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Follow the heart or the mind? Examining cognitive and affective attitude on HPV vaccination intention

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ABSTRACT

Human papillomavirus (HPV) is associated with various serious diseases including cervical cancer and genital warts. Although the HPV vaccine has been commended as a breakthrough for preventing HPV and HPV-related diseases, the uptake rate remains inadequate and lagging. This dissatisfaction is possibly attributed to a component of interventions that is insufficiently related to individuals' intentions to get vaccinated against HPV – attitude. With a sample of 430 participants, this study examined which attitudinal component (cognitive vs. affective) is a stronger influencer on the intention to get the HPV vaccine. This study also investigated the influence of risk perceptions of HPV on the attitude and intention of getting the vaccine. Results revealed that cognitive attitude is the sole predictor of intention and mediates the relationship between perceived susceptibility to HPV and the intention to get the vaccine. Theoretical and practical contributions to the field of health communication and HPV vaccine promotion are further discussed.

Human papillomavirus (HPV), which 80% of sexually active individuals become infected with at a given time in their lives, is accountable for various serious diseases including cervical, anal, penile, vulvar and oropharyngeal cancers as well as genital warts (Centers for Disease Control and Prevention [CDC], 2018a). Almost 80 million Americans are currently infected with some types of HPV and about 14 million individuals become infected yearly (CDC, 2018b). Since its inception in 2006, the HPV vaccine has been commended as a breakthrough for preventing HPV and HPV-related diseases. For instance, since 2006, infections with certain types of HPV decreased by 71%; data also indicated that HPV vaccination prevents over 90% of HPV-induced cancer (CDC, 2018a). Therefore, a plethora of previous studies endeavored to increase the acceptability and uptake of the HPV vaccine through interventions under the guidance of various behavior change theories (e.g., Gerend, Shepherd, & Monday, 2008; Juraskova, O'Brien et al., 2011). However, public acceptance and completion of the vaccine remain insufficient and lagging (e.g., Holman et al., 2014; President's Cancer Panel, 2018; Spencer, Brewer, Trogdon, Wheeler, & Dusetzina, 2018).

This disappointing result is possibly attributed to certain components of interventions that are insufficiently related to individuals' intentions to get vaccinated against HPV. Thus, an in-depth examination of the components is urgent in order to improve future health communication interventions aimed at enhancing the HPV vaccine uptake. One of the components that has been identified as a critical determinant of intention is attitude (e.g., Ajzen, 1991; Fazio, 1986). Previous research conceptualized attitude based on two dimensions: affective attitude (e.g., getting the HPV vaccine is desirable and pleasurable) and cognitive attitude (e.g., getting the HPV vaccine is useful and worthwhile; Lavine, Thomsen, Zanna, & Borgida, 1998; Zanna & Rempel, 1988). Despite

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abundant studies looking into the influences of attitude on HPV vaccine-related intentions (e.g., Gerend & Shepherd, 2012; Gesser-Edelsburg, Walter, Shir-Raz, & Green, 2015; Nan, 2012), no research to date has examined which attitudinal component (affective vs. cognitive) is more influential in determining the behavioral intention related to HPV vaccination. In addition, risk perceptions (e.g., perceived susceptibility and perceived severity) have been considered influential to health-related attitude (e.g., de Vries, Osch, Eijmael, Smerecnik, & Candel, 2012; El-Toukhy, 2015). However, the influence of HPV-related risk perceptions on the affective and cognitive attitude toward getting the vaccine remains underexplored.

Therefore, with a survey of 430 individuals, this study further investigates the relationship between risk perceptions, attitudinal components, and the intention related to HPV vaccine uptake.

Affective attitude and cognitive attitude

Commonly defined as “expectancies or subjective probabilities concerning the outcomes of a given action and the perceived values or utilities attached to those outcomes” (Sutton, 1987, p. 355), attitude is suggested to have two distinct dimensions that are either evoked by emotions or by rational evaluations (Ajzen & Fishbein, 2005; Breckler & Wiggins, 1989). The attitude that is elicited by emotions about a matter or an object and measured on a continuum of positive and negative feelings is often referred to as “affective attitude”; the attitude that is based on rational evaluations of a matter or an object and measured on a continuum of instrumental gains and losses is labeled as “cognitive attitude” (Lavine et al., 1998; Zanna & Rempel, 1988). For example, individuals may perceive getting the HPV vaccine as either useful or worthless; while they may also feel either pleasant or unpleasant in response to getting the vaccine.

Although much of previous health research heavily focused on assessing and inducing cognitive attitude in behavior change interventions (e.g., Manstead & Parker, 1995; Mayne, 1999; Zanna & Rempel, 1988), recent studies highlighted the importance of examining both cognitive and affective attitudinal components (e.g., Ajzen & Fishbein, 2005; Conner & Sparks, 2005). For example, in a study of 14 health behaviors, Lawton, Conner, and Mceachan (2009) demonstrated that affective and cognitive attitudinal components are distinct and significantly different in predicting intention and behavior. However, in summarizing the effectiveness and superiority of the two attitudinal components, the field of health research has yet to reach a concrete conclusion. For health detection behaviors that involve illness detection and imply a positive or negative consequence (e.g., self-examination, mammogram, Rothman, Bartels, Wlaschin, & Salovey, 2006), affective attitude seems to be slightly more influential than cognitive attitude (Lawton et al., 2009). However, results must be treated with caution as empirical evidence remains limited (Conner, McEachan, Taylor, Ohara, & Lawton, 2015).

For risky health behaviors “that potentially expose people to harm or significant risk of harm” (e.g., binge drinking; Ansari et al., 2016, p. 1), affective attitude seems to be somewhat more effective. For example, Lawton, Conner, and Parker (2007) found that speeding behavior was positively predicted by both cognitive and affective attitudes, among which negative affective attitude is the strongest predictor. Boers, Zebregs, Hendriks, and Putte (2018) also found that affective attitude was a stronger influencer on binge drinking intentions among adolescents.

For health prevention behaviors that “prevent the onset of an illness and maintain a person’s current health status” with minimal uncertainty and risks (e.g., exercise; Rothman et al., 2006, p. S205), findings are mixed with affective attitude being slightly more influential. For example, cognitive attitude appears to have an edge over affective attitude when predicting brushing teeth and sunscreen use (Lawton et al., 2009). However, affective attitude remains more influential for many other prevention behaviors such as exercise, healthy eating, and flossing (e.g., Conner, Rhodes, Morris, Mceachan, & Lawton, 2011; Lawton et al., 2009). A meta-analysis also demonstrated that targeting affective attitude may be particularly helpful in increasing intentions in multiple prevention behaviors (Conner et al., 2015).

While vaccination has been commonly acknowledged as a prevention behavior (O’Keefe & Jensen, 2007), the decision-making of vaccination has been frequently associated with cognitive processes (e.g., Asch et al., 1994; Meszaros et al., 1996). Much of prior research also primarily used promotional messages related to cognitive attitude by emphasizing instrumental benefits and costs of the vaccine (e.g., vaccine efficacy in preventing cervical cancer) and consequences of HPV infections (e.g., HPV causes cervical cancer; Bell, Mcglone, & Dragojevic, 2013; Nan, 2012). However, the affective aspect of HPV vaccination cannot be neglected due to three reasons. First, HPV-associated consequences may induce various kinds of affective attitude and confound the results. For example, through in-depth interviews with women about cervical health, Lee, Carvallo, Lee, Chung, and Shin (2019) found that cervical-related health issues are often related to a wide variety of affective emotions including fear, scariness, sadness, guilt, anxiety, and embarrassment. These emotions are likely to be carried over to influence their attitude about the vaccine. For instance, if cervical cancer raises sadness and fear, an effective cancer-prevention vaccine is likely to be perceived as pleasurable as it helps relieve the negative feelings. Such affective attitude would thus influence the vaccination intention since affective attitude is more accessible than cognitive attitude when making evaluations (Verplanken, Hofstee, & Janssen, 1998). Indeed, Christy et al. (2016) found that non-cognitive evaluations such as anticipated regret significantly increased intention to get the vaccine. Thus, it is difficult to conclude whether the intention of getting the vaccine is driven by these emotional and affective feelings or cognitive and rational judgment.

Second, in recent years, the controversy over the HPV vaccine has been repetitively highlighted in media with unsubstantiated narrative anecdotes (Intlekofer, Cunningham, & Caplan, 2012). More worryingly, there has been an increasing circulation of misinformation of the HPV vaccine on social media, much of which is associated with affective feelings such as sadness and anxiety (Himmelboim, Xiao, Lee, Wang, & Borah, 2019). Dunn, Leask, Zhou, Mandl, and Coiera (2015) pointed out that such content may inevitably increase vaccine hesitancy and refusal; later Dunn et al. (2017) further revealed that higher exposure to misinformation is significantly related to lower coverage of HPV vaccination. On the other hand, Himmelboim et al. (2019) suggested that HPV vaccine-related content with positive affective feelings flows faster among interconnected social media users, implying that individuals’ intention may also be influenced by the positive affective attitude toward the vaccine. As such, the affective attitudinal component merits further exploration in the context of HPV vaccination.

Notably, the previous two rationales linked affective attitude to emotions of some sort. This is based on prior research, which pointed out that emotions are uniquely linked to the affective component of attitude (Breckler & Wiggins, 1993). Fishbein and Ajzen (2010) further explained the mechanism and indicated that positive or negative emotions make the related behavioral beliefs more readily accessible, which in turn induce a pleasant or unpleasant attitude. However, such emotions can only be considered background factors whose effects on intention are mediated through attitude about the vaccine (Fishbein & Ajzen, 2010). As such, rather than emotions, affective attitude is a part of central inquires in the current study.

Third, the importance of examining the affective attitude of HPV vaccination lies in the possibility of having ambivalence (Zanna & Rempel, 1988). Zanna and Rempel (1988) suggested that ambivalence occurs when cognition and affect are at odds with each other in decision-making; such ambivalence may put individuals in a dilemma (Zanna & Rempel, 1988). This is particularly relevant in the context of HPV vaccination. For example, individuals may repel vaccination in general due to fear of needles while considering the HPV vaccine an effective cancer prevention method; individuals may find HPV vaccination useful but may also be affected by misinformation about the vaccine that is associated with negative emotions. Thus, which attitudinal component carries more weight in determining one’s intention about getting the HPV vaccine is largely unknown.

Therefore, in light of the reviewed literature, it is imperative to further understand which attitudinal component (affective vs. cognitive) is at play or more salient when individuals think of HPV vaccination.

Attitude and intention in HPV vaccination

Robust evidence buttressing the relationship between attitude and intention abounds in HPV vaccination-related research (e.g., Catalano et al., 2017; Fisher, Kohut, Salisbury, & Salvadori, 2013; Jozkowski & Geshnizjani, 2014; Ratanasiripong, Cheng, & Enriquez, 2013; Roberto, Krieger, Katz, Goei, & Jain, 2011). For example, in a sample of 256 male college students, Catalano et al. (2017) revealed that attitude toward HPV vaccination significantly predicted vaccine-related intentions. Additionally, they pointed out that attitude should be primarily targeted in the interventions designed to enhance vaccine uptake among male college students (Catalano et al., 2017). The importance of targeting attitude to increase HPV vaccination-related intention was also supported by a study conducted by Jozkowski & Geshnizjani (2014). In examining 279 female college students, they indicated that the intention of getting the vaccine was one of the strongest predictors of the intention to get vaccinated against HPV among female college students (Jozkowski & Geshnizjani, 2014). In a study with older adults, Askelson et al. (2010) found out that attitude toward the HPV vaccine was also strongly and positively associated with mothers' intentions to vaccinate their daughters. Thus, since prior studies consistently affirmed the crucial role of attitude in influencing the intention to get the HPV vaccine, an examination that further parses the differential impacts of cognitive and affective attitudes on this behavioral intention is necessary and important.

Attitude and risk perceptions

Notably, the majority of HPV vaccination-related studies that investigated attitude were mainly grounded in the frameworks of theory of planned behavior and theory of reasoned action (e.g., Fisher et al., 2013; Gerend & Shepherd, 2012; Ratanasiripong et al., 2013; Roberto et al., 2011). In these two models, risk perceptions are considered latent and "a subset of health beliefs," which influence behavioral intentions indirectly through attitude (p. 1342, de Vries et al., 2012; Fishbein, 2008; Fishbein et al., 2001). However, in models such as health belief model (Janz & Becker, 1984) and I-Change model (de Vries, Mesters, van der Steeg, & Honing, 2005), risk perceptions were considered a separate factor. Apparently, this discrepancy raised a question about the role of risk perceptions in health behavior models and inspired a series of research in this regard (e.g., de Vries, Mesters, Van't Riet, Willems, & Reubsat, 2006; de Vries et al., 2005, 2012; Rimal & Real, 2003).

Findings revealed that risk perceptions form the basis of attitudinal beliefs of suggested health behaviors (Rimal & Real, 2003); more importantly, as a separate factor, risk perceptions are mediated through attitude in influencing intention (e.g., de Vries et al., 2006). For example, in examining sunscreen use behavior, de Vries et al. (2012) found that parents with higher perceived severity of and susceptibility to skin cancer had a more positive attitude of using sunscreen; as a result, they are expressed higher intention to use sunscreen on their children.

de Vries et al. (2012) further pointed out that by not recognizing risk perceptions as a separate and distal factor that precedes attitude, health practices may erroneously overlook the important influences of risk perceptions in promoting health behaviors. Thus, examining the relationship between risk perceptions and attitude about HPV vaccination may be especially critical in helping improve the intention to get the HPV vaccine.

Risk perceptions contain two distinct dimensions: susceptibility and severity, which may have different levels of impacts on individuals' decision-making (El-Toukhy, 2015; Janz & Becker, 1984). Susceptibility refers to the "possibility of experiencing a health risk" whereas severity refers to the "seriousness or harmfulness of the risk" (El-Toukhy, 2015, p. 500). Although prior research examined the relationship between risk perceptions, attitude, and intention, risk perceptions are often operationalized as an additive or a multiplicative index of susceptibility and severity (e.g., Rimal & Juon, 2010; de Vries et al., 2012). Moreover, attitude is often operationalized as a combination of cognitive and affective attitude in HPV research (e.g., Nan & Madden, 2012). However, susceptibility and severity are conceptually different and also found to have inequivalent weights in predicting behaviors (El-Toukhy, 2015; Weinstein, 2007). Similarly, cognitive and affective attitude also

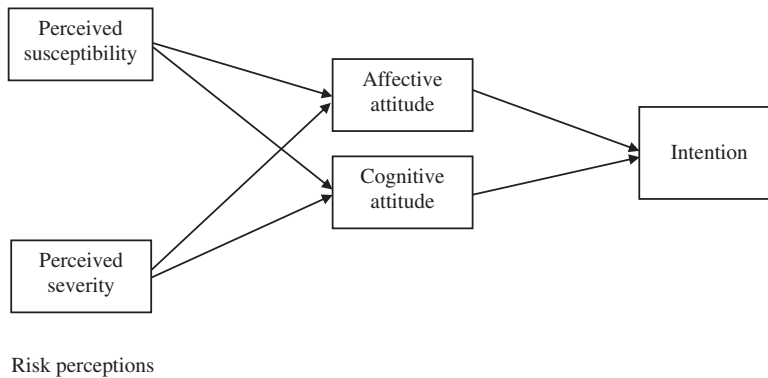


Figure 1. Proposed relationship of risk perceptions, attitude, and intention.

serve distinctive functions in influencing behavioral intentions (Lawton et al., 2009; Zanna & Rempel, 1988). Thus, parsing the differential impacts of susceptibility and severity on cognitive and affective attitude of getting the HPV vaccine is important in predicting the subsequent behavior.

In sum, translated into this study, perceived susceptibility to and perceived severity of HPV infections and diseases would be positively associated with the attitude toward the HPV vaccination; the attitude of HPV vaccination, in turn, would positively influence behavioral intention to get the HPV vaccine (visualization in Figure 1). However, investigations on such relationships remain scarce. More importantly, whether attitudinal components (cognitive vs. affective) would make a difference in such relationships merits further exploration.

In light of the reviewed literature, this study proposes the following research questions:

RQ1: How does perceived susceptibility of HPV influence attitude (cognitive vs. affective) toward the HPV vaccine?

RQ2: How does perceived severity of HPV influence attitude (cognitive vs. affective) toward the HPV vaccine?

RQ3: Which attitude (cognitive vs. affective) is a stronger influencer on the intention to get the HPV vaccine?

Method

Data were collected with an online survey conducted through Qualtrics. Participants were recruited from a college-wide research participant pool in which participants received a small amount of extra course credits. Five hundred and fifty-three participants completed the survey. One hundred and twenty individuals who never heard of the HPV vaccine were excluded. The final sample consisted of 430 individuals, ranging in age from 18 to 55 ($M = 20.25$, $SD = 3.32$). More than half were female participants (65.26%) and the majority were Caucasian (76.28%).

Measures

Affective attitude

Adapted from previous studies (e.g., Conner et al., 2011; Park, 2012) with minor modifications, participants rated “for me, getting the HPV vaccine” on a 7-point semantic differential scale from 0 to 6 with four items (unpleasurable/pleasurable, unpleasant/pleasant, undesirable/desirable,

unsatisfying/satisfying). The scores were averaged to form an index for affective attitude toward HPV vaccination ($M = 3.26$, $SD = 1.70$, $\alpha = .89$). Higher scores indicate a greater positive affective attitude.

Cognitive attitude

Adapted from previous studies (e.g., Boers et al., 2018; Conner et al., 2011) with minor modifications, participants rated “for me, getting the HPV vaccine” on a semantic differential scale from 0 to 6 with four items (useless/useful, worthless/valuable, unimportant/important, ineffective/effective). The scores were averaged to form an index for cognitive attitude toward HPV vaccination ($M = 5.06$, $SD = 1.47$, $\alpha = .95$). Higher scores indicate a greater positive cognitive attitude.

Exploratory Factor Analysis (EFA) was performed to determine the factor structure due to the lack of established scales for affective and cognitive attitude (Bandalos & Finney, 2010). Results recommended a two-factor model. Two factors accounted for 81.64% of the variance for the entire set of items. Affective attitude factor comprises the four items (e.g., unpleasurable/pleasurable) explained 44.61% of the variance with factor loading ranging from .70 to .92. Cognitive attitude factor comprises the four items (e.g., useless/useful) explained 37.03% of the variance with factor loading ranging from .86 to .94.

Perceived susceptibility to HPV

Adapted from previous studies (e.g., Nan & Madden, 2012), three items were used to measure susceptibility on a scale ranging from “strongly disagree” (0) to “strongly agree” (6) ($M = 1.52$, $SD = 1.44$, $\alpha = .84$). Items included: “It is likely that I will contract HPV,” “I am at risk for getting genital HPV,” and “it is possible that I will get HPV.”

Perceived severity of HPV

Adapted from previous studies (Nan & Madden, 2012; Wen & Shen, 2016), three items were used to measure severity on a scale ranging from “strongly disagree” (0) to “strongly agree” (6) ($M = 4.78$, $SD = 1.34$, $\alpha = .93$). Items included: “I believe that contracting HPV causes severe health problems,” “I believe that contracting HPV causes serious negative consequences,” and “I believe that HPV is extremely harmful.”

Intention to get the HPV vaccine

Adapted from a previous study (Nan & Madden, 2012), intention to get the HPV vaccine was measured averaging three items on a Likert type scale ranging from extremely unlikely (0) to extremely likely (6) ($M = 4.01$, $SD = 1.65$, $\alpha = .90$). Three items were: “How likely would you be to get the HPV vaccine sometime soon?” “If you were faced with the decision of whether to get the HPV vaccine today, how likely is it that you would choose to get the vaccine?” “How likely would you be to get the HPV vaccine in the future?” Higher scores indicate greater intention to get the HPV vaccine.

Covariates

Based on previous studies (e.g., Gerend, Shepherd, & Lustria, 2013; Jozkowski & Geshnizjani, 2014; Juraskova, Bari, O'Brien, & McCaffery, 2011; Nan, 2012; Ratanasiripong et al., 2013; Roberto et al., 2011), control variables included HPV-related knowledge, sexual history, risky sexual behavior, and perceived norms. HPV-related knowledge was measured using seven true or false questions. Answers were added together to form a single scale with higher scores denoting better knowledge ($M = 5.65$, $SD = 1.04$). Sample items included “HPV can cause cervical cancer,” and “Most HPV infections have no visible signs or symptoms.” Reliability analysis was not conducted for the knowledge scale as the items were deemed independent of each other (Juraskova, Bari, et al., 2011). However, the seven items covered basic and necessary knowledge such as HPV symptoms, transmission, and consequences. Sexual history was measured using a single item asking participants to indicate how many sexual partners they have ($M = 6.72$, $SD = 12.60$). Risky sexual behavior was measured using a single item questioning whether participants used

protection during sex on a scale ranging from “never” (0) to “always” (4) ($M = 2.27$, $SD = 1.48$). Adapted from previous studies (Cialdini, Kallgren, & Reno, 1991; Dunlop, Kashima, & Wakefield, 2010), perceived norms were measured by averaging three items on a scale ranging from “strongly disagree” (0) to “strongly agree” (6) ($M = 4.47$, $SD = 1.27$, $\alpha = .87$). Items included: “I think that my friends would feel positively about the HPV vaccine,” “I think that my friends will have the HPV vaccine,” and “I think that other individuals at my age will have the HPV vaccine.”

Results

Multiple regression analyses were used to examine the first and second research questions. As shown in Table 1, beyond all controls, perceived severity appeared not to associate with either affective or cognitive attitude about the HPV vaccine. Perceived susceptibility, on the other hand, was significantly associated with a higher cognitive attitude about the vaccine ($b = .11$, $SE = .05$, $p = .019$). In other words, individuals who considered themselves susceptible and vulnerable to HPV-related infections and diseases were more likely to perceive the vaccine as useful and necessary. However, the relationship between perceived susceptibility and affective attitude was not significant. Sexual history, perceived norms are significant covariates in predicting cognitive and affective attitude (affective attitude: $b_{\text{sexual history}} = -.02$, $SE_{\text{sexual history}} = .01$, $p_{\text{sexual history}} = .012$; $b_{\text{sexual history}} = -.01$, $SE_{\text{sexual history}} = .01$, $p_{\text{sexual history}} = .021$; $b_{\text{perceived norms}} = .39$, $SE_{\text{perceived norms}} = .07$, $p_{\text{perceived norms}} < .001$; $b_{\text{perceived norms}} = .48$, $SE_{\text{perceived norms}} = .05$, $p_{\text{perceived norms}} < .001$); ethnicity is a significant covariate in predicting cognitive attitude ($b = .11$, $SE = .05$, $p = .02$);

The third question probed the influences of the two distinct attitudinal components on the intention to get the HPV vaccine. Multiple regression results (Table 2) suggested that beyond controls, the results showed that cognitive attitude was the sole predictor of intention to get the HPV vaccine ($b = .16$, $SE = .06$, $p = .008$). That is, individuals who perceived the vaccine as useful were more likely to get the vaccine; whereas the affective attitude of the vaccine (e.g., pleasant vs. unpleasant) did not affect the intention to get vaccinated. Gender and perceived norms are significant covariates in predicting the intention ($b_{\text{gender}} = .37$, $SE_{\text{gender}} = .16$, $p_{\text{gender}} = .022$; $b_{\text{perceived norms}} = .32$, $SE_{\text{perceived norms}} = .07$, $p_{\text{perceived norms}} < .001$). The final visualization of the model is listed in Figure 2.

Discussion

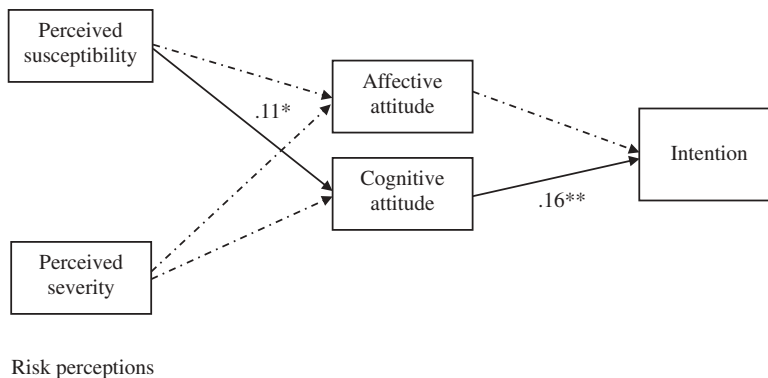
The motivation to undertake this study is twofold: a) to address the ambiguity in assessing attitudinal components in the field of HPV vaccination promotion and differentiate the influences of affective and cognitive attitude on the intention to get the vaccine; b) to expand the attitude-intention process by

Table 1. Multiple regression model: the relationship between risk perceptions and attitude.

	Affective attitude			Cognitive attitude		
	<i>b</i> (<i>SE</i>)	β	<i>p</i>	<i>b</i> (<i>SE</i>)	β	<i>p</i>
Constant	1.86 (.78)			2.70 (.63)		
Gender	-.14 (.18)	-.04	.437	.18 (.14)	.06	.198
Ethnicity	.07 (.06)	.05	.270	.11 (.05)	.10	.020
Age	-.02 (.03)	-.03	.484	-.02 (.02)	-.05	.251
Sexual history	-.02 (.01)	-.13	.012	-.01 (.01)	-.11	.021
Risky sexual behavior	.06 (.06)	.05	.301	.06 (.05)	.06	.197
HPV-related knowledge	.03 (.08)	.02	.751	.02 (.07)	.01	.812
Perceived norms	.39 (.07)	.30	<.001	.48 (.05)	.42	<.001
Perceived severity	-.04 (.06)	-.03	.491	.03 (.05)	.03	.501
Perceived susceptibility	.08 (.06)	.06	.207	.11 (.05)	.11	.019
Adjusted R^2	.09		<.001	.22		<.001
<i>F</i> for R^2	5.47			13.77		

Table 2. Multiple regression model: the relationship between attitude and intention.

	Intention to get the HPV vaccine		
	<i>b</i> (<i>SE</i>)	β	<i>p</i>
Constant	1.84 (.68)		
Gender	.37 (.16)	.11	.022
Ethnicity	.02 (.07)	.01	.784
Age	-.04 (.01)	-.09	.066
Sexual history	.01 (.01)	-.04	.354
Risky sexual behavior	.07 (.05)	.06	.184
HPV-related knowledge	-.004 (.07)	-.002	.959
Perceived norms	.32 (.07)	.25	<.001
Affective attitude	.10 (.05)	-.10	.052
Cognitive attitude	.16 (.06)	.15	.008
Adjusted R^2	.18		<.001
<i>F</i> for R^2	11.06		

**Figure 2.** Final relationship of risk perceptions, attitude, and intention; * $p < .05$, ** $p < .01$.

taking into account the effects of risk perceptions on cognitive and affective attitude and inform future interventions of what needs to be strengthened to increase the uptake of the vaccine.

This study revealed that the cognitive attitude about getting the HPV vaccine is the sole predictor of the intention to get vaccinated. The fact that the results are at odds with previous research is interesting. Previous studies indicated that affective attitude is a stronger influencer on intention to enact various kinds of prevention behaviors such as exercise, sunscreen use, and nutrition intake (e.g., Lawton et al., 2009; Conner et al., 2011). However, vaccination has been shown to be a more complex prevention behavior and consistently associated with the cognitive process (e.g., Asch et al., 1994; Meszaros et al., 1996). For example, Ball, Evans, and Bostrom (1998) suggested that while common prevention behaviors such as exercise hardly imply any negative consequences, vaccination often raises safety concerns or fear of side effects. Moreover, by examining common reasons for vaccine acceptance and hesitancy, Yaqub, Castle-Clarke, Sevdalis, and Chataway (2014) found that cognitive-based reasons such as self-protection and perceived ineffectiveness exerted much influence on individuals' decision-making, respectively. Therefore, it makes sense that when debating whether to get vaccinated, individuals put more emphasis on the usefulness of the HPV vaccine rather than the affective feelings of getting vaccinated against the virus.

Moreover, Zanna and Rempel (1988) proposed that a behavioral dilemma may exist when contradictory attitude information is present: "when mind (i.e., cognition) tells you one thing but your heart (i.e., affect) tells you another" (p.326). Fortunately, the dilemma is avoidable in HPV vaccination promotion. The insignificant relationship between affective attitude and the intention indicated that attitudinal components measured and targeted in previous interventions may have

been ambiguous and insufficient, resulting in an unsatisfactory uptake rate. For instance, much of prior research measured attitude with an index of affective and cognitive items without parsing the differential impacts of the two attitudinal components (e.g., Catalano et al., 2017; Fisher et al., 2013); some measures also heavily focused on affective attitude (e.g., Jozkowski & Geshnizjani, 2014). As such, rather than talking to individuals' "heart" and focusing on pleasant feelings, future interventions may appeal to individuals' "mind" by assessing cognitive attitude and orchestrating messages that enhance the perceived usefulness of the vaccine. Future research should also further examine whether the failure to parsing the differences in attitudinal components indeed accounts for some of the ineffectiveness in interventions.

Another key inquiry of this study is to examine the effects of risk perceptions in shaping the attitude. Surprisingly, inconsistent with previous research (e.g., de Vries et al., 2012; El-Toukhy, 2015), perceived severity of HPV did not significantly associate with either cognitive or affective attitude. This is possibly due to two reasons. First, there are some nuanced discrepancies between HPV-related and HPV vaccination-related knowledge. That is, although HPV-related knowledge is generally acceptable, knowledge about the HPV vaccine, its effectiveness and safety in particular, may be insufficient (American Association for Cancer Research, 2013). For example, prior research has repetitively highlighted rampant vaccine refusal and misperceptions surging on social media (e.g., Dunn et al., 2015; Himelboim et al., 2019). Therefore, even though individuals perceive the virus as detrimental, their attitude toward the vaccine remains somewhat reluctant or ambivalent and they prefer to "wait-and-see" until the controversy is over. Future research should employ a more comprehensive knowledge scale of HPV vaccination (e.g., Perez et al., 2016) and investigate whether HPV vaccination knowledge indeed moderates the influence between perceived severity of HPV and vaccination attitude. Another reason may be due to the sample characteristics. That is, individuals who are infected with HPV and also aware of the consequences may not think the vaccine is still effective for them and thus have an ambiguous attitude about the vaccine. The current study did not control for this specific characteristic due to ethical reasons. Future research could further examine this particular factor's moderating influence. On the other hand, partially coincide with previous research (e.g., de Vries et al., 2012; El-Toukhy, 2015), perceived susceptibility was positively associated with cognitive attitude but not affective attitude about the vaccine. As discussed earlier, since cognitive attitude is the sole predictor of intention to get vaccinated, future educational interventions should focus on stressing the likelihood, vulnerability, and probability of contracting HPV to increase the cognitive attitude about the vaccine. As an aside, this study buttressed previous research, which repetitively highlighted the importance of perceived norms (e.g., Jozkowski & Geshnizjani, 2014; Roberto et al., 2011). Perceived norms seem to be extremely crucial in influencing both affective and cognitive attitude as well as the intention to get vaccinated against HPV. As such, when promoting HPV vaccination to individuals, the messages could focus more on building a sense of norms by reinforcing that getting vaccinated is a well-accepted and well-enacted behavior among their peers. In addition, it is also implied from this study that the theory of reasoned action with a focus on cognitive attitude could be an effective theoretical framework for future educational interventions.

This study is not without limitations. First, although this study examined perceived susceptibility and severity of HPV infections, the risk perceptions of the vaccine per se (e.g., safety concerns about the vaccine) on the intention to get vaccinated were not examined in this study. However, it is justifiable due to previous results suggesting safety concerns did not deter the intention of vaccine uptake (Lajoie, Kerr, Clover, & Harper, 2018). Future studies could further incorporate this aspect of risk perceptions into the examination and find out if there are any sort of interactions. Second, the study did not control for the history of HPV infections. Thus, it is possible that HPV-infected individuals may be indifferent about the vaccine and may perceive the vaccine as less useful. Future research could advance this study design by including this control variable. Thirdly, the study did not control for whether these participants had vaccinated against HPV or had started the HPV vaccine series. Fourth, a college-wide sample was used in the current study, which may not be representative of a national population. Although the main demographic characteristics of this

sample such as age, gender and ethnicity are in accordance with those of the majority in the census (The United States Census Bureau, n.d.), future research could benefit from a nation-wide sample with more ethnic and age diversity. For example, young people under the age of 18 currently account for 22.4% of the total population in the United States and many of them are eligible for HPV vaccination (CDC, 2018b; The United States Census Bureau, n.d.). However, a recent national survey showed that the uptake rate among the youth remained low (Bednarczyk, Ellingson, & Omer, 2019). Therefore, a further examination of the influence of attitudinal components on HPV vaccination intention among this group of population is necessary. Lastly, future studies could further examine how specific emotions influence intentions since there is a slim possibility that emotions may not always influence behavioral beliefs or have a strong influence on attitude (Fishbein & Ajzen, 2010).

Despite the limitations, this study contributes theoretically and practically to the field of health interventions in several ways: a) it bridges the literature gap by parsing the differential impacts of cognitive attitude and affective attitude about HPV vaccination on the intention to get the vaccine; b) it also extends the understanding of the relationship between risk perceptions and attitude in HPV vaccination promotion; c) by revealing the importance of cognitive attitude and perceived susceptibility, this study sheds light on future interventions aimed at increasing the intention to get the HPV vaccine.

Disclosure statement

No potential conflict of interest was reported by the author.

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