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Optimizing educational video through comparative trials in clinical environments

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Abstract

Although video is increasingly used in public health education, studies generally do not implement randomized trials of multiple video segments in clinical environments. Therefore, the specific configurations of educational videos that will have the greatest impact on outcome measures ranging from increased knowledge of important public health issues, to acceptance of a voluntary HIV test, remain largely unknown. Interventions can be developed to run on affordable handheld computers, including inexpensive tablets or netbooks that each patient can use individually, and to integrate video delivery with automated data collection. These video interventions can then be used not only to educate patients who otherwise might not be reached, but to examine how content can be optimized for greater effectiveness as measured by cognitive and behavioral outcomes. This approach may prove especially valuable in high volume urban facilities, such as hospital emergency departments, that provide points of contact for lower income, lower literacy, and high-risk populations who may not otherwise interact with healthcare providers or researchers. This article describes the development and evaluation of an intervention that educates emergency department patients about HIV prevention and testing while comparatively examining a set of videos, each based upon competing educational theories. The computer-based video intervention and methodology are both highly replicable and can be applied to subject areas and settings far beyond HIV or the emergency department.

Keywords

Video; multimedia; clinical; health; HIV; handheld; education

Introduction

This paper describes the development and clinical trial of a video intervention designed to educate hospital emergency department (ED) patients about HIV testing and prevention. The results not only establish the feasibility of conducting comparative effectiveness research in a busy urban hospital emergency department, but indicate statistically significant improvements in knowledge of HIV testing and prevention, intent to use a condom during vaginal sex, and acceptance of an HIV test offered at the end of the intervention. The success of this intervention, and its accompanying methodology, offer a potential model for future uses of educational video technology that integrate and test conflicting elements of accepted theories in real-world settings. In addition to exploring relevant questions of educational theory, this paper examines how implementing comparative trials in working healthcare environments can help clinicians and researchers move beyond simply using

video to reach more people, in order to continually refine evidence-based video interventions that achieve greater results.

Previous research on how video can be used in health education has often evaluated a single video aimed at a target population (Carey et al., 2008; Merchant et al., 2007, 2009), or multiple video segments depicting the same person as an onscreen host or doctor that are tailored to specific viewers by behavior or circumstances (Gilbert et al. 2008). Although Lee, Plass, and Homer, 2006; Mayer and Moreno, 2003 created several versions of a multimedia-based intervention and then comparatively examined which is most effective, a similar approach is generally not applied to video interventions delivered in high volume clinical settings.

Adapting Educational Video to Clinical Settings

Even though hospital emergency departments and other high volume clinical facilities may be seem to be unlikely environments for patient education, the reality is that they lend themselves for this purpose very well because people seeking routine care in these venues often lack access to other forms of healthcare. Consequently, many have limited interactions with healthcare providers and, as a result, limited opportunities for patient education. In response to this situation, the Centers for Disease Control and Prevention recommend HIV testing for all emergency department patients, and providing each with basic education about prevention and how testing works (Branson et al., 2006).

Even when tests are routinely offered, patients at highest-risk may decline (Carey, Coury-Doniger, Senn, Vanable, & Urban, 2008). In fact, many people report not testing because they are “afraid to find out” (CDC, 2003, p.13). When this happens, people with HIV can pass through a medical facility undiagnosed and unaware of available services. It is not only important to offer HIV testing to all emergency department patients (Branson et al., 2006), but also to identify strategies to reach those reluctant to test (Carey et al.). Unfortunately, high volume and heavy workloads (Broyles & Gordon, 2010; Merchant et al., 2007) make emergency departments very difficult places to implement large-scale patient screening, education programs, or related research.

Urban emergency departments and clinics typically treat hundreds of patients daily. An intervention designed for routine delivery in the ED must be especially efficient, brief, and easy to administer. Interventions that interfere with workflow or patient care would simply not be feasible nor ethical. To avoid these problems, some interventions have been developed for locations outside emergency departments’ main treatment areas, where patient volume is lower, but these may not reach those most in need.

Healthcare providers have used video to educate patients about HIV testing and other sensitive topics, but showing video to groups of patients in a waiting room on television style monitors, rather than individually on a handheld computer, creates privacy issues. HIV testing is very personal, and many patients are understandably uncomfortable watching an HIV-themed video in a crowded room. Video interventions designed to address sensitive issues must enable patients to individually and discretely participate from locations where they are receiving treatment. Requiring patients to move to a separate, private area, could in itself stigmatize if others realize they are being moved to discuss their HIV status.

Computer-based video offers a solution that is feasible to implement, even in the highest volume environments (Aronson & Bania, 2011) because it can communicate understandable, standardized public health messages to individual patients. Modeling and vicarious learning (Bandura, 1986) methods can be employed to create experiences that feel personal without placing excessive demands on staff. Further, reading is not required,

making videos especially well suited to lower-literacy or limited English proficiency populations that frequent emergency departments.

Design of the Intervention

The intervention described in this paper is rooted in Social Cognitive Theory (SCT) (Bandura, 1986, 1994), and the Information, Motivation, Behavior Model (IMB) (Fisher & Fisher, 1992; 2000). These theories offer a number of recommendations that are directly applicable to video-based promotion of HIV testing, yet leave important questions unanswered. On the conceptual level, in terms of SCT, what type of video would learners view as relevant and worthy of their attention, and in terms of IMB, what would most effectively motivate viewers? In more immediate terms, what should the people in a video look like (should they be demographically concordant with the viewer or intentionally non-matching) and what type of emotional response should the video elicit?

Bandura (1986, 1994) described the value of vicarious learning and the power of educational modeling, but noted that external stimuli, in this case educational video segments, will not automatically determine behavior. Instead, people "attend selectively" to some aspects of their behavior and "ignore nonrelevant aspects" (1986, p. 336). Similarly, Fisher and Fisher (2000) argued fact-filled presentations alone are not enough to produce meaningful change and that information, motivation, and behavior must be collectively addressed to achieve results.

Unfortunately, although HIV infection poses a significant risk to people at all levels of society, and, in particular to the populations that seek routine care in hospital emergency departments (Branson et al., 2006), many patients may falsely believe that HIV is not something to worry about. A significant challenge, then, is to make material that is meaningful and relevant to people who have come to see a doctor but may not have any interest in learning about their HIV status, while simultaneously providing the requisite motivation and behavioral skills people need to take preventive action.

Characteristics of the Interventionist—What characteristics should the actors representing the health care provider and the patient, have to make a successful video intervention? To increase the impact of a modeling intervention, Bandura recommends presenting models that resemble the learner in terms of "their age, sex, and status, the type of problems with which they cope, and the situation in which they apply their skills," (1994, p. 37). Fisher and Fisher write that content should be tailored to specific populations and risk behaviors (1992), and should be made relevant and applicable to the learner's social setting (Fisher, Fisher, Bryan, & Misovich, 2002). Likewise, the Centers for Disease Control and Prevention (2001) recommend providing services that are appropriate to clients in terms of culture, language, gender, sexual orientation, and other factors.

However, the question of what is most appropriate for a given population of learners, and whether models resembling learners are always best-suited to deliver an intervention, remains unresolved. In a study of HIV prevention in inner-city high schools, Fisher et al. (2002) found good short term results for interventions delivered by peers and by a combination of peer-based and classroom-based learning, but only found significant long-term effects for recipients of the classroom-based intervention. Further, in a meta-analysis of HIV-prevention interventionists and their effectiveness among different groups Durantini, Albarracín, Mitchell, Earl, and Gillette (2006) found that, while greater similarity may lead to increased understanding, non-matching interventionists may deliver more convincing arguments and provide information more effectively.

Emotional Content—In keeping with recommendations of Fisher and Fisher (1992, 2000) a major goal of the study was to examine what form effective motivation might take in a video segment. For example, beyond the question of who should appear onscreen, what type of affective response should the content elicit in viewers? Many researchers emphasize the importance of consistently using positive emotional content (Ashby, Isen, & Turken, 1999; Isen, Daubman, & Nowicki, 1987; Astleitner, 2000, 2005) while others argue that negative emotional content used properly, can produce much better outcomes (Beiner, McCallum-Keeler, & Nyman, 2000; Witte & Allen 2000).

States of positive affect have been shown to facilitate greater creative problem solving and cognitive flexibility in both laboratory and field studies (Ashby et al., 1999). Similarly, Isen et al., (1987) write that people experiencing an induced state of positive affect tend to categorize stimuli more inclusively and perceive items as interrelated. However, not all researchers agree that a state of positive affect is necessarily the best for all types of cognitive tasks.

Oaksford, Morris, Grainger, and Williams (1996), found that positive affect did not facilitate reasoning, but instead depleted working memory resources and, as a result, suppressed reasoning performance. According to their findings, the same mental responses to positive affect that enable creative problem solving can actually impair analytic reasoning. Petty, Schumann, Richman, and Strathman (1993) found that people in a positive affective state may be less likely to "process a persuasive communication" (p. 7) of a more negative nature because they want to maintain their positive state and are less willing to focus on a message which could impact it negatively. In the case of a project aimed at focusing people's attention on an important issue that may threaten the learner's well being, such as HIV/AIDS, messages intended to produce positive affect could, therefore, prove counterproductive.

At the same time, messages intended to evoke states of negative affect, such as fear, may not always be effective either. "People need enough knowledge of potential dangers to warrant action, but they do not have to be scared out of their wits to act, any more than homeowners have to be terrified to insure their households" (Bandura, 1994, p. 32). Although fear-based appeals have been used effectively in a variety of public-health campaigns from seatbelt use to anti-smoking advertisements (Biener et al., 2000), frightening messages "may backfire if target audiences do not believe they are able to effectively avert a threat" (Witte & Allen, 2000, p. 606). An effective fear-based message not only scares people, according to Witte and Allen, but also provides the viewer with a practical solution by which they can reduce the danger. Otherwise, if viewers doubt the effectiveness of the recommended response or their ability to take recommended action, people work to control only their fear, as opposed to working to control the actual danger, and as a result may take no tangible action at all (Witte and Allen, 2000).

Applying Methodologies From the Learning Sciences to Health Education

Research on the science of learning frequently creates multiple versions of a media based-treatment, each designed to embody specific factors related to aspects of a theory or set of theories, and then implements experimental trials to examine how these design factors influence effectiveness. Examples of such experiments to determine how different combinations of text, narration, animation, and still images do or do not facilitate learning in computer-based environments were reported by Mayer (1997; 2009), Mayer and Anderson (1991) and Mayer and Sims (1994). Likewise, Plass and colleagues have developed experimental trials of multiple interventions to examine how design factors influence learning in simulations, games, and computer-based foreign language instruction (Kalyuga & Plass, 2008; Plass, Chun, Mayer, & Leutner 1998; Plass, Homer, & Hayward, 2009).

Similar methodologies are rarely, if ever, applied to educational video content, and in particular, to health education video interventions. The previously cited studies produced important findings about how people learn from multimedia, but it is not clear to what extent the findings apply to educational videos. The goal of this research was therefore to create sets of multiple video segments specifically developed to test different educational theories.

While a number of studies (Baylor, 2011; Baylor and Ryu, 2003; Domagk, 2010; Frechette and Moreno 2010; Sträfling, Fleischer, Polzer, Leutner, and Krámer, 2010) have examined the effects of animated pedagogical agents, “lifelike characters that guide users through multimedia learning environments,” (Domagk, 2010, p. 84), none of these studies involve the comparison of different video recordings of actual people. Further, it is not clear whether findings from these studies apply to clinical settings, especially those with participants recruited from an urban hospital patient population. Because the above studies were largely conducted with university students, their results may not be fully generalizable to lower socio economic status and lower literacy populations seeking care in emergency departments.

Although clinical applications of educational video have been studied extensively in the context of HIV testing and prevention, experimental trials have largely focused on whether educational videos are adequately effective (Gilbert et al., 2008; Merchant et al., 2007; 2009) or on the effects of video-based treatments versus another type of intervention, such as stage-based counseling (Carey et al., 2008). Prior research shows educational video interventions can effectively reduce risky behavior (Gilbert et al.) and increase knowledge of HIV testing and prevention (Carey et al; Merchant et al.), yet due to the lack of side-by-side trials of multiple video approaches, the specific theory-based configurations that will result in the most effective educational videos have yet to be fully explored. Further, previous studies have shown computer-based video segments to patients who had already agreed to a voluntary HIV test (Merchant, 2007, 2009) or to patients who knew they were HIV positive (Gilbert, 2008). By showing all study participants a video explaining the importance of a particular behavior, in this case accepting an HIV test, and then offering a test to each patient, the protocol used in the present study can measure which video segments result in the greatest number of people who say yes — including those who may have previously declined testing during the same emergency department visit. The primary goal of this research is, therefore, to integrate systematic examination of multiple educational video segments into a computer-based health intervention that can be effectively delivered in high volume clinical environments. This entailed the following:

1. Developing multiple video segments about HIV prevention and testing, based on differing educational theories,
2. Creating an application that runs on affordable, lightweight computers; randomizes participants into different groups; delivers a different video segment to each group; administers pre- post data collection instruments; and transmits patient responses to a database for later analysis,
3. Implementing a clinical trial in a high volume clinical environment, and
4. Analyzing data to determine the effectiveness of the intervention overall and by treatment, as measured by increases in knowledge of HIV testing and prevention, intent to use a condom during future sexual encounters, and acceptance of an HIV test.

Method

Materials

The *study materials* included four original short videos developed by one of the study's authors, each made to test a specific combination of the educational theories described earlier. The videos depicted either a White healthcare provider speaking with a White patient, or an African American healthcare provider speaking with an African American patient. In addition, the healthcare providers either spoke in positive terms, emphasizing the benefits of receiving an HIV test, or in negative terms, underscoring the dangers of not testing. All videos were approximately two minutes long.

The perceived legitimacy and applicability of the intervention content, concerning, for example, the apparent similarity of the viewer to a person onscreen discussing the need to use condoms and take an HIV test, may play a key role in motivating the learners and capturing their attention. In short, perceived authenticity and relevance may impact motivation (Choi & Hannafin, 1995), which in turn, may impact learning (Tessmer & Rickey, 1997).

To create video segments that appeared as authentic as possible, all four videos were shot in recognizable emergency department settings similar to the physical environments in which patients would view them. To further increase the authenticity of the video segments, the healthcare providers who appear onscreen are, in fact, healthcare providers. For privacy reasons, actual patients were not included in the video segments. Patients were role played by healthcare providers.

The study also used a software application developed by an author of this paper to collect basic demographic data from each participant, including age, race, and gender; randomize participants into groups; administer a set of pre- post intervention data collection instruments; automatically deliver the video segments; and at the end of the intervention, ask participants if they would like an HIV test. The application was designed to run on inexpensive, commonly available netbook computers. Each participant was shown a single video. All participants completed the same pre- post intervention measures. The entire intervention took patients roughly ten minutes to complete.

The *Measures* used in this study consisted of knowledge pre/post-tests, condom intent pre/post-tests, and a single question delivered by the computer at the end of the intervention asking participants if they would like an HIV test. The knowledge tests consisted of five item, five point Likert-type multiple choice scale with responses ranging from "strongly disagree" to "strongly agree." For example, the pre-test stated "You are automatically tested for HIV anytime your doctor gives you a blood test" and instructed participants to indicate their agreement or disagreement using the Likert scale. The post-test consisted of five items measuring the same constructs, but worded slightly differently and presented in a different order. For example, the post-test stated "I am tested for HIV whenever my doctor gives me a blood test" and presented a Likert scale for participants to indicate their agreement or disagreement. The pre- post-intervention condom intent instruments used a two-item, five-point Likert type multiple-choice scale, asking participants to separately indicate their intent to use a condom during anal and vaginal sex, with responses ranging from "highly unlikely" to "highly likely."

Responses were automatically recorded by the application. At the end of each patient's participation the application sent the data to an offsite, password protected database using a mobile broadband connection. No data were stored on the individual computers. To protect

the privacy of study participants, no identifying data were collected or recorded by the application.

Participants and Design

The sample included 202 emergency department patients recruited in a high volume urban hospital center. Participants ranged in age from 18 to over 65. Approximately half the participants reported their age as 25–34 (27.7%, n=56) or 34–55 (23.3%, n=47). Study participants self-identified as Black or African American (36.6%, n=74), White (29.7%, n=60), Latino (24.3%, n=49), and other (9.4%, n=19).

One hundred thirteen patients identified themselves as female (55.9%) and 89 identified themselves as male (44.1%). One hundred thirty two patients (65.3%) reported that they planned to have vaginal intercourse within the next three months. Thirty participants (14.9%) reported they planned to have anal sex in the next three months. Participants who did not report intent to have vaginal or anal sex in the next three months were not asked about intent to use a condom during vaginal or anal sex, respectively.

The study employed a 2 (emotional content: positive, negative) × 2 (onscreen race: African American, White) design. An a-priori power analysis revealed that with an expected effect size of .25, power of .94, and a 2 × 2 design, we required a sample of 200 subjects. Participants were randomly assigned to one of the four resulting treatment conditions by the computer application. The application employed algorithms to distribute participants across the four groups, and, based on the demographic data participants provided at the beginning of the intervention, ensured that participants from different races were represented in each treatment group.

Of the 74 Black or African American patients enrolled in the study, 38 were shown a video depicting White people onscreen, 36 were shown a video depicting African Americans. Of the 60 White participants, 32 were shown a video depicting White people onscreen, 28 were shown a video depicting African Americans. Of the 49 Latinos who participated in this research, 29 were shown a video depicting White people onscreen, 20 were shown videos depicting African Americans. Of the remaining 19 patients, who reported a race other than Black or African American, White, or Latino, 13 were shown videos depicting White people, 6 were shown videos depicting African Americans.

Procedure

Participants were tested individually. Patients were approached by ED staff or volunteer Academic Associates trained and credentialed by the hospital, and asked if they would like to learn more about the study. Those categorized by hospital staff as Emergent, or most in need of immediate care, were excluded from the study, as well as those who were in too much pain, intoxicated, or otherwise unable to provide informed consent.

Patients who expressed an interest in the study and who provided informed consent were handed a netbook running the application and a pair of headphones. The headphones enabled patients to hear the dialogue in the video while maintaining their privacy. Participants took approximately four minutes to complete the pre-test instruments. The application then immediately delivered a 2-minute video segment. Following the video, the intervention automatically delivered the post-test instruments, which took approximately four minutes to complete.

The pre-post intervention knowledge test questions were intended to measure different areas of HIV prevention knowledge, e.g. the importance of condom use, the interpretation of HIV test results, and whether people display visible symptoms of HIV infection. A central goal of

this study was to assess item-by-item knowledge change following the presentation of a very brief video segment. For this reason, we conducted separate repeated measures ANOVAs for each knowledge test items, rather than computing an overall mean score for all five items on the knowledge test.

At the end of the intervention, the computer application asked participants if they would like an HIV test. Possible responses were yes or no. If patients responded yes, hospital staff administered an HIV test separate from this study. All HIV testing was performed by hospital staff and no HIV test results were recorded as part of this research.

Results

Scores on all pre- and post-intervention instruments were analyzed using a series of repeated measures 2 × 2 ANOVAs with emotional content (positive, negative) and onscreen race (African American, White) as factors. Thus, separate repeated measures ANOVAs were conducted to determine changes in: knowledge of HIV testing and prevention (5 items); intent to use a condom during vaginal sex; and intent to use a condom during anal sex. Bonferroni corrected statistically significant increases were noted on three of the five knowledge test questions. Responses to a fourth knowledge test question trended toward significance ($p < .05$), but the increase was not significant after the Bonferroni correction. Significant increases were also noted with regard to condom usage during vaginal sex; see Table 1 for details.

Analyses revealed that after viewing a video segment, participants agreed more strongly than in the pre-test that a male or female condom would protect them from HIV. After viewing a video segment, participants also disagreed more strongly than in the pre-test that they were automatically tested for HIV anytime a doctor tested their blood. Following a video, participants disagreed more strongly than in the pre-test that people feel sick immediately after being infected with HIV. After watching a video participants also disagreed more strongly than in the pre-test that an HIV negative test result would mean they were not infected. (HIV antibody tests detect antibodies to the virus, which can take up to 90 days to develop. As the videos explain, it is possible that even if a person has been exposed to HIV, a test administered within 90 days of exposure could possibly produce a negative result. Therefore, by moving closer to the “strongly disagree” end of the scale, participants moved closer to the correct response to this item.) The only change that did not approach significance was to the question “You can tell from looking at someone if they have HIV/AIDS”: the response after viewing a video segment was only slightly but not significantly higher than the mean pre-test response, which was already fairly high indicating a ceiling effect.

After viewing a video segment, participants indicated greater intent to use a condom during vaginal sex than before they had viewed a video segment. No significant increase was observed in participants’ self reported likelihood of using a condom during anal sex.

Overall, 42.6 percent of participants (n=86) accepted a test at the end of the intervention. Of the 202 patients who took part in this study, 44 had been offered a test when they first arrived in the emergency department, and declined. Thirteen (29.5%) of the 44 patients who initially declined a test accepted one after receiving this study’s intervention (Aronson & Bania, 2011).

A chi-square analysis was conducted to compare the initial responses of participants who were offered an HIV test when they first arrived at the hospital to the responses of participants who were not offered an HIV test until after they watched a video as part of this research. The difference is statistically significant: while 20 percent of participants accepted

a test offered at triage, 42.2 percent of patients who were not offered a test until after they watched a video segment accepted the test, χ^2 (1, 202) = 8.53, p < .01 (Aronson & Bania, 2011).

Repeated measures ANOVAs on the entire sample of 202 participants did not indicate that the videos' emotional content nor onscreen race resulted in a pattern of significant differences in knowledge test score increases or self-reported intent to use a condom. Likewise, a chi-square test performed on the entire sample did not indicate statistically significant differences in HIV test acceptance for these two factors.

Based on a review of relevant literature, a single video was expected to be most effective overall. Because this was not the case, we sorted patient responses by participant race (Black or African American, White, and Latino) and performed an additional series of repeated measures ANOVAs with onscreen race (African American, White) as the between-subjects factors and time (pre- and post-intervention) as the within-subjects factor. This enabled us to separately examine the responses of Black or African American, White, and Latino participants to videos that depicted either a White doctor and patient onscreen, or an African American doctor and patient. In both the condom intent measures and all knowledge test measures except one, the mean increase in scores by African American participants who watched White people onscreen was higher than the mean increase in scores by Black or African American participants who watched African Americans onscreen (Aronson & Bania, 2011). The difference was not always statistically significant, which may be due, at least in part, to the wide variance of scores as well as the small size of each subgroup, but repeated measures ANOVAs on responses of Black or African American participants indicate statistically significant increases in knowledge and self-reported condom intent after watching a video segment, and Time X Treatment interactions as follows (Aronson & Bania, 2011):

1. In response to a question about whether people are automatically tested for HIV anytime a doctor administers a blood test, Black or African American participants who watched a video depicting White people (pre-test *M*=3.92, *SD*=4.5; post-test *M*=4.50, *SD*=1.06) displayed greater knowledge increases than Black or African American participants who watched African Americans onscreen (pre-test *M*=3.86, *SD*=1.53; post-test *M*=3.86, *SD*=1.59), F(1,72) = 4.94, p < .05, partial η^2 = .06;
2. In response to questions about whether a negative test result means a person is not infected with HIV Black or African American participants who watched a video depicting White people (pre-test *M*=2.89, *SD*=1.67; post-test *M*=3.84, *SD*=1.53) displayed greater knowledge increases than Black or African American participants who watched African Americans onscreen (pre-test *M*=3.44, *SD*=1.54; post-test *M*=3.33, *SD*=1.66), F(1, 72) = 8.70, p. < .01, partial η^2 = .108;
3. Black or African American participants who watched a video depicting White people (pre-test *M*=3.72, *SD*=1.62; post-test *M*=4.36, *SD*=1.25) reported a significant increase in intent to use a condom during vaginal sex while Black or African American participants who watched African Americans onscreen (pre-test *M*=3.21, *SD*=1.74; post-test *M*=3.25, *SD*=1.80) reported almost no increase at all F(1, 47) = 4.61, p < .05, partial η^2 = .089

Identical repeated measures performed on the responses of White participants and Latino participants did not reveal a similar pattern of Time x Onscreen Race interactions (Aronson & Bania, 2011).

A chi-square analysis of White participants not offered a test at triage indicates a highly significant relationship between emotional content and decision to test, χ^2 (1, 48) = 6.94, p < .01 (Aronson & Bania, 2011):

- While 45.5 percent (n = 10) of the White participants who were not offered a test at triage and viewed positive content accepted an HIV test at the end of the intervention, only 11.5 percent (n=3) of the White participants who were not offered a test at triage accepted one after watching a video with negative content;
- Identical chi-square analyses of the 34 Latino participants and 52 African American participants not offered a test at triage did not show a statistically significant relationship between emotional content and a participant's decision to test.

Discussion

The chief goal of this research was to integrate the systematic, comparative examination of multiple theory-based designs of video segments into an intervention delivered in high volume clinical environments, such as an urban emergency department. The findings indicate that the videos resulted in general highly significant increases in participants' knowledge of HIV testing and prevention; intent to use a condom during vaginal sex; and increased HIV test acceptance. Results further indicate that the two theory-based factors employed to design the different versions of the videos, emotional content (positive, negative) and onscreen race (African American, White) did not lead to different outcomes overall. When examining results by race, we found that White participants were more likely to agree to an HIV test after viewing positive emotional content; and Black or African American participants showed greater increases in knowledge and condom intent after viewing White people onscreen.

The research design did not address why participants appear to have responded differently by race, and these findings warrant further research. It may be that a more pronounced incongruity between the interventionist and recipient, such as a difference in race, can result in greater perceptions of authority or credibility among specific populations in certain circumstances (Durantini et al., 2006), however, we did not ask participants why they responded as they did. Our most important initial finding may be, in fact, that instead of seeking one most effective theory-based video design, video segments can be optimized for greater effectiveness based on the characteristics of learners. Several follow up studies are under development to better understand how demographic and behavioral characteristics may influence learner response to different theory-based video interventions. These follow-up studies incorporate designs that will better enable us to examine between group differences by treatment and by learner characteristics, such as age and race.

At the same time, this study does not only support the feasibility of our intervention and methodology, but indicates its effectiveness in a truly challenging environment. Working within the constraints of the emergency department setting, a computer-based video intervention enabled us to effectively deliver important educational messages to patients who otherwise may not have been reached.

The finding that 13 of the 44 participants in this study who initially declined an HIV test upon arrival at the hospital accepted one after receiving the intervention is especially encouraging. As described earlier, people often decline an HIV test because they fear a positive result (CDC, 2003). Therefore, developing strategies to reach patients who are reluctant to test has become a priority (Carey et al., 2008). Further, people who decline an HIV test in the emergency department are generally not offered another chance to test

during that hospital visit. It is safe to say that without our intervention these 13 people would most likely not have learned their HIV status as soon as they did.

Conclusion

Applying comparative methodologies commonly used by the learning sciences to research in a high volume healthcare facility enabled us to test the effectiveness of multiple theory-based approaches on both cognitive and behavioral outcomes with populations frequently not reached by educational interventions or academic research. The finding that different population groups appear to respond differently to the same set of educational video segments viewed in the same environment underscores the value of testing multiple videos to develop an evidence-base of effectiveness among different types of learners. Rather than simply asking if a video intervention can be effective in clinical environments, our results suggest the importance of beginning a line of research aimed at determining how characteristics of an intervention, including the race of the people who appear onscreen and the affective response their messages elicit in viewers, among others, can be fine-tuned, and tested, to create the most effective educational video presentations.

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Table 1

Mean Increases In Knowledge, Condom Intent Among All Participants

	Pre		Post			
Item	**Mean**	**SD**	**Mean**	**SD**	**F and *p*- Value**	**Partial η^2**
Any type of condom (male or female) will protect you from HIV	3.12	1.56	4.15	1.29	75.79 F (1, 198) $p < .001$	.28
You are automatically tested for HIV anytime your doctor gives you a blood test	3.98	1.43	4.28	1.31	12.80 F (1, 198) $p < .001$	. 061
When people first get infected with HIV they feel sick right away	4.53	0.97	4.68	0.83	4.80 F (1, 198) $p < .05$	. 024
You can tell from looking at someone if they have HIV/AIDS	4.67	0.84	4.76	0.73	2.13 F (1, 198) $p = .146$	.011
Getting an HIV negative test result means I'm not infected	3.17	1.64	3.82	1.55	27.51 F (1, 198) $p < .001$	. 122
How likely are you to use a condom during vaginal sex?	3.23	1.73	3.55	1.72	13.00, (1, 128) $p < .001$	.092
How likely are you to use a condom during anal sex?	3.12	1.76	3.28	1.75	.569 (1, 21) $p = .459$	. 026