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Influence of Oral Sex and Oral Cancer Information on Young Adults' Oral Sexual-Risk Cognitions and Likelihood of HPV Vaccination

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Public health information and educational interventions regarding human papillomavirus (HPV) have focused on the link between vaginal sex and cervical cancer among women. Many people are unaware that HPV can be transmitted through oral sex or that HPV causes oral cancers. Given that HPV infections and unprotected oral sex are increasing, research on oral sex-related HPV risk is important. This study examined the effect of a brief informational intervention regarding HPV and oral sex on the sexual risk cognitions of young adults. College students (N = 238) read information on HPV, oral sex, and oral cancer or no information. Participants then completed measures of oral sex and HPV knowledge, oral sex willingness, HPV vaccination likelihood, and risk perceptions. Participants who read the information on HPV and oral sex and cancer (compared to those who did not) reported greater knowledge, perceived risk and concern, and lower willingness to engage in oral sex. These effects were only significant among women. However, men reported a higher likelihood of future HPV vaccination compared to women who had not yet received the vaccine. Focusing on oral sex and cancer, this study adds to research investigating ways to reduce HPV infections.

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) in the United States. It is estimated that at least 50% of sexually active men and women will be infected at some point (Centers for Disease Control and Prevention [CDC], 2011), and the prevalence of HPV infection is highest among women ages 20 to 24 (Dunne et al., 2007). HPV is transmitted through vaginal, anal, and oral sex. Although most people infected with HPV will not develop symptoms, certain types (6 and 11) can cause genital warts, and high-risk types (16 and 18) are associated with multiple forms of cancer (CDC, 2011; Chaturvedi, 2010).

HPV, Oral Cancer, and Oral Sex

HPV-16 and HPV-18 account for approximately 70% of cervical cancer cases (Bosch & de Sanjose, 2003). Because these types of HPV have most commonly been associated with cervical cancer, many people are unaware of the link between these strains of HPV and other cancers. Recent medical research has revealed that oral HPV infection also causes oropharyngeal (tonsillar and tongue, "oral") cancers (D'Souza et al., 2007; Heck et al., 2010; Kreimer, Clifford, Boyle, & Franceschi, 2005; Psyrri, Prezas, & Burtness, 2008), even among those without a history of tobacco or alcohol use (Gillison et al., 2008; Psyrri & DiMaio, 2008). In 2010, there were approximately 37,000 new cases of oral cancers in the United States (National Cancer Institute, 2011). It is estimated that HPV-16 is a factor in up to 86.7% of HPV-positive cancers in the oropharynx, which is a higher percentage of HPV-16-associated cancers than cancers of the cervix (Kreimer et al., 2005). Some researchers have estimated that 12% to 63% of oropharyngeal cancers may be attributable to HPV infection (Chaturvedi, 2010). The incidence of HPV-associated oral cancers has risen over the past few decades, whereas the incidence of cervical cancer and oral cancers associated with tobacco/alcohol use has declined (Chaturvedi, 2010; Palefsky, 2010; Psyrri

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et al., 2008). HPV-positive diagnoses are the fastest growing group of the oral cancers among Americans under 50 years of age (Oral Cancer Foundation, 2011). The HPV virus, which is associated with HPV-positive oral cancers, is most likely transmitted via sexual behaviors—in particular, oral sex (D'Souza et al., 2007; Gillison et al., 2008). Engaging in oral sex, especially with more or casual oral sex partners and with infrequent condom use, is associated with oral cancer risk (D'Souza et al., 2007; Gillison et al., 2008; Heck et al., 2010).

Oral Sex and HPV Knowledge among Youth

Although getting an STI via oral versus vaginal sex is less likely, the increasing reports of oral HPV infections, cancers, sexual behaviors, and the low levels of condom use during oral sex increase the importance of studying this behavior. Approximately 65% to 85% of 18- to 24-year-olds report engaging in oral sex behaviors (Higgins, Trussell, Moore, & Davidson, 2010; Mosher, Chandra, & Jones, 2005). The majority of adolescents and young adults who give or receive oral sex do not use protection (Prinstein, Meade, & Cohen, 2003; Stone, Hatherall, Ingham, & McEachran, 2006). For example, only 5% of college students report using condoms mostly or always in the last 30 days during oral sex (American College Health Association, 2010).

Most young adults are unaware that STIs can be transmitted via oral sex (Stone et al., 2006). Many students lack knowledge regarding HPV transmission, prevalence, and the link between HPV and cancer (Baer, Allen, & Braun, 2000; Sandfort & Pleasant, 2009). In addition, the majority of public and media focus has been directed toward women due to HPV's link to cervical cancer. Given that the majority of young adults engage in oral sex without protection and are unaware of the health risks due to oral sex, researchers have called for focusing more educational efforts on the health consequences of oral sex (Brady & Halpern-Felsher, 2007; Halpern-Felsher, 2008; Stone et al., 2006). In addition, researchers have called for increasing HPV-related knowledge.

The lack of knowledge among students may be partially due to research and educational efforts focusing on vaginal intercourse and cervical cancer. Thus, it is not surprising that men report (a) lower levels of HPV knowledge compared to women, (b) not knowing HPV is associated with oral cancers, and (c) low perceptions of severity and risk related to HPV infection (Allen, Fantasia, Fontenot, Flaherty, & Santana, 2009; Gerend & Magloire, 2008; Klug, Hukelmann, & Blettner, 2008; Sandfort & Pleasant, 2009). It has been suggested that educational messages for men may be more effective if they mention genital warts and anal, penile, or oral cancers (Allen et al., 2009; Ferris et al., 2009; Liddon, Hood, Wynn, & Markowitz, 2010). Using a within-subjects design with heterosexual and homosexual men ages 18 to 59, HPV vaccination willingness was highest when the vaccine was framed as preventing genital warts and cancer (oral, penile, or anal) versus preventing genital warts alone (McRee, Reiter, Chantala, & Brewer, 2010).

Experimental and intervention studies indicate that exposing students to HPV information has a positive effect on HPV-related knowledge and cognitions. For example, a brief educational intervention delivered by a physician's assistant resulted in greater HPV knowledge three months later among college students (Lambert, 2001). In addition, after reading about HPV, the link to cervical cancer, and the importance of screening (in addition to other facts), women increased their perceived risk of cervical cancer (Marlow, Waller, & Wardle, 2009). High school students who read about HPV (vs. a control group) reported more positive HPV-testing intentions and vaccination intentions, as well as increased HPV knowledge (Lloyd, Marlow, Waller, Miles, & Wardle, 2009). However, no studies that we are aware of have examined the impact of oral sex transmission and oral cancer information, in relation to HPV, on the oral sex cognitions of men and women.

HPV: Reducing Risk

Factors associated with a lower likelihood of HPV infection include wearing a condom, being in a monogamous relationship, and limiting number of sex partners (Baldwin et al., 2004; CDC, 2011). For men and women ages 9 to 26, Gardasil®, which protects against most genital warts (caused by HPV types 6 and 11) and prevents most cervical cancers by protecting against HPV types 16 and 18, is approved and recommended (CDC, 2011). For women only, the HPV vaccine Cervarix™ is available, which protects against high-risk HPV types (16 and 18) that cause most cervical cancers (CDC, 2011). HPV vaccination among men may offer additional societal and health benefits, including reduced HPV infections, genital warts, and HPV-positive oral, vaginal, and penile cancers (in part, due to reduced male-to-female and male-to-male transmission) and reduced health-care costs associated with these HPV cancers and infections (CDC, 2011; Palefsky, 2010; Zimet & Rosenthal, 2010). Research on the efficacy of the (quadrivalent) vaccine in men and boys is limited, but evidence suggests it is safe, well tolerated, and effective in reducing genital infection (Block et al., 2006; Giuliano et al., 2011). In addition, although more research is needed, HPV vaccines may also protect against HPV-associated oral cancers (Kreimer et al., 2005; Palefsky, 2010). Thus, it is important to determine the acceptability of the HPV vaccine among women and men and to examine the impact of oral sex information on risk cognitions.

This Study

This study examined the impact of informing students about HPV, oral sex transmission, and the potential negative physical outcomes of oral sex on the following cognitions: HPV vaccination likelihood, risk perceptions, concerns, and willingness to engage in unprotected oral sex. College students were randomly assigned to a control group (who did not read any information on oral sex or oral cancers and HPV) or to read a factual article on the potential negative health effects of unprotected oral sex with a focus on HPV-associated oral cancer and genital warts (written by the researchers, based on information from the CDC, 2011; D'Souza et al., 2007; National Institutes of Health, 2011). The participants in the information condition received basic information about HPV, including prevalence, transmission routes (emphasizing unprotected oral sex), diagnosis, and prevention. The information sheet also discussed the HPV vaccine, and men were told that, although it is currently unavailable for men, it may become available in the next year (the Food & Drug Administration [FDA] had not yet approved Gardasil or Cervarix for men at the time of the study). The university's institutional review board approved all documents and procedures.

Method

Participants

Participants were 238 undergraduates, who participated for psychology course credit (45% male; 95% heterosexual; 77% White, 8% Asian, 7% Black, and 8% "other" races). Participants averaged 19.73 years of age (range = 18–35).

Procedure

Participants were told the study involved an examination of sexual attitudes and behaviors. They first completed a questionnaire about their past sexual behaviors. Next, participants were randomly assigned to the oral sex and HPV information reading ($n = 125$) or a control group ($n = 113$). Participants then completed a questionnaire assessing knowledge of oral sex and HPV, oral sex willingness, risk perceptions, HPV concern, and HPV vaccination likelihood.

Measures (Post-Manipulation)

Knowledge. Participants read seven statements regarding HPV transmission and symptoms, as well as items on oral sex and STIs (e.g., "HPV can be spread through oral sex," and "HPV infection can lead to cancer of the throat"). Participants' responses were coded as 0 (*incorrect or don't know*) or 1 (*correct*), then averaged, such that a higher score represented higher levels of correct knowledge.

Oral sex willingness. Participants were presented with two hypothetical situations similar to those used in previous studies (Gibbons, Gerrard, Blanton, & Russell, 1998). Because our sample included students who engaged in oral sex with steady and casual partners, willingness for steady and casual partners was assessed. Steady partner willingness was assessed with the following: "Suppose you were out on a date with your boy/girlfriend and you both wanted to have sexual intercourse. Neither of you has a condom. Under these circumstances, to what extent would you be willing to engage in oral sex?" Response options ranged from 1 (*not at all willing*) to 7 (*very willing*). Casual partner willingness was assessed by asking participants the following: "Assume you are not seriously dating anyone. Suppose you were at a party and met a man/woman for the first time. ... At the end of the evening you find yourself alone with this person. Neither of you has a condom. How willing would you be to engage in oral sex?" Response options ranged from 1 (*not at all willing*) to 7 (*very willing*). These two items were averaged ($\alpha = .75$).

Risk perception. Perceived risk (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008) was assessed by averaging two items: "If you were to have oral sex without a condom, what do you think the chances are that you would contract an STI (e.g., HPV)?," with response options ranging from 1 (*very likely*) to 7 (*not at all likely*); and "How dangerous (health-wise) do you think having oral sex without a condom is?," with response options ranging from 1 (*not at all dangerous*) to 7 (*very dangerous*) ($\alpha = .88$).

HPV concern. Participants were asked, "How concerned are you about the possibility of getting HPV in the future through oral sex?" Response options ranged from 1 (*not at all*) to 7 (*very*).

HPV vaccination likelihood. Women were first asked if they had received the HPV vaccine. If they said no, they were asked, "How likely is it that you will get vaccinated for HPV?" Response options ranged from 1 (*not at all likely*) to 7 (*very likely*). Men were asked, "If the HPV vaccine becomes available for men, how likely is it you will get vaccinated?" Response options ranged from 1 (*not at all likely*) to 7 (*very likely*).

Control Variables (Pre-Manipulation)

Oral sex behavior. *Oral sex partners* was assessed by summing four open-ended questions; for example, "How many (steady/casual) partners have you

(performed/received) oral sex (on/from) total in your lifetime?'' *Oral sex condom use* was assessed by averaging two items asking participants how often they used protection (e.g., a condom) during oral sex with a steady/casual partner. Response options ranged from 1 (*always*) to 7 (*never*) ($r = .68$).

STI diagnosis. STI diagnosis was assessed with one item: ''Have you ever been diagnosed with an STI?'' Response options ranged from 1 (*no*), 2 (*once*), to 3 (*more than once*).

Relationship status. Participants were asked to rate their current relationship status. Response options ranged from 1 (*no relationship*) to 7 (*very strong commitment*).

Sexual orientation. Participants reported if they were heterosexual, bisexual, or homosexual.

Statistical Analyses

To examine the impact of the informational versus control conditions and gender (Gender × Condition interactions) on cognitions, a series of analyses of covariance (ANCOVAs), using general linear models (GLMs), were conducted. Bonferroni-adjusted pairwise comparisons were used to further examine differences between the two conditions within each gender. All analyses controlled for previous STI diagnosis, oral sex risk behavior, relationship status, and sexual orientation. Cohen's *d,* which represents the differences between means divided by the averaged variability, was calculated to represent effect sizes. A series of initial GLM ANCOVAs examined condition randomization of gender, past oral sex behaviors, STI diagnosis, and HPV vaccination. No significant condition effects were found (Fs $< .8$, ps $> .5$).

Results

Descriptive Statistics and Correlations

Eighty-five percent of participants reported engaging in oral sex, and these participants averaged eight oral sex partners (giving and receiving). Less than 5% reported always using a condom during oral sex. Forty-four percent of women had received the HPV vaccine. Six percent reported being diagnosed with an STI in the past. As seen in Table 1, women who already received the vaccine reported higher oral sex willingness, lower levels of perceived risk, and greater levels of condom use (ps $< .05$). Among all participants, likelihood of future HPV vaccination was correlated with higher levels of knowledge, condom use, and willingness to engage in unprotected oral sex (ps $< .05$). Participants with a greater number of oral sex partners and who engaged in higher levels of condom use reported higher levels of willingness (ps $< .05$). HPV concern was positively associated with having an STI in the past, HPV knowledge, and perceived risk (ps $< .05$). Higher levels of knowledge and lower levels of willingness were also associated with higher levels of perceived risk (ps $< .01$).

ANCOVAs: Condition × Gender

For all ANCOVAs, we report significant covariates, gender, or condition main effects, followed by the Gender × Condition interaction. Pairwise comparisons are then reported if a significant interaction was revealed,

Table 1. *Means, Standard Deviations, and Correlations*

Variable	1	2	3	4	5	6	7	8	9	10	11
1 Gender	—										
2 HPV vaccine	.51***	—									
3 Oral sex behavior	−.13*	−.08	—								
4 Condom use	−.08	.18*	−0.10	—							
5 Relationship status	−.00	−.01	0.13†	0.04	—						
6 STI diagnosis	.11	.04	0.14*	0.00	0.05	—					
7 Knowledge	.12†	.10	0.02	0.05	−0.12†	0.11†	—				
8 Willingness	−.51***	.23**	0.25***	−0.16*	0.10	−0.02	−.09	—			
9 Perceived risk	.37***	−.22**	−0.15*	0.14†	−0.02	0.03	.23**	−0.45***	—		
10 HPV concern	.09	.01	0.05	0.03	−0.12†	0.14*	.17**	−0.07	0.67***	—	
11 HPV vaccine intentions	.08	.63***	0.13†	0.26***	0.10	0.14†	.19**	0.30***	0.03	0.13†	—
M		.24	7.07	2.99	3.45	1.08	.60	4.49	3.73	3.14	5.03
SD		.43	7.85	1.87	2.56	0.29	.27	1.73	1.17	1.67	1.77

Note. $N = 238$. All variables were coded such that high scores indicate more of the construct. For gender, 0 = male, 1 = female; human papillomavirus (HPV) vaccine coded 0 = no, 1 = yes; sexually transmitted infection (STI) diagnosis coded 0 = no, 1 = yes; knowledge coded 0 = incorrect or don't know, 1 = correct. The correlations with the measure HPV vaccine included the women only ($n = 131$), and HPV vaccination intentions correlations do not include the women who had already received the vaccine ($n = 180$).
*$p < .05$. **$p \leq .01$. ***$p \leq .001$. †$p < .10$.

Table 2. *Means and (Standard Errors) of Knowledge and HPV Cognitions*

	Control		Information	
Variable	**Men ($n = 52$)**	**Women ($n = 61$)**	**Men ($n = 55$)**	**Women ($n = 70$)**
Knowledge	0.45_{a} (0.04)	0.53_{a} (0.03)	0.66_{b} (0.04)	0.71_{b} (0.03)
Oral sex willingness	5.25_{b} (0.19)	3.75_{a} (0.18)	4.99_{b} (0.19)	$3.10_{a,c}$ (0.17)
Perceived risk	3.21_{a} (0.15)	3.77_{a} (0.14)	3.26_{b} (0.15)	$4.45_{b,c}$ (0.13)
HPV concern	2.94_{a} (0.22)	2.74_{a} (0.22)	2.95_{b} (0.23)	$3.86_{b,c}$ (0.19)
HPV vaccine intentions	$5.45_{a,c}$ (0.24)	3.75_{a} (0.27)	$5.51_{b,c}$ (0.22)	$5.03_{b,d}$ (0.26)

Note. $N = 238$. All variables coded such that high scores indicate more of the construct. The means for human papillomavirus (HPV) vaccination intentions do not include the women who had already received the vaccine ($n = 180$). Parameter estimates in each row that share subscripts do not differ significantly.

and these means are shown in Table 2. Relationship status, STI diagnosis, and sexual orientation were not significant in any of the ANCOVAs ($ps > .10$).

Knowledge. As anticipated, participants in the HPV–oral information condition reported higher levels of knowledge regarding STIs and oral sex compared to participants in the control condition, $F(1, 236) = 31.62$, $p < .001$ ($d = 0.78$; $Ms = 0.69$ vs. 0.49). The gender main effect was marginal, $F(1, 236) = 3.72$, $p < .08$; women tended to score higher on knowledge ($M = 0.62$) than did men ($M = 0.56$). The Gender × Condition interaction was not significant ($p = .63$).

Oral sex willingness. Men reported higher levels of willingness, $F(1, 237) = 90.10$, $p < .001$ ($d = 1.27$; $Ms = 5.14$ vs. 3.39). The Gender × Condition interaction was significant, $F(1, 237) = 5.56$, $p < .02$. Pairwise comparisons revealed no significant differences by condition among the men ($p > .3$; see Table 2 for means). Women who read the oral information reported significantly lower levels of willingness compared to those who did not, $F(1, 130) = 6.47$, $p < .02$ ($d = 0.50$).

STI risk perceptions. As expected, participants who read the oral sex information reported higher levels of perceived risk, $F(1, 225) = 4.68$, $p = .03$ ($d = 0.85$; $Ms = 4.11$ vs. 3.23). The Gender × Condition interaction was also significant, $F(1, 225) = 5.99$, $p < .02$. Pairwise comparisons again revealed no condition differences among the men ($p > .8$). However, women reported higher risk perceptions in the information versus control condition, $F(1, 120) = 11.22$ $p < .001$ ($d = 0.66$).

HPV concern. Participants who read the oral sex information reported higher levels of concern, $F(1, 235) = 4.11$, $p < .05$ ($d = 0.44$; $Ms = 3.42$ vs. 2.71). The Gender × Condition interaction was also significant, $F(1, 235) = 4.28$, $p < .04$. Once again, pairwise comparisons revealed no condition effects among the men ($p > .9$). However, women in the information condition reported higher concern compared to those in the control condition, $F(1, 130) = 9.33$, $p < .01$ ($d = 0.69$).

HPV vaccine likelihood. Women who had received the vaccine were excluded in the vaccination likelihood analyses. Only 4% of men indicated they were not at all likely to get the vaccine, and 40% reported being very likely to get the vaccine. Among the women, 10% reported they were not at all likely to get the vaccine, and 28% reported being very likely. Men reported a higher likelihood of vaccination, $F(1, 176) = 16.85$, $p < .001$ ($d = 0.71$; $Ms = 5.49$ vs. 4.36). Participants who read the oral sex information reported higher vaccination likelihood, $F(1, 176) = 5.61$, $p = .02$ ($d = 0.57$; $Ms = 5.27$ vs. 4.36). Finally, the Gender × Condition interaction was significant, $F(1, 174) = 6.73$, $p = .01$. Pairwise comparisons revealed no differences by condition among the men ($p > .8$). Among women, oral information was associated with greater vaccination likelihood, $F(1, 73) = 10.05$, $p < .01$ ($d = 0.81$).

Discussion

This study examined the impact of oral sex and HPV-associated oral cancer information on HPV-related risk cognitions among men and women, controlling for oral sex behaviors. Students exposed to the oral sex-related HPV information reported greater knowledge and HPV vaccination likelihood, and increased perceived risk and HPV infection concern, compared to students who did not read information. Gender moderated the impact of information on cognitions such that the positive information effects were only found among women. However, among participants who had not received the HPV vaccine, men reported a higher likelihood of receiving the vaccine. Examining sexual risk cognitions associated with oral sex and HPV is important to public health, given recent medical findings relating oral sex and HPV-positive oral cancers (Gillison, 2008; Heck et al., 2010).

Gender, Oral Sex Information, and HPV Vaccination

We found that the oral sex information resulted in healthier HPV-related cognitions (i.e., lower oral sex

willingness and greater HPV concern, STI risk perception, and likelihood to receive the HPV vaccine) for women, but not for men. Past research has demonstrated that men may be less convinced by STI health information promoting condom use compared to women (Kiene, Barta, Zelenski, & Cothran, 2005). Men may be more resistant to messaging aimed at changing their sexual behavior because sexual prowess (e.g., high numbers of sexual partners) is a socialized part of the male role norm (Courtenay, 2002). For HPV, men may be more affected by messaging if they receive information on additional and gender-specific negative health outcomes (e.g., anal and penile cancers; Ferris et al., 2008; McRee et al., 2010). It may also be the case that, although they are being told they are at risk, the men may have felt the HPV and oral sex information was less relevant to them. They may feel as though HPV is a "woman's disease" (Allen et al., 2009). Thus, information on oral sex and oral cancer may not be sufficient to influence men's cognitions, and information about more severe gender-specific health outcomes (e.g., penile cancer) may be necessary to influence men.

Unlike the men, the women in our sample were significantly affected by the oral sex information. These results are related to research demonstrating that women who received information about HPV vaccination from their doctors are more likely to get the vaccine compared to those who did not (Rosenthal et al., 2011). Research on HPV vaccine acceptability among men has demonstrated that overall, men have low knowledge regarding HPV and prevention, and health care providers tend to have a bias toward vaccinating females (Zimet & Rosenthal, 2010). In addition, women in our sample reported greater amounts of baseline exposure to information about HPV than men. Although most women were aware that vaginal sex is a risk behavior for HPV transmission, exposure to the *oral sex* information was likely novel for women. Some research suggests that exposure to novel information for a known risk behavior has a stronger impact on health cognitions than information related to well-known outcomes for that behavior (Moradi et al., 2007). For example, research examining the effect of information on intentions to quit smoking among adolescents demonstrated that information focused on blindness as a result of smoking had a greater impact than information focused on lung cancer, stroke, or heart disease (Moradi et al., 2007). Thus, the novelty of the oral sex information, along with the perceived relevance, may help explain why this information had a stronger impact on women. The men may have had less overall acceptability and interest in acquiring knowledge about oral cancers and the HPV vaccine.

Although gender moderated the effect of oral sex information on HPV vaccination likelihood, men reported overall higher HPV vaccination intentions than women. One possible explanation for why men reported greater likelihood of vaccination is that the subsample of women in the analysis included those who had not yet received the vaccine, and they may have already thought about and decided against vaccination. In addition, the men were reporting a hypothetical likelihood, whereas women were reporting on their actual likelihood. Barriers to vaccination, such as concerns about cost, safety, and side effects, could have been more salient for women's responses because they may have considered them in the past, and vaccination was already approved for females.

Oral Sex Cognitions and Behaviors

This study extends findings on risk cognitions associated with oral sex, as little research has examined oral sex cognitions among college students. Previous research has demonstrated that willingness to engage in unprotected vaginal sex predicts future risk behavior (Gerrard et al., 2008; Gibbons et al., 1998). In this study, unprotected oral sex willingness was related to lower STI risk perceptions due to oral sex, lower levels of condom use during oral sex, and a higher number of oral sex partners. Although directionality cannot be determined from this dataset, intentions to receive and actually receiving the HPV vaccine were also associated with higher levels of willingness. Higher STI perceived risk due to oral sex was related to higher HPV knowledge, greater concerns about contracting HPV through oral sex, lower numbers of past oral sex partners, and, among women, having received the HPV vaccine. Oral sex may be an especially important area within which to investigate risk cognitions, HPV vaccination, and oral sex behaviors, given that adolescents perceive oral sex as a low-risk behavior (Brady & Halpern-Felsher, 2007; Stone et al., 2006).

Implications

Increasing awareness surrounding the risks of oral sex and HPV is important, given that oral sex behavior is increasing, condom use during oral sex is rare, and youth report low levels of both STI risk due to oral sex and knowledge regarding HPV (Higgins et al., 2010; Sandfort & Pleasant, 2009; Stone et al., 2006). Our results suggest that willingness to engage in oral sex without a condom, perceptions of vulnerability for STIs, HPV concern due to oral sex behavior, and HPV-related knowledge are malleable with brief information exposure. Information on the consequences of oral sex and the effects of HPV could be distributed through health education classes or public health campaigns in high schools or on college campuses. Our examination of oral sex information is especially relevant given interest in testing the HPV vaccine's ability to prevent oral cancer (Psyrri & DiMaio, 2008). Including oral sex and cancer information in future messages

to encourage vaccination may be beneficial. In addition, our findings suggest that some HPV informational interventions may not enhance HPV vaccination likelihood and oral sex risk cognitions similarly for both genders.

Limitations and Future Directions

Although the results inform a growing literature on ways to target HPV-related information to enhance HPV-related cognitions, additional studies are needed to examine what types or delivery styles (e.g., personal testimonies) of information will impact HPV risk cognitions among men. Future research could examine how HPV information related to oral cancer prevention could be integrated into current interventions designed to encourage vaccination behavior or to increase awareness of the risks associated with unprotected oral sex. Prior research suggests that exposure to brief HPV information resulted in increased knowledge three months later (Lambert, 2001). It would be beneficial to examine the impact of oral HPV information over time to determine whether information results in increased HPV vaccination or raises awareness of the risks of oral sex.

In addition, our willingness and perceived risk items did not specify giving versus receiving oral sex. The likelihood of acquiring an oropharanygeal cancer is higher when one gives versus receives oral sex (e.g., D'Souza, Agrawal, Halpern, Bodison, & Gillison, 2008; D'Souza et al., 2007), and women are more likely to give oral sex than men (Chambers, 2007; Herbenick et al., 2010). Thus, future research should examine cognitions associated with each of these constructs by specifying giving versus receiving.

The impact of HPV messages among males and females also needs to be assessed among a more ethnically diverse sample and among adolescents and young adults with varying levels of education. Expanding testing of oral sex HPV-related messaging to these populations would ensure greater external validity and application of the results. Finally, because these data were collected prior to the FDA's approval of the HPV-vaccination (for prevention of genital warts and anal cancer) among men (CDC, 2011), future research should more thoroughly examine whether men's higher likelihood to receive HPV vaccination persists when the decision is no longer hypothetical and the barriers to receipt of vaccination are likely more salient in men's decision-making processes.

Conclusion

This study adds to the growing literature examining information-based messaging to encourage HPV vaccination behavior, demonstrating that oral sex risk perceptions and vaccination intentions can be increased and willingness to engage in risky oral sex behavior can be reduced, especially among women. Given recent medical findings on the connection among oral sex, HPV infection, and oral cancer, effective interventions for increasing HPV vaccination and risk cognitions associated with oral sex have the potential to enhance public health.

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