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Testicular Cancer Knowledge among Deaf and Hearing Men

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Introduction

Testicular cancer is the most common cancer among young and middle aged men [1]. Given that survival odds increase with early detection and treatment, increasing men's testicular cancer knowledge can have life-saving consequences [1]. Print and electronic media, provider-patient communications, and even overheard conversations can facilitate the dissemination of testicular cancer information among hearing men; Deaf men experience significant barriers to accessing such mainstream information sources. The capital "D" in "Deaf" is used to signify membership within the community of people in the United States who share a common language (American Sign Language (ASL)) and cultural experiences [2]; the word deaf with a lower case "d" is an audiological term.

Limited access to aurally delivered health information contributes to information gaps that can compromise Deaf people's health status. In addition, print media can be difficult for Deaf people to access because they usually learn English as a second language. As with other individuals who learn English as a second language, Deaf individuals prefer the ease of accessing health information in their primary language, ASL [3]. However, unlike other hearing individuals with limited English language proficiency, Deaf individuals are unable to learn English in the same way because they do not have the benefit of full aural reinforcement of the language [3]. These barriers to accessing vital health information through mainstream resources underscore the need for health education programs that are offered in a more accessible manner to people with hearing challenges.

Health education programs are most effective when cultural and linguistic constructs from the specific focus community are interwoven with the program content. The educational partnership that led this research initiative (Moore's University of California San Diego [UCSD] Cancer Center, Deaf Community Services of San Diego, Inc., Gallaudet University, National Association of the Deaf, and Bovee Productions) worked closely with other Deaf community partners and their members in California and throughout the country to create a series of online cancer education programs in formats deemed optimal for Deaf audiences (<http://cancer.ucsd.edu/deafinfo>).

In this study, Deaf and hearing men's pre-test general cancer and testicular cancer knowledge were compared before and after viewing the same testicular cancer segments of the education video (*Prostate and Testicular Cancer: Know Your Options*). The hypotheses tested were: (1) Deaf men would have significantly lower pre-test knowledge in General,

Testicular, and Total Cancer Knowledge domains compared to hearing men; (2) Deaf and hearing men's General, Testicular, and Total Cancer Knowledge would increase from pre- to post-test (3); these knowledge increases would be equivalent across groups; and (4) Deaf men's post-test scores would equal or exceed hearing men's pre-test scores.

Methods

Procedure

The UCSD Institutional Review Board approved this study in which adult (18 years and older) hearing men whose preferred language was English and Deaf men whose preferred mode of communication was ASL were recruited to participate in a “health education study.” Because testicular cancer is predominantly a disease of younger men, recruitment efforts focused on attracting men between 18 and 40 years of age to the study. Both groups were given a written consent in English and Deaf men were also offered an ASL translation to assure full understanding during the consenting process. The Deaf men were recruited from San Diego, Los Angeles, Oakland, Minneapolis and Washington D.C. because these metropolitan areas all have large Deaf communities. The sample of hearing men was recruited from San Diego and Minneapolis. Recruitment strategies included in-person and emailed person-to-person dissemination, accompanied by IRB-approved flyers. Since we relied on personal and electronic viral messaging to disseminate information about the opportunity to participate in this study, it is not possible to accurately calculate a refusal-to-participate rate for this study.

Development of Testicular Cancer Video in ASL

Through consensus building, the partnership developed a 54-minute, graphically enriched video (*Prostate and Testicular Cancer: Know Your Options*) that features ASL signers explaining how prostate and testicular cancer develop, who is at risk, how the cancers can be diagnosed and treated, and the importance of clinical trials participation. During the development of this video, the research team and community advisors had hypothesized that there were many advantages to combining information about prostate and testicular cancer into a single video. Most importantly, it was anticipated that there would be significant cost savings from putting the common information about both cancers into one video chapter (What is Cancer?), followed by chapters that discussed just the distinguishing characteristics of each cancers (What is Prostate Cancer? What is Testicular Cancer?). Additionally, it was believed that since it is difficult to recruit men to health education programs, there was a clear advantage to being able to teach about the two cancers once the men had agreed to participate. Further, by making the video appropriate for men of all ages, older men would have information to pass on to younger men about testicular cancer and younger men would have information about prostate cancer to pass along to older men. The final advantage was that it would still be possible to focus a training session on one of the two cancers by combining the chapter about general cancer information along with the chapter for the specific cancer. An earlier paper reported the outcomes of using the total training video [4]. In this study, the focus was on evaluating the educational impact of the general and the testicular cancer portions of the video for Deaf and hearing males.

Although ASL is the predominant method of communication within the Deaf community, the partnership recognized that many members of the Deaf community have sufficient English literacy to use open captioning to complement their assimilation of complex signed information, making it culturally appropriate to offer both signed and captioned versions of the script. Hence, open captioning was also included in the video along with a voice over of the ASL script, both of which would make it possible for Deaf people to watch the video with hearing and hard-of-hearing family and friends.

The Present Study

Both hearing and Deaf men provided sociodemographic information, including educational background, ethnicity, and age. They then completed a pre-test knowledge survey on general and testicular cancer information. They next viewed the general and testicular cancer education chapters of the video, and then completed the same knowledge survey immediately after seeing the video. Both the pre- and post-test surveys included a total of 21 cancer knowledge questions regarding General Cancer Knowledge (4 items) and Testicular Cancer Knowledge (17 items). The survey questions are listed in Table 1. Each question on general or testicular cancer was taken from the same survey that had been pilot-tested and also used in the previous study conducted to evaluate the video in its entirety (i.e., with the prostate cancer component included) [4]. Any Deaf man who had participated in the prior study [4] was ineligible to participate in this study. The questions presented to both Deaf and hearing groups were identical except that the Deaf group had the option of seeing a signed version of the survey. The post-test survey also contained questions about their opinions on the video they had just seen. Participants received a complimentary meal during the educational session as appreciation for their participation in the study.

Data Analysis

The data were analyzed using SPSS version 17.0. General (4 questions) and Testicular (17 questions) Cancer Knowledge scores were calculated by summing the number of correct responses for each category. The Total Cancer Knowledge score that was calculated represents the number of correct responses for all 21 questions. The larger number of testicular cancer than general cancer questions created an imbalance in this score that favored a paralleling of the result of the Testicular Cancer Knowledge. Hence, this score is only offered as an alternate way of viewing the outcome data for future researchers who may wish to use only the single combined score as their outcome measure. In all cases, higher scores represent greater knowledge. Independent samples t-tests were conducted to examine pre-test differences in General, Testicular, and Total Cancer Knowledge scores between Deaf and hearing groups. Then, separately for each group, paired samples t-tests were conducted to examine pre-test to post-test differences for the General, Testicular, and Total Cancer Knowledge scores, as well as for each individual survey question. Repeated measures ANOVAs were conducted to determine whether knowledge increases differed between the Deaf and hearing groups for all three knowledge domains. Independent sample t-tests were conducted to compare Deaf men's post-test to hearing men's pre-test General, Testicular, and Total Cancer Knowledge scores.

Results

Sample

The sociodemographic characteristics of the study participants are shown in Table 1. The two groups only significantly differed on education, $\chi^2 = .008$, in that, 23.2% ($n = 19$) of deaf and 14.4% ($n = 13$) of hearing individuals reported high school as their highest level education. Additionally, 36.6% ($n = 30$) of deaf and 54.4% ($n = 49$) of hearing individuals reported some college, and 29.3% ($n = 24$) of deaf and 30% ($n = 27$) of hearing individuals reported that they complete college. Of those who reported completing more than college, 11% ($n = 9$) were deaf and 1.1% ($n = 1$) were hearing. Additionally, 3.5% ($n = 3$) of hearing individuals did not reply.

Hypothesis #1. Pre-test knowledge differences

At pre-test, the Deaf men had significantly less General Cancer knowledge than did hearing men, $t(173) = 4.29$, $p < .001$ (see Table 2). For Testicular Cancer Knowledge, Deaf men had

significantly less knowledge than hearing men had, $t(173) = 3.10, p = .002$. For Total Cancer Knowledge, Deaf men had significantly less cancer knowledge than did hearing men, $t(173) = 4.02, p < .001$. These results support the first hypothesis that Deaf men would have lower pre-test General, Testicular, and Total Cancer Knowledge compared to hearing men.

Hypothesis #2. Pre- to Post-intervention changes in knowledge

Knowledge gains for the three domains between pre-test and post-test were evaluated separately for the Deaf and hearing groups by using paired samples t-tests. For General Cancer Knowledge, Deaf men significantly increased from pre-test to post-test, $t(84) = 3.57, p = .001$, as did hearing men, $t(89) = 4.31, p < .001$. For Testicular Cancer Knowledge, Deaf men significantly increased from pre-test to post-test, $t(84) = 8.69, p < .001$, as did hearing men, $t(89) = 13.20, p < .001$. For Total Cancer Knowledge, Deaf men significantly increased from pre-test to post-test $t(84) = 8.39, p < .001$, as did hearing men $t(89) = 14.22, p < .001$. Percent correct for each question at pre-test and post-test, and significance values for changes in percent correct, are reported separately for Deaf and hearing men in Table 3. These results support the second hypothesis that both Deaf and hearing men would significantly increase their General, Testicular, and Total Cancer Knowledge from pre- to post-test.

Hypotheses #3. Differences in knowledge gains

Differences in the magnitude of knowledge change were evaluated by examining the interaction of group (Deaf or hearing) and time-point (pre- or post-intervention). For General Cancer Knowledge, there was a significant interaction between time-point and hearing status, $F(1, 173) = 28.61, p < .001$, indicating that Deaf men showed a greater mean change in knowledge (M difference = .42) compared to hearing men (M difference = .30). In contrast, for Testicular Cancer Knowledge, there was a significant interaction between time-point and hearing status, $F(1, 173) = 27.41, p < .001$, indicating that hearing men showed a greater mean change in knowledge (M difference = 3.52) compared to Deaf men (M difference = 3.04). For Total Cancer Knowledge, there was a significant interaction between time-point and hearing status, $F(1, 173) = 38.38, p < .001$, indicating that hearing men showed a greater overall mean change in knowledge (M difference = 3.82) compared to Deaf men (M difference = 3.46). These findings do not support the third hypothesis that knowledge gains would be equivalent for Deaf and hearing men.

Hypotheses #4. Pre-test knowledge gap

In order to test whether the pre-test knowledge gap between hearing and Deaf men had been closed, Deaf men's post-test scores were compared to hearing men's pre-test scores. There was no significant difference between post-test Deaf men's and pre-test hearing men's General Cancer Knowledge, $t(173) = .1156, p = .284$. The absence of a statistically significant difference between the Deaf men's post-test scores and the hearing men's pre-test scores demonstrates that the Deaf men's pre-test General Cancer Knowledge gap score was closed. Deaf men's post-test Testicular Cancer Knowledge was significantly greater than hearing men's pre-test Testicular Cancer Knowledge, $t(173) = 5.869, p < .001$, demonstrating that not only had the gap for testicular cancer knowledge been closed, but Deaf men's post-test knowledge now surpassed that of hearing men at pre-test. Deaf men's post-test Total Cancer Knowledge was significantly greater than hearing men's pre-test Total Cancer Knowledge, $t(173) = 8.422, p < .001$, demonstrating that the intervention had helped the Deaf men to gain enough Total Cancer Knowledge to surpass hearing men's pre-test knowledge. These findings support the fourth hypothesis that, following an ASL accessible training program on testicular cancer, Deaf men's post-test scores would equal or exceed hearing men's pre-test scores.

Participant Response to Testicular Cancer Video

Both Deaf (95.2%) and hearing (100%) men reported that the training program gave them useful information. Additionally, both Deaf (78.6%) and hearing (72.2%) men reported that they would be comfortable showing the video to their friends and relatives.

Discussion

Testicular cancer has become an increasingly controllable disease due to advancing medical knowledge [5]. A public that is well informed about testicular cancer is more likely to benefit from such advances. Knowing the early warning signs can help trigger prompt medical attention, enhanced medical decision making, increased survival rates, and better survivorship experiences [1]. Because Deaf men lack access to many sources of information about testicular cancer, a video on testicular cancer was developed in ASL and evaluated to determine whether viewing the video would result in increased knowledge for Deaf, as well as hearing men.

We hypothesized that the barriers Deaf men face to accessing health information and healthcare would result in less general and testicular cancer knowledge at pre-test compared to hearing men. This was a circumstance that could place them at higher risk of suboptimal health outcomes [6, 7].

This study's results confirmed that Deaf men had significantly lower pre-test levels of testicular and general cancer knowledge than hearing men. The study also provided evidence that, with only a single viewing of the video's testicular cancer components, Deaf men's post-test knowledge scores increased significantly, to the level of equaling or exceeding hearing men's pre-test scores, effectively closing the pre-test knowledge gap between the two groups. This finding is in congruence with past studies that demonstrated the educational value of videos presented in ASL for teaching members of the Deaf community about colorectal [8], prostate [9], testicular [10], cervical [11], breast [12], skin [13], and ovarian [14] cancers.

Hearing men showed a greater mean change for testicular cancer and total knowledge cancer domains. It is possible that the hearing men's greater baseline knowledge about testicular cancer enabled them to understand and retain more of the testicular cancer video's information, compared to Deaf men.

The research team created the video with open captioning and voice-over without the distraction/competition of background music (important for enabling people who are heard of hearing to access the spoken script), so that the video could be shared with family, friends, colleagues, and audiences with varying levels of hearing. Thus, this study was also an opportunity to assess the value of ASL videos for men who did not rely upon ASL as their preferred mode of communication. The outcomes showed that hearing men also had significant gains in testicular and general cancer knowledge. Educators can, therefore, use this video in an audience with mixed audiologic characteristics with confidence that it can benefit all participants.

Limitations

These study results were achieved with a relatively small sample drawn from a limited number of geographic areas and without follow-up to assess longer term retention.

Future Directions

Future research should include evaluating the video's value with a larger and more geographically diverse sample, investigating whether a giving Deaf men a second opportunity to view the video will increase their post-video knowledge equivalent to hearing men's post-video viewing knowledge gains, determining the value of the video for participants who are hard of hearing, and assessing retention of the cancer knowledge gains over an extended time period for all three of these scenarios.

Following the evaluation of the video, it was uploaded to the Internet with the intention of facilitating the additional viewing and sharing of the video by members of the Deaf community and with those who seek to increase the Deaf community's cancer literacy (<http://cancer.ucsd.edu/coping/resources-education/deaf-info/Pages/prostate-and-testicular-cancer.aspx>). This video and several others focused on ASL-based cancer education can be found at <http://cancer.ucsd.edu/deafinfo>. Because hearing and Deaf men reported their willingness to share this video with others, and the video was created so it could be used in a train-the-trainers program, future research could evaluate the degree to which the viewers share and promote the sharing of the video and its information through their social networks.

Conclusions

The results of the study confirm that this graphically enriched testicular cancer education video in ASL with English open captioning and voice overlay is an effective strategy for improving testicular and general cancer knowledge for both Deaf and hearing men.

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Table 1

Sample characteristics

Characteristic	Deaf	Hearing
	Number (%)	Number (%)
Participants	85	90
Mean age, years (SD)	25.75 (5.56)	22.70 (3.46)
Race		
African American	3 (3.8)	7 (8.1)
Caucasian	47 (59.5)	42 (48.8)
Hispanic	13 (16.5)	21 (24.4)
Asian/Pacific Islander	9 (11.4)	10 (11.6)
Other	7 (8.9)	5 (5.8)
Did Not Reply	6 (7.1)	4 (4.4)
Education		
High School	19 (23.2)	13 (14.4)
Some College	30 (36.6)	49 (54.4)
Completed College	24 (29.3)	27 (30.0)
More than College	9 (11.0)	1 (1.1)
Did Not Reply	3 (3.5)	0

Table 2

General and Testicular Cancer Knowledge Means at Pre- and Post-test for Deaf and hearing men

Time point	Deaf Mean (SD)	Hearing Mean (SD)
Pre-test		
General	3.05 (0.95)	3.59 (0.73)
Testicular	10.25 (2.50)	11.32 (1.97)
Total	13.30 (3.15)	14.91 (2.10)
Post-test		
General	3.47 (0.81)	3.89 (0.38)
Testicular	13.29 (2.44)	14.84 (1.73)
Total	16.76 (2.79)	18.73 (1.80)

Table 3

Comparison of pre- and post-test percent correct and percent change for individual survey items reported separate for Deaf and hearing men

True/False Question (Correct Answer)	Deaf Pre-test	Deaf Post-test	Deaf Percent Change	<i>p</i>	Hearing Pre-test	Hearing Post-Test	Hearing Percent Change	<i>p</i>
General Cancer Knowledge (1–4): 1. A disease you can catch by kissing other people. (False)	93%	96%	3%	NS	98%	100%	2%	NS
2. A disease where viruses attack your organs. (False)	67%	74%	7%	NS	79%	92%	13%	.002
3. A disease where your cells become mutated and divide uncontrollably. (True)	71%	89%	18%	.001	90%	98%	8%	.007
4. A disease that cannot be cured in any case. (False)	72%	87%	15%	.006	89%	99%	10%	.002
Testicular Cancer Knowledge (5–21): 5. Testicular cancer usually occurs in men 15 to 40 years old. (True)	79%	94%	15%	.001	81%	99%	18%	<.001
6. Older men are more likely to get testicular cancer than younger men. (False)	42%	73%	31%	<.001	57%	93%	36%	<.001
7. If you find a lump on your testes, you have testicular cancer. (False)	51%	43%	–8%	NS	76%	67%	–9%	NS
8. Testicular cancer can be cured. (True)	69%	84%	15%	.004	87%	93%	6%	NS
9. After treatment for testicular cancer, most men can still have children. (True)	61%	91%	30%	<.001	74%	98%	24%	<.001

True/False Question (Correct Answer)	Deaf Pre-test	Deaf Post-test	Deaf Percent Change	<i>p</i>	Hearing Pre-test	Hearing Post-Test	Hearing Percent Change	<i>p</i>
10. Your testicle needs to be removed if you have testicular cancer. (True)	59%	91%	32%	<.001	39%	96%	57%	<.001
11. When testicular cancer is suspected, a biopsy will be recommended. (False)	14%	71%	57%	<.001	17%	66%	49%	<.001
12. If testicular cancer is found in one testicle, the doctor will remove both testicles. (False)	73%	82%	9%	NS	93%	97%	4%	NS
13. Family history increases your risk of getting testicular cancer. (True)	79%	89%	10%	.019	92%	98%	6%	NS
14. Getting older increases your risk of getting testicular cancer. (False)	48%	76%	28%	<.001	43%	90%	47%	<.001
15. Undescended testicle in childhood increases your risk of getting testicular cancer. (True)	30%	62%	32%	<.001	40%	93%	53%	<.001
16. High blood pressure increases your risk of getting testicular cancer. (False)	68%	88%	20%	<.001	63%	95%	32%	<.001
17. Being African American increases your risk of getting testicular cancer. (False)	77%	88%	11%	.041	71%	91%	20%	<.001
18. Watchful waiting is an option for the treatment of testicular cancer. (False)	73%	76%	3%	NS	90%	88%	-2%	NS
19. Radiation is an option for the treatment	42%	34%	-8%	NS	21%	24%	3%	NS

True/False Question (Correct Answer)	Deaf Pre-test	Deaf Post-test	Deaf Percent Change	<i>p</i>	Hearing Pre-test	Hearing Post-Test	Hearing Percent Change	<i>p</i>
of testicular cancer. (False)								
20. Removal of a man's penis is an option for the treatment of testicular cancer. (False)	87%	92%	5%	NS	93%	99%	6%	NS
21. Surgical removal of the testicle that contains the cancer is an option for the treatment of testicular cancer. (True)	70%	83%	13%	.004	98%	99%	1%	NS

The figures listed display the percentage of each group (Deaf and hearing) giving the correct answer both prior to (pre-test) and subsequent to the educational intervention (post-test).