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College students and HIV testing: cognitive, emotional self-efficacy, motivational and communication factors

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Abstract

Most college students have never been tested for HIV, even though they regularly have unprotected sex and multiple sex partners. Theory-based research addressing factors influencing HIV testing among college students is limited. This study explored this topic via a conceptual framework that integrates the health belief model with emotion and communication factors. Data was collected with a sample of four focus group panels, including two male and two female groups ($N = 52$). Transcripts for the seven discussion questions were produced based on the audio recordings of group sessions. Two research assistants reviewed, summarized and cross-validated the discussion content to address each of the four research questions under study. Students believe HIV to be a severe health threat, but feel ‘invincible’ about contracting the virus. Their low emotional self-efficacy is a barrier for adopting HIV testing. Gaining social approval and emotional support for making a testing decision can help them overcome the perceived fear, stigma and lack of response efficacy associated with taking the test. Students are open to receiving cues to action via confidential HIV-testing related communication from health professionals or important others as well as media messaging from various sources. Bridging the perceptual-emotional gap between perceived invulnerability and fear can help increase emotional self-efficacy in coping with HIV testing. Normalizing HIV testing as a primary care routine for harm avoidance/reduction will increase perceived benefits of testing. Communicating cues to action will help reinforce HIV testing as a societally approved and socially supported protective behavioral norm.

Keywords

College students; HIV testing; health belief model; emotional self-efficacy; motivations; HIV communication

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The Centers for Disease Control and Prevention [1] reported that 22% of the HIV infection cases diagnosed in 2014 involved individuals ages 13–24; 81% of these individuals were gay and bisexual males. Moreover, within this age group, 81% of the cases were represented by those aged 20–24. Heterosexual transmission accounted for 24% of those diagnosed with HIV in 2015 and women accounted for 19% of all new HIV infection cases; gay and bisexual men represented 82% of new HIV cases among men and 67% of all HIV cases [2]. The CDC estimated that of the 1.1 million individuals living with HIV in 2014, 15% of them were not aware of their HIV-positive status [3].

Individuals who don't consider themselves part of the high-risk groups or at-risk for contracting HIV tend to show relatively low interest in receiving an HIV test [4]. At the national level, only 28% of college students reported having ever been tested for HIV [5], despite an overwhelming large number of college students reported that they had unprotected sex [6,7]. Hightow and her colleagues [8] considered college students a high-risk group for HIV infection.

Theory-based research addressing HIV-testing adoption among college students is limited, even though past studies have investigated students' awareness, perceptions [9], knowledge [10], attitudes [11], and sexual behavior associated with HIV [12]. To help bridge this gap in the literature, this study utilized focus groups to explore the cognitive and affective factors that could influence college students' HIV-testing behavior. Specifically, the health belief model was adopted and integrated with emotion and communication factors as the conceptual framework to guide the current study.

Conceptual framework

The Health Belief Model (HBM) has been widely utilized to examine HIV-prevention behavior. Based on HBM, an individual's HIV-testing behavior could be a result of (1) perceived vulnerability to and perceived severity of the threat; (2) perceived benefits of and perceived barriers to adopting the recommended action; and (3) exposure to cues for and perceived self-efficacy in adopting the recommended action [13].

When the HBM was applied to explain college students' HIV-risk and sexual behavior, the results were mixed, as students' HIV risk perceptions tended to be low and the model often failed to predict risk-prevention behavior [14,15]. Zak-Place and Stern [16] suggested that additional variables should be integrated with the HBM – which is largely a cognitive model – to refine the model and to increase its predictive strength. For instance, cultural health beliefs could be considered alongside HBM, when studying HIV risk of specific racial/ethnic groups [17,18]. Emotional responses to a health threat could likewise significantly influence health behaviors [19,20]. The current study adopted HBM as the conceptual guide, while adding emotions and communication factors to help explain how college students respond to HIV-testing. As the study aims to examine the general college student population as a cohort without focusing on any specific racial/ethnic group, it did not include the concept of cultural health beliefs.

Perceived severity and vulnerability

In recent years, public perception of the severity of the HIV threat has seen a drastic decline. As noted in a 2012 Kaiser Family Foundation study [21,p.5], ‘In 1987, two-thirds of Americans named HIV/AIDS as the most urgent health problem facing the country, a share that has declined steadily over the years, and sits at just 7% today.’ Research has shown that college students, often aided by the consumption of alcohol or other substances, can become disinhibited and engage in sexually risky behaviors (e.g. [22]). This disinhibition can thus contribute to a decline in perceived severity of the threat posed by having unprotected sex [23].

Research has also found a gender difference in risk perception, even though men reported more sexually risky and intravenous drug-injection behavior than women [24]. This perceptual gap also exists among college students, as male college students convey a significantly lower perceived HIV/AIDS risk than women [24]. Similarly disconcerting is the research finding which reveals that about half of all college students are unaware of their vulnerability to HIV and STIs [18], due to excessive trust in both partners and beliefs in low infection prevalence rates in their community. Additional research also shows a low level of perceived susceptibility to HIV infection among college students is low [16].

Even though college students were knowledgeable about how HIV is transmitted, they did not perceive themselves as a high-risk group [25] nor did they take much precaution for risk avoidance [26,27]. A study conducted with African American students at a historically black university found that while 80% of the participants reported having unprotected sex in the past 90 days, 84% of them reported a low perceived HIV risk [6]. The study also indicated that students with a lower risk perception were more open to HIV testing than those with a higher risk perception. An earlier British study also found that college students in the lower-risk group were more receptive toward the idea of receiving an HIV test than those who were in the higher-risk group with a low-risk perception [28].

To validate these past findings and to understand the current thinking of students about their HIV risk status, the following research question is proposed.

RQ1: How do college students perceive the HIV threat and the needs for HIV testing?

Emotional self-efficacy

The concept of emotional self-efficacy reflects an individual’s ability to cope with and control their reactions to negative emotions [29]. Recent works suggest that adolescents with low efficacy in regulating their emotions and emotional experiences tend to engage in risky behavior [30], including sexually risky behavior [31]. A longitudinal study indicates that emotional self-efficacy beliefs in expressing positive emotions significantly predict an individual’s ability to manage negative emotions between the age of 18 and 22 [32].

Emotions have been found to impact an individual’s HIV risk perceptions by altering their expectations of the probability or desirability of future consequences associated with the

HIV [20]. While the emotional response of fear was found to elicit reactance, the emotion of anger was said to encourage health-seeking behaviors [33]. In particular, anticipatory emotions about one's HIV status could elicit fear toward HIV-testing [34]. Likewise, anxiety related to others' awareness of one's potential or actual HIV status, including not wanting to be seen by people at a testing facility, was also reported as a deterrent for HIV testing (e.g. [24]).

Past research also indicates that a host of anticipatory or anticipated emotions played a role in an individual's contemplation of whether to get tested for HIV [35]. Furthermore, when individuals experienced the emotions of 'shame' and 'embarrassment' in their interactions with others, their self-concept, self-worth and sense of personal dignity could also suffer [36]. Shame and embarrassment can result in perceived social stigma, which could play a significant role in creating apprehensions toward receiving HIV testing [37].

Self-stigma has a negative effect on self-identity, which could result in lower self-confidence or self-efficacy [38]. Shame, a private emotion, was found to be closely related to perceived stigma; perceived stigma, a social judgment, was a stronger obstacle for developing a positive attitude toward HIV testing than shame [39]. To explore whether emotions are related to HIV-testing self-efficacy among college students, a research question is posed below.

RQ2: What is the level of emotional self-efficacy associated with HIV testing?

Perceived barriers and motivations

Perceived social stigma associated with HIV testing was found to elicit fear of social discrimination from others [40] and was an impediment to testing [34,41]. Individuals who have never been tested for HIV are said to experience greater HIV stigmas than those who have been tested; untested individuals also reportedly exhibit greater disapproval toward those who are HIV positive [42]. Self-denial of one's potential HIV-positive status was also a barrier to seeking HIV testing [34]. Moreover, those who felt a positive HIV diagnosis would be a 'death sentence' were found to perceive little benefit from receiving an HIV test [34]. When people feel that they are not vulnerable to the HIV risk, they also lack the motivation to test for HIV [40].

Among men, fear of learning about their potential HIV-positive test results was found to delay their compliance with HIV testing [43]. The number of lifetime sexual partners predicted men's HIV testing behavior as well as pressure from their female partners, even though they prefer to rely on women's testing results to gauge their own HIV status or need for testing [44]. Women who perceived their partners as engaging in risk behaviors and having multiple sexual partners [44] were most motivated to test for HIV, in addition to suggestions from health care providers and suspicions of having been infected by their partners [43]. Not unlike men, women who engaged in more risky sexual behaviors were less likely to receive an HIV test [24].

The literature reviewed thus far indicates that very little research has identified the perceived barriers or benefits of HIV testing among college students. One early study found that

students who voluntarily tested for HIV perceived more benefits of testing [45]. Beyond that, testing routine was promoted as a health benefit for adults [46]. Other studies suggested that the need for promoting HIV-testing benefits to sexually active individuals as part of their routine healthcare (e.g. [42]). To help ascertain the motivational factors associated with HIV-testing, a research question is forwarded below.

RQ3: What are the perceived barriers and benefits that motivate college students to avoid or seek HIV testing?

Communicating cues to action

A meta-analysis study indicated that computer-technology based prevention and intervention programs significantly improved HIV/AIDs knowledge, sexual/condom attitudes and condom-use self-efficacy as well as perceived susceptibility, condom communication and condom-use intentions [47]. Research has also shown that digital communication channels were effective in communicating sexual health prevention messages with a more personalized focus on emotions and motivations [48,49].

Specifically, mobile devices and online interactions were found to offer a potential venue for bypassing the confidentiality concerns [50–52] and increase voluntary requests for HIV counseling/testing [53]. A study of African American men and women aged 18–25 also reported that text messaging was used to exchange requests for receiving an STD/HIV test before engaging in sex, even though no testing evidence was gathered through such requests [54].

A study of male and female African American adolescents revealed that receiving short messages about HIV transmission, prevention information and videos – as well as engaging the ‘facilitator’ (i.e. the health educator) one-on-one – enabled them to ask explicit questions and receive personalized feedback about their HIV risk [55]. Utilizing closed-group social network communication (via Facebook) with a ‘peer leader’ to share and discuss information related to HIV testing, a study showed that more than twice of the intervention group participants (44%) ordered home-based HIV-testing kits than the control group participants (20%) [56]. To learn about the types of communication channels that could best transmit the cues to action for HIV-testing uptake, the research question below is proposed to advance this query.

RQ4: What communication channels will deliver effective cues to action for HIV-testing among college students?

Method

Study data was collected via the focus group method. The study protocol was reviewed and approved by the Institutional Review Board of a large Northeastern university prior to sample recruitment and data collection. Undergraduate students from a large, multisection general education course were recruited to be participants and received extra course credit as compensation. Following the IRB policy to ensure that student privacy would be respected,

anonymous data collection method was adopted. This method entails the three approaches below.

First, participants' sexual orientation, personal and sensitive information was not screened nor identified. Second, participants were asked to share the beliefs, attitudes and behaviors of their peers – without referring to any specific individuals – to prevent them from learning each other's personal response. Third, participants were instructed to keep the discussion content strictly confidential and not repeat such content outside of the focus group session. To capture gender-specific responses and avoid discomfort in discussing risky sexual behaviors in a mixed-gender setting, single-gender focus group panels were formed.

Overall, 52 participants were recruited in four focus group panels. These panels consisted of (1) 14 and 12 male students in two separate groups, and (2) 13 female students each in two different groups. The racial and ethnic composition of the sample included Caucasian, African American, Hispanic, Asian American and mixed-race students. Participants' ages ranged from 18 to 24 years.

Each single-gender focus group session was conducted by a trained facilitator of the same gender and was audio recorded. A transcript was produced for each session, based on their respective audio recording. To maintain participant anonymity during the discussion session, they were identified as participant 1, 2 and so on, based on their self-selected seating. As aforementioned, participants were asked to share the prevailing views of their cohort – instead of their own – to protect their privacy and facilitate a more candid discussion of the topic at hand.

Seven focus group questions (see Table 1) were developed to broadly capture the conceptual framework of the study and explore the answers for the four research questions. These focus group questions were intentionally worded to minimize participant discomfort, sensitivity, self-consciousness and social desirability concerns associated with discussing HIV risk and testing. Participants were probed to elicit data that was both rich and deep to reach data saturation, until no new information would need to be extracted through the group discussion.

Two research assistants each reviewed two sets of single-gender transcripts separately to summarize the relevant narratives that addressed the four research questions. Specifically, these summaries were generated by first systematically classified the different statements provided by the participants into a set of themes. Based on the statements grouped under each theme, a summary was produced to present the key findings that address the query put forth in each research question. Selected quotes that best reflect the different perspectives in response to each research question were presented to support the reporting of study findings.

Following that, the two research assistants both reviewed each other's summaries and quotes selection. To reconcile any inconsistencies found in the summaries or quotes for each gender group, each research assistant reviewed the transcripts again until an agreement was reached to reclassify the summary narratives and quotes in question. When these research assistants were unable to resolve their differences, one of the researchers conducted an independent

review of the relevant statements in the transcript and to help facilitate a consensus on reclassifying the narratives.

Results

RQ1: How do college students perceive the HIV threat and the needs for HIV testing?

Results show that male students overwhelmingly did not consider HIV a severe threat to them; they believed that ‘only those who suspect having been infected should think about testing.’ When they heard the mention of the term, HIV testing, they thought of the following: ‘being sexually active,’ ‘unprotected sex,’ ‘Magic Johnson,’ and ‘precautionary.’ The following two statements summarize their risk perceptions particularly well: (1) ‘No, no, no, it’s not like a pre-empted thing. It’s like you think you contracted it, so you’re going to check;’ and (2) ‘I think most people will get tested because they think they could have it, and they need to get it checked out.’

Female students believed that college students are highly sexually active and hence can be at risk for getting HIV/AIDS. The thought of HIV testing evoked vocabulary such as: ‘intimidating,’ ‘important,’ ‘disease,’ ‘irrelevant,’ ‘protection,’ and ‘unhealthy.’ One student revealed how HIV is something that she ‘really worr[ies] about’ for her peers. Another student also commented that ‘Individuals who are high risk may be afraid to know;’ and ‘college students assume that they are not a high-risk category.’

A majority of the male students believed that sexually-active and promiscuous individuals should get tested for HIV as a preventative and precautionary measure. One of them commented that, ‘people who tend to like not use condoms during sex should definitely get tested.’ Others stated that high-risk groups (e.g. drug addicts, persons who share needles, and sex workers), MSM and medical professionals (e.g. doctors and nurses) should receive HIV testing. Another student believed that testing is not required ‘if you’re sexually active with just one girl.’

In contrast, female students were unanimous in identifying a narrower set of specific populations that require HIV testing; these populations included groups such as ‘drug users,’ ‘sexually promiscuous people,’ ‘those who live in high risk areas,’ ‘low income,’ and ‘people who have doubts.’ They were somewhat hesitant and were less willing to elaborate on college students’ susceptibility to the virus and why they would need to be tested for the virus. One of them indicated that the students who should be tested are blasé about sex, stating ‘Many women have a “who cares” attitude.’

RQ2: What is the level of emotional self-efficacy associated with HIV testing?

Male students were more willing to share their views than female participants. For example, they mentioned that HIV-infected individuals could feel guilty about having sex with others. This guilt was noted by one of them as follows, ‘... thinking about all the people that you have had sex with. If you did get a positive result, obviously you would regret making the decisions that you did.’ Another student added, ‘Well, like, possibly guilt...[who] you might have given it to.’ Most agreed that those who choose to get tested might have opted to act

responsibly, as noted by one participant: 'I think they are responsible because they don't want to pass anything on to anyone else.'

Both male and female students mentioned that people are judgmental about and look down on those who choose to get tested. One male student described how people reacted to those who chose to get tested as 'dirty' or 'promiscuous.' A female student observed a similar response, 'Moral judgment ... what are your values and beliefs and how [HIV testing] can give you a status. [If you test] positive, your social status will suffer.' Another female student also commented, '... if you tested positive, your social status would suffer. It's a social taboo.' A male participant reflected on the gender bias associated with HIV testing: 'I feel like we are all males here... it's like a double standard. If a girl were to go do it, it sort of would be looked down upon. But for us, it's not so much.' In essence, students stressed the anxiety about making the HIV-testing decision, as revealed in this statement, 'I think that you worry that people might think that about you. So that's why you don't go. So you don't want the stigma ...'

RQ3: What are the perceived barriers and benefits that motivate college students to avoid or seek HIV testing?

Most male students cited ignorance and self-denial about their HIV risk as the reasons for college students to not get tested. For example, lacking information about where to seek an HIV test was acknowledged by one participant, 'People don't know where to actually go to initiate getting testing.' One of them commented, 'So they're just like "there's no chance I have it, I'm not going to waste my time" to try to get tested.' Other barriers revealed an individual's lack of emotional self-efficacy to accept a potential HIV-positive result, in addition to low perceived susceptibility to an HIV infection. Another pointed out that, 'I don't think that anyone would get tested if they were 100% certain that they didn't have HIV.' Male students also noted that not living with their parents allows them to consider receiving the test more freely, but they lack the financial means to pay for the test at a private health service.

Female students discussed how invincibility or excessive confidence was a barrier that prevented HIV testing. This sentiment was well reflected by a statement, 'I think all the young people have it like in their mind that they are invincible so they would be like, "No, I can't get HIV," so they wouldn't even think about [getting tested].' Students also alluded to other obstacles to HIV testing, including a lack of information, economic cost, moral judgment, impact on social status and avoidance of test outcomes. Nearly all them agreed that '[they] don't know where to go' and half of the female participants were unclear about the financial costs associated with HIV testing.

Most male students believed that knowing one's HIV status could be beneficial, but having social acceptance and social support will motivate HIV testing. They mentioned an individual who is HIV positive or has AIDS could be seen as an influential, non-judgmental and credible source, so could significant others such as a girlfriend or a spouse. One of them further emphasized the importance of social support from friends, 'Like you bring it up like, "I messed up last night. I think I might have something." If your friends were like "yeah, you should probably get that checked out"... I think that would make a huge motivator.'

Another commented, 'I think it would be a lot easier to go with someone else, either your partner or just another friend.' Awareness of their peers' STD status was also a motivator, as noted in 'I think if you hear that one of your friends or someone you know has an STD, it can motivate you to think about [HIV testing] for yourself.'

Female students also described the need to know as a motivator for contemplating HIV testing as in, 'It would just be nice knowing that you aren't HIV positive, so the motivation itself would be like finding out that you would be HIV negative.' Most agreed that conversing with family or friend could help a person become more receptive toward adopting HIV testing. Nearly all of them felt that media content such as movies or public services announcements (PSA) could influence college students' intentions for testing. One student stated that celebrity endorsements championing the cause could be a good motivator, 'Celebrities might be a good influence, when they speak up and promote HIV testing.' This view was shared by the male participants as well.

RQ4: What communication channels will deliver effective cues to action for HIV-testing among college students?

Students recommended utilizing various promotional channels to get the testing information out, including television, outdoor or transit advertising outlets, among others. A male student said, 'Just put it out there.' Most male students believed that television programs, advertisements and newspapers could be good sources to gain information because everyone is exposed to some or all of these sources. They also suggested that HIV-testing advertisements during sporting events might catch a lot of male attention.

Some female students observed that television programs do not seem to focus on promoting the idea of HIV testing or even condom use. One of them suggested adding more real-life HIV discussions in media could be useful, 'I think you can like post ads that are like telling people to get [HIV] tested but like show people who are already like in a real life situation.' Another advocated the idea of information campaigns, 'They have like campaigns, like "test it yourself" campaigns... It gives you the resources...so like I think it could be effective because it actually like tells you the steps to get tested.'

Students also recommended that campus community outreach through student media and promotional events could be an effective way to get people to learn about HIV testing, as long as students are incentivized with popular give-away items and free merchandise. Most of them also reported that text messages received on mobile phones from health professionals emphasizing the importance of receiving HIV testing would be more effective than communication received from family, friends, peers, or outreach campaigns. However, one student disagreed, 'I would just get rid of the message. We get a lot of messages.' Another participant concurred, 'It's like email. There's too much.'

Male students believed text messages about HIV testing to be potentially psychologically bothersome. One of them articulated that individuals may not be in a state of mind to receive HIV news/information through a smart phone. Other male students thought it would be beneficial if the person who wishes to get tested initiates the text-messaging contact. They also proposed that after a text message is delivered from a healthcare provider, there should

be a follow-up phone call or personal meeting. Another student explained, 'If it was a text message that followed up with like a personal meeting...that would work too.'

Students also perceived the discourse shared via online support groups as a useful interpersonal dialogue; one of them pointed out, 'You have someone else to experience it with. You can talk to someone else about it.' An online support group was also seen as a channel for people who did not have access to friends or family to broach the topic, as noted by another student, 'I feel like there's a place for online support groups...for someone who doesn't have [friends or family], who is scared and doesn't know what to do.'

Most students considered that social media such as Facebook would be a more effective channel for communicating the importance of HIV testing than peers, family, friends or community outreach, due to its audience reach and the potential for the information to go viral. They also liked the idea of utilizing online social media to provide private and anonymous discussion opportunities to interested students. One male student commented, 'I think the people who are scared would be like more apt to talk[ing] anonymously... through a chat.' Another agreed, '... just seeing it in the atmosphere would make me like want to join [an anonymous online social network].' Other female students focused on the anonymity aspect of an online social network as a benefit, 'Anonymously being in a group, I guess, it would kind of motivate me personally.' They also discussed the idea of perceived credibility of health professionals on social networks regarding utilizing private and anonymous online social networks to share questions and experiences about HIV testing. One female student explained, 'I do feel if it's professionals...I'd feel a little more comfortable with the information than just [someone participating in an anonymous online social network].'

All student participants endorsed the idea of creating a campus mobile-app for downloading, as long as the app does not send out frequent updates to bother them regularly. One student noted, 'If you promote it out there, it's easy, just say 'download the app if you've got a question.' Tailored and uniquely titled email reminders from a campus 'authority' (e.g. relevant student affairs offices) for students to get tested were considered potentially useful, as voiced by another student, 'Well I think you have to make it like a separate email just about testing. I don't have time to read the [daily campus email] or whatever it's called... with a bold print so it attracts attention.'

The key findings from the focus groups can be summarized as follows. First, students believe that the HIV virus is a severe threat to high-risk individuals and their sexually promiscuous peers. They perceive themselves as not susceptible to either the virus or the need for HIV-testing. Second, low emotional self-efficacy, as reflected by negative emotions associated with HIV-testing, cause students to experience stress and anxiety. Third, low emotional self-efficacy creates barriers to information-seeking and motivation related to HIV-testing. The desire to know one's HIV status as well as societal approval of and social support for the HIV test benefit students' testing motivation. Lastly, students are open to receiving HIV-testing communication and messaging via mediated, campus-based and interpersonal channels.

Discussion and implications

The HBM has been criticized for lacking specific variable ordering [57] or mediating sequence [58]. This study proposes that emotional self-efficacy could be a moderator between HIV-related thoughts and feelings (i.e. perceived risk and vulnerability) – and the cost–benefit evaluation of HIV testing (i.e. perceived barriers and benefits) – to influence HIV-testing messaging (i.e. cues to action) and an individual’s HIV-testing efficacy.

Our study shows that students perceived HIV as a severe health threat, but viewed only selective others in the high-risk category as being vulnerable to that threat. They reported perceived barriers to seek an HIV test that are related to negative emotions such as fear and stigma. Previous work suggests that when fear is aroused, psychological reactance is activated; when fear is reduced, psychological reactance is mitigated or inhibited [59]. Psychological reactance toward HIV testing is a form of maladaptive coping [60], which is a response triggered by low emotional self-efficacy [61]. The current study contends that cultivating social support from significant others/friends/family and normalizing HIV testing could help reduce fear, remove stigma and increase emotional self-efficacy for mitigating psychological reactance.

The focus on emotional self-efficacy falls under a broader framework of emotional competence, which has been shown to relate to risky behaviors [62]. In particular, deficient emotion regulation in youth can lead to engagement in risky behaviors. Hence, adopting such emotional education strategies as ‘emotional inoculation’ [63] – which trains individuals to imagine and rehearse potentially anxious or stressful experiences – could help prepare youth for more competent emotional self-regulation when contemplating sexual encounters. By implication, developing college students’ emotional knowledge [64] and emotional self-efficacy will likely enhance their ability to anticipate and adapt to the emotions that they need to self-regulate with confidence, when considering whether to seek HIV-testing.

Students similarly demonstrated low response efficacy, as they cited a lack of knowledge about the financial cost associated with HIV testing and testing locations. While the University’s student health center does not offer free HIV testing, health insurance coverage required for all students will typically cover the HIV-test cost. Free HIV-testing service is also available at a campus center that serves students with diverse gender identities. The findings shown here are similar to those revealed by a study across several New England university, which indicate that less than 5% of college students reported having received an HIV test at their college medical centers, citing cost and availability of Rapid Antibody Test as significant barriers [65]. This suggests that the cues to action communicated should focus on improving student awareness of the inexpensive or free HIV testing service normally offered on college campuses.

Past studies of non-student populations found that digital and *mhealth* channels could help promote HIV prevention [47,53,56]. Our framework suggests that significant others, family and friends could be good (but little utilized) change agents for communicating ‘cues to action’ regarding HIV testing, in addition to one-on-one or anonymous online group

exchanges with health professionals as well as media messaging via entertainment programs and social marketing campaigns. In other words, a holistic approach for communicating HIV-testing as a positive and normative action – one that is tailored to meet the information and emotional self-efficacy needs of students with racial/ethnic and gender diversities – will be more successful than the one-size-fits-all approach commonly adopted on college campuses.

Low HIV-testing adoption among college students is an under-studied public health problem. Research should more fully address the emotional self-efficacy required in confronting HIV prevention vs. testing, as the former doesn't imply a plausible HIV-positive status but the latter does. As students paradoxically perceive HIV-risk related invulnerability and fear at the same time, research should explore how to bridge this cognitive-affective response gap to increase their HIV-testing related emotional self-efficacy.

For instance, studies could analyze emotional responses to HIV-testing related thoughts and images – through physiological and self-reported measures – with students who show a similar level of resistance toward HIV-testing at baseline. By incorporating emotional-competence coaching into the research design, these studies could further explore whether those received coaching become more willing to seek HIV-testing than those who did not receive coaching. If a longitudinal approach is also employed in the research design, then HIV-testing compliance could be tracked over time.

Additional research could explore potentially effective means to cultivate the mechanism that could help normalize HIV testing as a primary care routine for harm avoidance/reduction to reduce or remove the prevailing perceived social stigma. This would require primary-care physicians to adopt routinized HIV-testing counseling for their college-student patients who are sexually active and at risk for STI/HIV infection. Social norming of HIV testing could be crucial for increasing perceived self-protection and self-preservation care benefits associated with HIV testing. Importantly, identifying the 'channels of least resistance' to promote HIV testing would also be necessary for establishing and spreading the acceptance of HIV testing as a socially desirable behavior. These 'channels of least resistance' could be traditional change agents such as health educators, counselors, nurses or physicians. They could also be non-traditional change agents such as a close friend, a sex partner or a parent; they could even be anonymous individuals who share stories, warnings and the virtue of HIV-testing on the Internet.

Several study limitations should be noted here. First, data were collected from only one residential campus community. To draw a potentially wider range of responses, future research could consider including multiple college campuses to represent more diverse demographics and geographic locations as well as 'residential' and 'non-residential' student bodies. Second, due to IRB concerns with privacy and psychological risks, topics such as sexual orientation, risky sexual behaviors and the like were not explored to provide additional context for discussion. To involve students with a full spectrum of sexual orientation and gender diversity in the study, researchers could consider recruiting them through the LGBTQ student service center and/or related student organizations. Moreover, an approach that broadly explores the types of circumstances and behaviors relevant to the

need for HIV testing could be considered, when discussing risky sexual behavior topics to avoid creating potential psychological and privacy risks. Third, probing emotional processes toward a sensitive topic in a group setting presents a limited window into seizing anticipatory and actual emotions that may be associated with the contemplation of risky sexual behaviors. Thus, having students respond to a checklist of discreet emotions (e.g. [66]) and write down any additional emotions related to the notion of HIV-testing – prior to addressing the emotions topic – may help elicit a more thorough and thoughtful discussion. Lastly, social desirability remained a concern for an open discussion of sexual behaviors, even as focus group panelists were not individually identified and moderators were gender-matched. To reduce this concern, focus group moderators should try to establish a rapport with and gain the trust from the participants, in addition to emphasizing the nature of anonymous data collection, confidential discussion content and aggregated data reporting.

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Table 1

Focus group questions.

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1. When young adults hear the mention of ‘HIV testing,’ what are the first thoughts that came to their minds?
 2. Who are the individuals that young adults believe should receive HIV testing in our society?
 3. What are the usual emotions young adults might experience, when thinking of the idea of receiving HIV testing?
 4. What might be the reasons (or barriers) for young adults to not seek HIV testing? (Barriers)
 5. What might be the reasons (or motivators) for young adults to seek HIV testing? (Benefits)
 6. What are the most effective media channels to make young adults become aware of the importance of receiving HIV testing (e.g. TV ads, Internet ads, social media ads, mobile ads, etc.)?
 7. What are the most effective interpersonal channels to remind young adults of the importance for receiving HIV testing (e.g. peers, friends, family, community outreach, social media discussion, texting messages from health professionals, etc.)?
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