as separate serial mediators in these same relationships from message frame to the two types of behavioral intentions.

Two serial mediation analyses, also referred to as multiple-step multiple mediation (e.g., Hayes, Preacher, & Myers, 2010), were conducted using the SPSS macro PROCESS (Hayes, 2012) with the two efficacy variables as mediators in one analysis (process model: genital warts message frame → self-efficacy → response efficacy → behavioral intention) and the two threat variables as mediators in a separate serial multiple mediation analysis (process model: genital warts message frame → severity → susceptibility → behavioral intention). This procedure uses an ordinary-least-squares path analysis to estimate the coefficients in the model in order to determine the direct and indirect effects of the genital warts frame on behavioral intentions. Bootstrapping, a method that does not rely on the assumption of a normally distributed sampling distribution of the indirect effect, was implemented in these analyses to obtain bias-corrected 95% confidence intervals for making statistical inference about specific and total indirect effects (see Preacher & Hayes, 2008).

Each of the two serial multiple mediation analyses was run twice—once on our female student sample data with the outcome variable of behavioral intentions to "talk to your doctor about the HPV vaccine" and again on the data from the mothers of these female students with the outcome variable of behavioral intentions to "encourage your daughter to talk to her doctor about the HPV vaccine." To capture serial multiple mediation through the efficacy variables unique from the threat variables, the threat variables were included in the mediation analyses as covariates. For the same reasons, the efficacy variables were included as covariates in the serial multiple mediation analyses through the threat variables.

For all female student analyses testing the proposed hypotheses (H_{1a} and H_{2a}), additional covariates were used. Two variables measuring participants' HPV status and participants' knowledge about the STI status of previous sexual partners were included in the model, given that personal experience with STIs and HPV might influence motivations to talk to a physician about the HPV vaccine. Additionally, two knowledge variables (one scale variable created from items asking about specific aspects of HPV and one variable created from a single item asking whether or not they had heard about HPV from their health care provider) as

well as an attitude and a social norm scale about HPV were included in the model due to their strong association with the outcome variable. For all analyses conducted on the mothers' responses, attitudes and social norms were included as covariates.

Serial Multiple Mediation Analyses for Efficacy Variables

We first tested (H_{1a}) whether self-efficacy and response efficacy sequentially mediate the influence of messages framing the HPV vaccine as preventing genital warts versus preventing cervical cancer on female students' behavioral intentions to talk to their doctor about the HPV vaccine. As mentioned previously, a serial mediation analysis (model 6 in PROCESS) was conduced with bootstrap methods (Hayes, 2012). All paths for the full process model are illustrated in

Figure 2 and their corresponding coefficients are provided in Table 1. The total effect (c) of the genital warts message frame on intentions to talk to your doctor was not significant ($\beta = -.0149$, $t = -.0888$, $p = .9293$) and neither was the total direct effect (c'), removing the effect of the mediators ($\beta = -.1186$, $t = -.7682$, $p = .4438$). The total indirect effect, the sum of the specific indirect effects, was not significant with a point estimate of .1037 and a 95% confidence interval between −.0609 and .2808. The specific indirect effect through self-efficacy only was not significant ($a1b1 = .0361$; CI $= -.0219$ to .1593); nor was the specific indirect effect through response efficacy only ($a2b2 = .0053$; CI $= -.1152$ to .1115). However, when testing serial multiple mediation, the specific indirect effect of the genital warts frame on intentions to talk to your doctor through both self-efficacy and response efficacy ($a1a3b2$) was significant, supporting H_{1a}, with a point estimate of .0624 and a 95% confidence interval between .0113 and .1723. Thus,
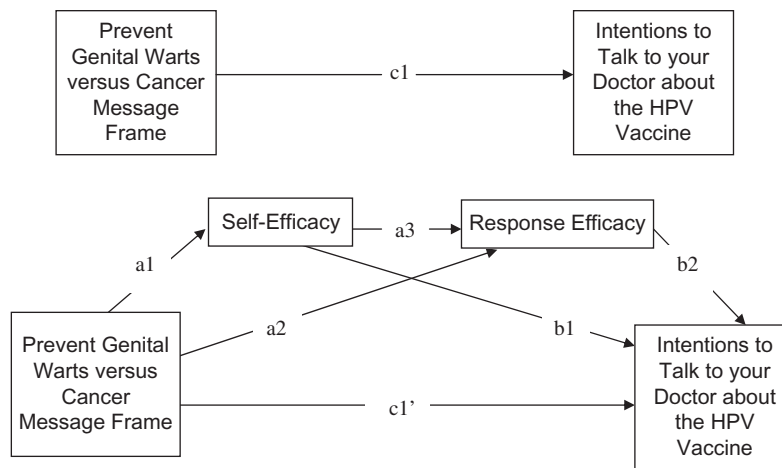

FIGURE 2 A serial multiple mediation model with self-efficacy and response efficacy as proposed mediators of message frame effects on intentions (see Table 1 for estimates).

TABLE 1
Path Coefficients From Models Estimated Using PROCESS

	H1a: Efficacy Serial Multiple Mediation Model (Figure 2)	H1b: Efficacy Serial Mediation Model	H2a: Threat Serial Mediation Model	H2b: Threat Serial Mediation Model	Exploratory Analysis: Conditional Process Model (Figure 4)
a1	.2425** (.1157)	.0500 (.1149)	−.0804 (.1421)	−.2189 (.1983)	.3726*** (.0632)
a2	.0076 (.0854)	−.0389 (.0637)	.0473 (.1630)	−.3189 (.2064)	
a3	.3721*** (.0637)	.8558*** (.0557)	.0298 (.1005)	.0670 (.1040)	
b1	.1487 (.1294)	.1770 (.1499)	.1057 (.0952)	.0560 (.0450)	−2.2770 (1.4491)
b2	.6912*** (.1592)	.4499** (.1472)	.3445*** (.0834)	.0173 (.0464)	−4.1360* (2.1201)
b3					−3.5367** (1.5403)
b4					1.0572** (.4883)
b5					.8673** (.3603)
b6					1.3337** (.5484)
b7					−.3132** (.1247)
c1	−.0149 (.1681)	.0788 (1159)	−.1117 (.1637)	.0457 (.0913)	
c1'	−.1186 (.1544)	.0682 (.0931)	−.1186 (.1544)	.0682 (.0931)	.1958 (.1332)

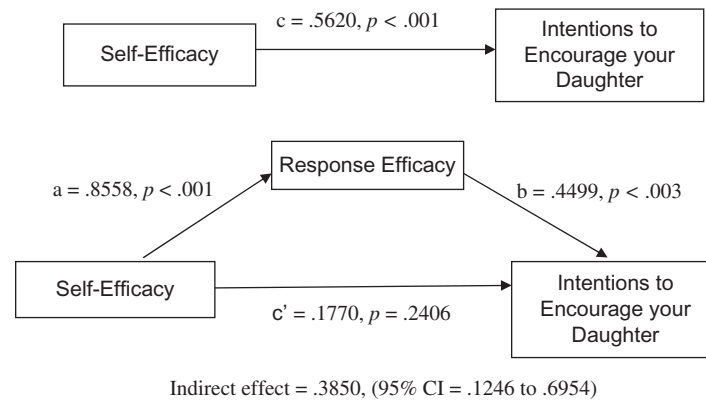*$p = .05$. **$p < .05$. ***$p < .001$.

FIGURE 3 Estimates of self-efficacy effects on mothers' intentions through response efficacy.

perceptions of self-efficacy about talking to a doctor about the HPV vaccine resulting from the genital warts message frame (compared to the cervical cancer prevention frame) increase response-efficacy perceptions, which in turn produce greater intentions to talk to a doctor about the HPV vaccine.

H_{1b} tested the same serial mediation model with data from the mothers of the female students, but it hypothesized that messages framing the HPV vaccine as preventing cervical cancer would impact intentions of the mothers to encourage their daughters to talk to their doctors about the vaccine through both self-efficacy and response efficacy. Results of the mediation analysis were not significant, such that the specific indirect effect of the cervical cancer frame on intentions through both self-efficacy and response efficacy were potentially due to chance ($a1a3b2 = .0193$; CI $= -.0873$ to $.1286$). However, despite a lack of support for message framing impacts on the mediating variables or the outcome variable, path coefficients were statistically significant for the efficacy variables' impact on intentions of mothers to encourage their daughters (see Table 1). These paths suggest that the majority of the mediation model found in H_{1a} and suggested in H_{1b} is statistically significant apart from the message frame as the predictor variable (partial support for H_{1b}). In other words, for mothers, self-efficacy perceptions predict intentions through response efficacy regardless of what message frame they were shown (see Figure 3). The indirect effect of self-efficacy on intentions through response efficacy was calculated as the product of paths a and b in Figure 3 (point estimate $= .3850$) and was statistically significant using 95% confidence intervals produced after applying bootstrapping resampling methods, CI $= .1246$ to $.6954$. However, the direct effect of self-efficacy on intentions after controlling for response efficacy was not statistically significant, $c' = .1770$, $p = .2406$. This suggests that response efficacy is a primary mechanism driving the association between self-efficacy and intentions.

Serial Multiple Mediation Analyses for Threat Variables

For H_{2a} and H_{2b}, the same serial mediator models were run as for H_{1a} and H_{1b}; however, the two mediators that were proposed as causally linked were the threat variables—severity and susceptibility. We first analyzed the female student data and suggested (H_{2a}) that the messages framing the HPV vaccine as prevention against genital warts as opposed to cervical cancer would increase intentions to talk to a doctor about the HPV vaccine through increases in severity and subsequent increases in susceptibility. Results of this analysis revealed insufficient support for the predicted serial mediation, such that the specific indirect effect of the genital warts frame on intentions to talk to your doctor through both severity and susceptibility were potentially due to chance ($a1a3b2 = -.0008$; CI $= -.0306$ to $.0049$). Further, no significant total, direct, or indirect effects were found in the model (for total, direct, and path coefficients see Table 1). The only significant path coefficient was from susceptibility to intentions, $b2 = .3445$, $p < .001$.

The results from the serial mediation analysis conducted on the mothers' data testing H_{2b} revealed similar nonsignificant findings. The specific indirect effect that would indicate serial multiple mediation included zero within the 95% bias corrected confidence intervals ($a1a3b2 = -0008$; CI $= -.0127$ to $.0007$). The total, direct, indirect, and all-path coefficients of the model, including for the path $b2$ from susceptibility to intentions, were also not significant (see Table 1).

Exploratory Analysis

Based on the results, an exploratory analysis was conducted to investigate severity and susceptibility's impact on the indirect effect of the genital warts framed messages on behavioral intentions through the serial multiple mediation of self-efficacy and response efficacy.[1] Considering the

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[1]The full conditional process model suggested here combines the serial mediation findings from H1a as well as the exploratory analysis findings of
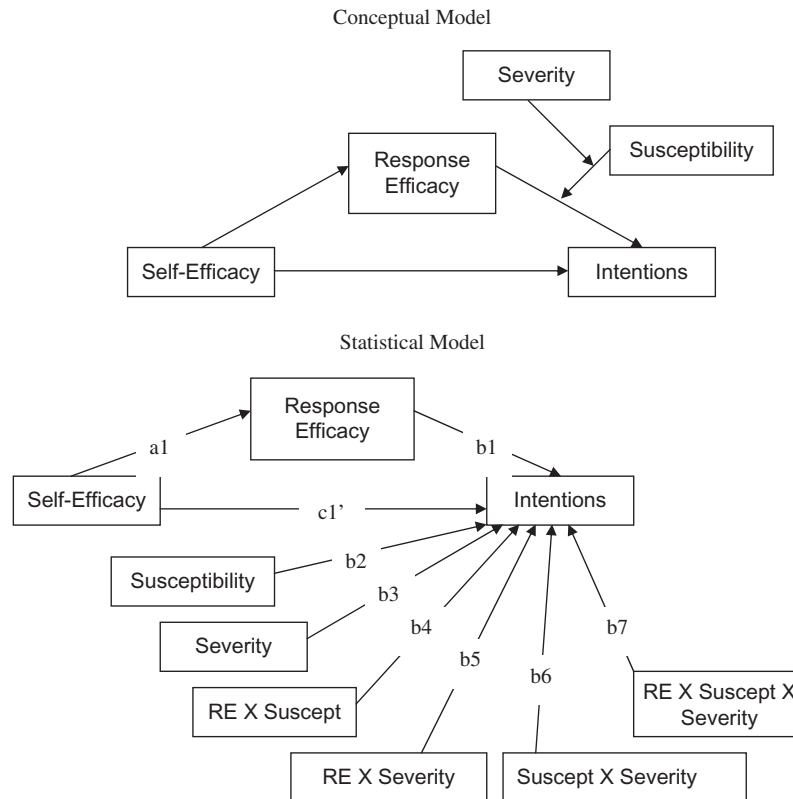
Conceptual Model

Statistical Model

FIGURE 4 Conceptual and statistical representation of the exploratory analysis conditional process model depicting moderated moderation of an indirect effect (see Table 1 for estimates).

failed attempt at demonstrating the threat variables role as mediators, as found with the efficacy variables, and due to the significant path coefficient from susceptibility to intentions (see Table 1), we considered threat's potential role as a moderator in this process. We proposed that the indirect effect of self-efficacy on intentions to talk to your doctor through response efficacy likely depends on a person's perception of susceptibility. Additionally, considering severity's influence on susceptibility perceptions (Witte, 1992, 1994), varying perceptions of severity might alter this moderation of susceptibility on the final link in the serial mediation model, from response efficacy to intention.

Model 18 of the statistical analysis macro PROCESS (Hayes, 2012) was designed to examine such conditional process modeling. Therefore, PROCESS was used to test the conditional indirect effect of self-efficacy on intentions through response efficacy, depending on students' perceptions of susceptibility and severity (or is moderated by

both susceptibility and severity). See Figure 4 for a conceptual and statistical model and Table 1 for corresponding path coefficients. The three-way interaction between response efficacy, susceptibility, and severity on intentions was significant, $\beta = -.3132$, $t = -2.5109$, $p = .0133$, and is illustrated in Figure 5. Specific conditional indirect effects are provided in Table 2 and reveal that at low levels of susceptibility (1 SD below the mean), increasing perceptions of severity leads to an increase in the indirect influence of self-efficacy on intentions through response efficacy. However, at relatively high levels of susceptibility (1 SD above the mean), increasing perceptions of severity leads to a decrease in the indirect effect of self-efficacy on intentions through response efficacy.

The same analysis on the model just described was conducted on the indirect effect found for mothers of the female students. The three-way interaction between response efficacy, susceptibility, and severity on intentions was not significant ($\beta = -.0102$, $t = -.1798$, $p = .8577$) and neither were the specific conditional indirect effects of self-efficacy on intentions through response efficacy and both moderators. Severity and susceptibility did not seem to impact the process by which self-efficacy increased mothers' intentions to encourage their daughters to talk to their doctors through response efficacy perceptions about this behavior.

moderated moderation of an indirect effect. This complete model could not be tested due to constraints of the statistical program relative to its inability to run moderation analyses on serial mediation. Therefore, the model tested in Figure 4 added message frame as a covariate in order to account for its impact on the indirect effect of self-efficacy on intentions through response efficacy. Significant results of this model's analysis while including message frame as a covariate suggest the potential significance of the full conditional process model described herein.
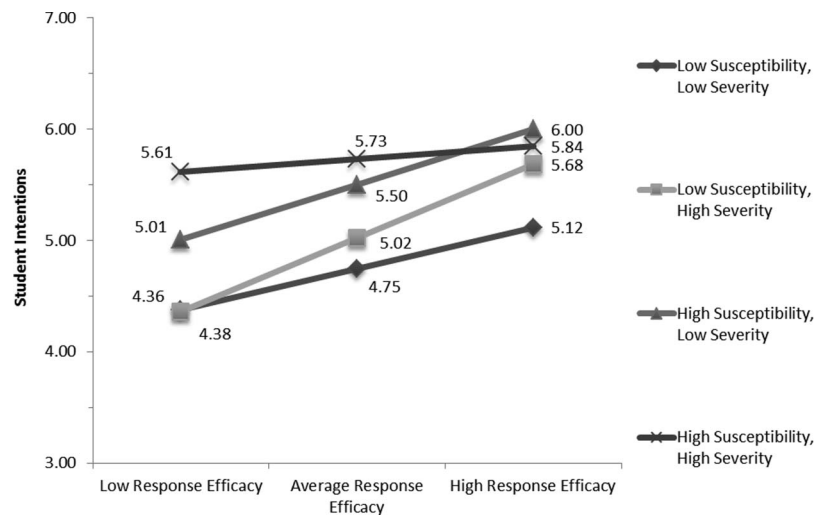
FIGURE 5   A visual representation of the significant three-way interaction between response efficacy, susceptibility, and severity on intentions.

TABLE 2
Specific Conditional Indirect Effects at Indicated Levels of Moderators

	Severity			
Susceptibility	−1 SD (95% CI)	Mean (95% CI)	+1 SD (95% CI)	Difference between the indirect effect at +1 SD Sev. and − 1 SD Sev.
−1 SD (95% CI)	0.211 (.013–.662)	0.294 (.100–.653)	0.377 (.119–.713)	0.166
Mean (95% CI)	0.247 (.076–.585)	0.234 (.061–.493)	0.221 (.015–.576)	−0.026
+1 SD (95% CI)	0.284 (.104–.734)	0.174 (−.009–.418)	0.065 (−.157–.480)	−0.219
Difference between the indirect effect at +1 SD Susc. and − 1 SD Susc.	0.073	−0.120	−0.312	

*Not*e. Entries are the specific conditional indirect effects of self-efficacy on intentions through response efficacy, at the indicated levels of susceptibility and severity. Difference values are simple subtraction calculations and no significance level is calculated.

DISCUSSION

The primary purpose of the current study was to investigate the potential for message framing to influence HPV vaccine-related intentions. In doing so, we also investigated the potential for the threat and efficacy constructs in the EPPM to serve as serial, rather than parallel mediators of message frames and health related intentions. Overall, the data were fully or partially consistent with two of the four hypotheses.

The findings from H_{1a} suggest that framing messages about the HPV vaccine as a method of preventing genital warts to female college students increases their intentions to talk to their doctor about the vaccine by first increasing their self-efficacy for talking to their doctor and then increasing their perceptions of response efficacy about this behavior. The results of H_{1b} demonstrated that although the message frame had no impact on mothers' intentions to encourage their daughter to talk to a doctor about the HPV vaccine, the process by which intentions were affected relative to efficacy was the same in that response efficacy mediated the

relationship between self-efficacy and behavioral intentions. Analyses conducted to test H_{2a} and H_{2b} were not significant, indicating that severity and susceptibility perceptions were not mediators of message frame on intentions, and suggested their potential role as moderators on the relationship between efficacy and behavioral intentions.

Based on the findings from the conditional process model tested in the exploratory analysis, the indirect effect of self-efficacy on intentions through response efficacy is moderated by susceptibility, which is dependent upon levels of perceived severity. Self-efficacy increases intentions of female students to talk to their doctors about the HPV vaccine by increasing response efficacy, unless perceptions of both susceptibility and severity are relatively high. Further, the indirect influence of self-efficacy on intentions is amplified when one type of threat is high while the other is low. This process involving specific conditional indirect effects at varying levels of severity and susceptibility was only significant for female student participants and not for their mothers. Efficacy seemed to be the driving force behind mothers' intentions to encourage their daughter to talk to a doctor,

regardless of perceptions of severity of HPV and perceptions of how susceptible their daughter was to contracting HPV.

The results of this study have implications for future theorizing and testing of the EPPM. From a theoretical standpoint, the data provide preliminary evidence that it is appropriate to conceptualize the efficacy constructs of the EPPM as serial, rather than parallel, mediators of messages and behavioral intentions. This represents a new approach for understanding the psychological processes that occur in response to health risk message exposure outlined by the EPPM. In the current study, support for serial mediation was found for self-efficacy and response efficacy. This finding suggests that perceptions of one's behavioral capabilities influence intentions through expectations of whether the behavior is actually effective. If a person does not believe the behavior is effective, the person's intention to perform the behavior is reduced; likewise, if a person feels extremely capable at performing a behavior, the person's perceptions about how important and efficacious that behavior is are likely to increase out of self-bolstering motives. In sum, the data suggest a potential causal order to efficacy perceptions and clarify the crucial role response efficacy plays in producing behavioral outcomes that may have been previously overlooked.

Although the serial mediation predictions for threat were not supported in the current study, exploratory analysis suggests additional directions for considering the relationships among threat and efficacy variables, specifically related to the EPPM's predictions about the threat threshold. The EPPM predicts that fear control processes dominate when perceived threat exceeds perceptions of efficacy. Thus, perceiving high levels of threat results in adaptive behavioral outcomes when levels of efficacy are also high. The current findings contradict this prediction. Even when perceived self-efficacy and response efficacy were high, increasing levels of severity when susceptibility was high decreased intentions to talk to a physician about the HPV vaccine. That is, if a college-age female perceives herself to be highly susceptible to HPV and perceives HPV to be rather severe, the beneficial effect of elevated efficacy perceptions on intentions is reduced. In the context of HPV vaccine promotion, this suggests that very high levels of threat may not result in adaptive behavior regardless of efficacy levels. Future research should explore whether this relationship holds across health risk contexts.

Strengths and Limitations

The current study benefitted from several key strengths. The first is that the theoretical predictions were tested using a sample consisting of both college-age females and their parents. Previous research has found that young adults rely heavily on their parents for health decision making in general, and that parents have an influential role on whether females receive the HPV vaccine in particular (Dempsey

et al., 2009). Thus, it is important to consider the factors that college-age females and their parents consider persuasive in the context of the HPV vaccine. Second, data were collected using rigorous experimental design (i.e., posttest only with random assignment), which eliminates major threats to internal validity. Finally, the messages used in the experiment were identical to one another with the exception of the manipulated elements. The precision of the experimental stimuli employed in the current study alleviates the potential for unsystematic differences between the conditions to confound the results.

In addition to these methodological strengths, there are also important practical implications of the current study. First, the data suggest that framing the HPV vaccine as preventing genital warts is most effective for increasing female college students' intentions to talk to a physician about the HPV vaccine. Thus, messages created for emerging adults should emphasize the short-term benefits of the HPV vaccine to protect against STIs. Second, the results indicate that efficacy perceptions were key constructs in the models tested for both mothers and their daughters, with response efficacy mediating the influence of self-efficacy on behavioral intentions regardless of message frame for mothers. In light of these findings paired with the exploratory analysis results, HPV vaccine messages for both college students and their parents should be cautious about inducing high levels of severity and susceptibility in favor of enhancing perceptions of self-efficacy and response efficacy.

As with any investigation, certain limitations must be noted. One limitation is that the causal ordering of variables cannot be definitely established without longitudinal data. Although some causality was established by our experimental design in that one message frame increased self-efficacy perceptions over another, future research will be needed to support the causal relationships implied by the serial mediation hypotheses advanced in the current investigation. A second limitation is that the young females in the sample were all college students. Although this sample is appropriate given that engaging in risky sexual behaviors is a common problem on college campuses (Holman & Sillars, 2012), it is important to replicate these findings for females with diverse levels of educational achievement.

CONCLUSION

The approval of the HPV vaccine has provided health communicators with an important role in reducing morbidity and mortality due to cervical cancer. It is important to understand how HPV vaccine messages can best be constructed to encourage females and their parents to consider taking preventative action. This study demonstrates that perceptions regarding the threat of HPV and efficacy perceptions related to the vaccine are important for understanding persuasive outcomes; however, the relationships

among these variables are somewhat contrary to propositions of the EPPM. Specifically, the conditional indirect effect revealed by the exploratory analysis suggests a novel and comprehensive role that the constructs of the EPPM play in message processing and subsequent behavioral intentions. Perhaps these findings paired with advances in statistical methods for conditional process modeling will foster additional research attempts to discover how the original constructs of the EPPM are processed within unique health topics and contexts. Answering such questions should clarify previous research that has failed to replicate the direct propositions of the EPPM framework and will help identify what message factors produce desired levels of threat and efficacy perceptions that result in intended effects.

ACKNOWLEDGMENTS

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