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A Preliminary Study of a Spanish Graphic Novella Targeting Hearing Loss Prevention

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Abstract

Purpose: This preliminary study developed a digital graphic novella targeting hearing protection beliefs of Spanish-speaking agricultural workers. Researchers used pretest–posttest interview surveys to establish if the novella had an immediate influence on the participants' beliefs about noise-induced hearing loss and usage of hearing protection devices.

Method: Researchers developed a digital graphic novella directed to increase knowledge about noise-induced hearing loss and increase the proper use of hearing protection devices. The novella was tailored to meet the specific linguistic and literacy needs of Spanish-speaking agricultural workers. Thirty-one Spanish-speaking farmworkers of Mexican nationality participated. This study included an interview survey with specific questions on noise-induced hearing loss, myths, and hearing protection device usage. A pretest–posttest design was applied to measure the graphic novella's immediate influence on workers.

Results: The posttest scores on Hearing Protection Beliefs statements were significantly better than pretest scores, with a large effect size observed.

Conclusion: Digital media may be an effective way to overcome language and literacy barriers with Spanish-speaking workers when providing health education and prevention efforts.

Noise-induced hearing loss (NIHL) is one of the most common occupational illnesses in the United States (National Institute on Deafness and Other Communication Disorders [NIDCD], 2014). Approximately 15% of Americans between 20–69 years of age (26 million) have hearing loss that

can partially be attributed to exposure to hazardous noise (NIDCD, 2014). The National Institute for Occupational Safety and Health (NIOSH) estimates that annually more than 22 million American workers are exposed to hazardous levels of occupational noise (Murphy & Tak, 2009). Exposure to loud sounds comes from a variety of sources, including household and recreational activities, but even more frequently from occupational exposure. NIHL is a significant problem in the agricultural community due to frequent exposure to loud noises from machinery, equipment, and animals. Repeated exposure to loud sounds for an extended period of time in agricultural settings is substantial and inevitable; it is estimated that noise is a significant occupational hazard for 84% of the agricultural workforce (Lankford & Meinke, 2006; Le Prell, 2011). The cumulative effect of repeated exposure to hazardous agricultural noise ultimately results in disabling NIHL.

Noises that are, on average, greater than 85 dBA are considered hazardous to workers exposed to such noises for 8 or more hours per day, and louder noises (> 100 dBA) are hazardous even for brief exposures of less than 15 min. Agricultural workers are exposed to numerous and frequent noise sources that are hazardous to hearing health. Lankford and Meinke (2006) summarized typical agricultural noise sources to include tractor noise ranging from 74–112 dBA, grain dryer 81–102 dBA, chain saw 77– 102 dBA, and pig squeals 85–115 dBA. Long hours that are required of agricultural workers result in increased risk to developing NIHL. Agricultural workers tend to have significant hearing loss at the higher frequencies (2000–8000 Hz) and have a higher likelihood of NIHL the longer they work in agricultural settings (Lankford & Meinke, 2006).

A number of studies have described NIHL in agricultural workers. Early onset of NIHL is frequent in agricultural workers and has been found in older teens and young adults of farm families (McCullagh, Lusk, & Ronis, 2002). NIHL leads to increased risk for injury related to the inability to detect sounds that indicate danger and also negatively affects quality of life due to communication difficulties and social isolation (Sherman & Chertok, 2014). A study of 150 Spanish-speaking agricultural workers showed that more than half the workers had some degree of disabling hearing loss, especially in the higher frequencies (Rabinowitz, Sircar, Tarabar, Galusha, & Slade, 2005). In the same study, while over 35% of the respondents complained of difficulty in hearing or understanding speech, only 14% of workers reported using hearing protection devices (HPDs).

Spanish speakers represent a growing and substantial proportion of agricultural workers in the Mountain–West region (U.S. Department Health and Human Services, 2013). The limited number of health care

providers and occupational health professionals who speak Spanish has resulted in language barriers to effective worker education (American Speech-Language-Hearing Association, 2015). Wakefield and Meinke (2011) completed a survey of 300 certified occupational hearing conservationists (OHCs) to describe communication strategies between OHCs and Spanish-speaking workers. This study revealed a shortage of bilingual OHCs and that Spanish-speaking workers received less hearing loss prevention education when only English-speaking OHCs were available. This study also pointed to the need for hearing loss prevention resources developed specifically for Spanish-speaking workers, especially resources that could help bridge the language barrier between health care providers and workers.

The Pender Health Promotion Model

The Pender Health Promotion Model (Pender, Murdaugh, & Parsons, 2011) can be applied to the problem of NIHL. The model is based on a holistic view of the patient, including the patient's background, experiences, and situational or environmental factors (for a review, see Pender, Murdaugh, & Parsons, 2011). The Pender Health Model helps explain patient behaviors and provides knowledge that can be used to target interventions that lead to sustainable healthy choices. The model has been applied to the use of hearing protectors in construction and agricultural settings (Lusk et al., 2003; McCullagh et al., 2002). Researchers have found that interpersonal support, beliefs about the benefits of using hearing protection, barriers to hearing protection use, and self-efficacy are significant predictors of hearing protection use. This knowledge can be directly applied to intervention programs targeting specific beliefs and behaviors that will lead to improved safety and health (Fernandez, Bartholomew, & Alterman, 2009).

Because of demographic and cultural influences, it is important to also explore factors influencing hearing protection use in Spanish-speaking workers. Furthermore, research on hearing conservation programs has shown that computer-based, tailored interventions designed for specific communities are more successful than general interventions (e.g., educational pamphlets; Kerr, Savik, Monsen, & Lusk, 2007; Lusk et al., 2003). A study that applied the Pender Health Promotion Model with Spanish-speaking agricultural workers showed that three factors predicted hearing protection usage: (a) beliefs about the benefits of hearing protection use, (b) barriers to the use of HPDs, and (c) self-efficacy in the use of hearing protection (Kerr, Lusk, & Ronis, 2002). Researchers have described

similar findings with Spanish-speaking construction workers (Robertson, Kerr, Garcia, & Halterman, 2007). These findings are important and indicate that tailored hearing protection programs need to be directed at these specific beliefs and behaviors.

One complicating factor in designing health promotion programs for Spanish immigrant populations is that these individuals have varying literacy levels and education levels, ranging from no formal education to some education. Two studies have documented that between 50%–60% of Spanish-speaking immigrants had literacy skills that were too low to comprehend basic health materials presented in print (Barrera-Anderson, Olives, Larsen, & Pereira, 2007; Garbers & Chiasson, 2004). Spanish speakers with low literacy skills need to be specifically targeted with health and safety materials. Furthermore, current trends in consumer patterns of digital and technology usage to obtain health information indicate that Hispanics and Latinos are beginning to rely heavily on digital media over traditional print media for health information (Blumberg & Luke, 2016; Brown, López, & Lopez, 2016; Pew Research Center, 2014).

The current study developed a digital graphic novella intervention that targeted HPD usage, applying a tailored approach for potentially low literacy and high use of technology and digital media observed in this population. This preliminary study also aimed to describe the immediate influence that the digital graphic novella had on Spanish-speaking workers' beliefs about hearing protection use with a questionnaire in a one-group pretest–posttest design study. The following research questions were addressed through this preliminary study: (a) What HPD usage patterns and beliefs were reported by a sample of Spanish-speaking agricultural workers? (b) What immediate influence did a digital graphic novella have on prospective HPD usage patterns and beliefs, as reported by a sample of Spanish-speaking agricultural workers?

Method

Digital Graphic Novella Development

Approach

This preliminary study applied guidelines and recommendations for alternative approaches to effective health communication and followed recommendations for the use of graphic novellas for public health purposes (AMC Cancer Research Center, 2014; Centers for Disease Control

and Prevention, 2014; J. Cauley, personal communication, July, 16, 2014). A graphic novella that included storyboard stills and drawings was developed to deliver critically needed hearing conservation information with Spanish narrations in a digital movie format. The final product, a digital graphic novella, was playable as a movie on wireless devices, computers, or tablets, and accessible and down-loadable through YouTube.

Spanish novella: http://www.youtube.com/watch?v=pBkROHDj2TA

English version: http://www.youtube.com/watch?v=Gxwxr5StBVo

Target Hearing Loss Prevention Concepts

Essential components of a hearing loss prevention program, as mandated by government agencies (e.g., Mine Safety and Health Administration, 1999; NIOSH, 1998; Occupational Safety and Health Administration, 1983), include education on the effects of noise on hearing, proper hearing protector selection, fit, use and care, purpose of audiometric testing, and/or noise control. In addition to the occupational government required hearing loss prevention programs, there have been numerous public education campaigns, such as Dangerous Decibels, Wise Ears, and Listen to Your Buds. Most of these public education campaigns are designed for school-aged children. In recent years, a few of these campaigns have been translated to other languages. A Brazilian version of Dangerous Decibels was recently created and evaluated for the effectiveness of increasing knowledge, attitudes, and behaviors regarding NIHL on school-aged children (Knobel & Lima, 2014). Wise Ears, a program developed in 1999 as a joint effort between NIDCD and NIOSH, provides very basic and broad information regarding the prevention of NIHL that is intended for the general public. Wise Ears has developed many written materials that have been translated into Spanish. Listen to Your Buds is a campaign developed by the American Speech-Language-Hearing Association targeted to educate children ranging from 5 to 10 years of age about safe listening habits when using personal listening devices. Most of the educational campaigns emphasize the same core concepts: the insidious yet preventable hearing damage resulting from noise, techniques for limiting hazardous noise exposure, and the importance of developing habits to protect the ears from NIHL. However, none of these programs were specifically designed for use with Spanish-speaking agricultural workers or Spanish-speaking workers with low literacy levels.

The current study is a preliminary study, but a long-term goal of this line of research was to create an effective tool for educating

Spanish-speaking agricultural workers in the prevention of NIHL. To prevent NIHL, the workers must first be educated on the effects of noise on hearing and learn the preventable measure to be taken. In the absence of integrating education into a personal daily environment, education will be less effective (Berger, 1981). A key focus when educating on the effects of noise includes the psychological effects, which can be achieved through personal narratives or stories. In the context of a story, motivating the worker to prevent NIHL involves using the main characters to make the psychological effects of hearing loss personally relatable and using the agricultural setting to make the education relevant. A review of the literature revealed that myths and perceived barriers hindered the use of HPDs (Kerr et al., 2002; McCullagh, Ronis, & Lusk, 2010; Robertson et al., 2007). Addressing these perceived barriers and debunking the myths were vital components to the graphic novella. For the purposes of this study, the following five major hearing loss prevention components were targeted by the digital graphic novella: (a) education on the effects of noise on hearing, (b) the preventable nature of NIHL, (c) the definition of hazardous noise levels, (d) limiting noise exposure, and (e) debunking of HPD myths.

Story Development

Having identified the key concepts, the primary investigators then developed a story to use in a graphic novella format that effectively presented the concepts in a personal and contextualized way. Although graphic novellas vary, a common approach is the use of a story arc, which includes specific story components. The story components for the current project included (a) an introduction that established the setting and characters, (b) rising action in which problems were identified, solutions were identified, and myths and misconceptions were deconstructed, (c) a climax that emphasized personal implications and applications, and (d) conclusions in which solutions were identified and implemented. The primary investigators, both Spanish-speaking professionals experienced with working with Mexican populations, used these specific story components to develop a script. The initial script was written in English, and then a reverse translation process was applied. The script was translated by professional interpreters from Mexico and reviewed by an external panel that included two native Spanish-speaking residents and two native Spanish-speaking health care professionals, all of whom were of Mexican background.

Storyboard Design

A professional graphic design team was contracted to develop the storyboards to accompany the script of the graphic novella. Photographs of Spanish-speaking and migrant farmworkers, Mexican artwork and comics, and other Mexican graphic media were compiled and discussed by the graphic design team and the investigators. This visual information was used to identify features and styles for the illustrations. Technical illustrations and HPDs were reviewed and discussed, as well as the appropriate use of these HPDs. As a first step, the graphic design team provided black and white sketches for each of the 20 storyboards. The primary investigators gave the graphic design team feedback about both artistic and technical aspects of the storyboards, and then they developed the 20 color storyboards.

Digital Recording of the Graphic Novella

Native Spanish speakers recorded the voices of the two characters in the story. Digital audio recordings were collected by using GarageBand (Apple Inc., Cupertino, California). Camtasia (TechSmith Corporation, Okemos, Michigan), a screencasting program, was then used to synchronize digital storyboards with digital audio recordings. The final product was in MOV or MP4 formats, both of which are movie files that are compatible with iPads (Apple Inc., Cupertino, California), as well as YouTube. The completed digital graphic novella was then reviewed by the professional interpreter and the external panel.

Survey

Survey questions from earlier studies that were designed to quantify hearing protection beliefs and behaviors with Spanish-speaking populations were used (Kerr et al., 2002; Robertson et al., 2007). No specific psychometric properties of these survey questions were reported in earlier studies. Additional questions were added to mirror the specific concepts targeted by the graphic novella. Back translation, an iterative process of repeated independent translation and back translation by a team of translators, was used. Specific wording was adjusted until the desired language and phrasing was obtained. This method ensured that surveys adapted for use with other languages or dialects were indeed conveying the intended content (Behling & Law, 2000). Two native Spanish-speaking

translators from Mexico were contracted for this project to ensure that the dialect of Spanish was appropriate for the participants of the study.

The final survey included basic demographic and health questions, as well as Hearing Protection Usage questions and Hearing Protection Beliefs statements. The Hearing Protection Usage questions gathered information on exposure to noise, availability of HPDs, and usage of HPDs (see Appendix A). Five pretest questions on hearing protection usage and influences, as well as four different posttest questions (including past exposure to noise and prospective hearing protection usage decisions) were asked. These questions were used for descriptive purposes only and were not included in subsequent calculations or analyses.

Appendix B presents the Hearing Protection Beliefs statements, which remained unchanged at pretest and posttest. The 14 Hearing Protection Beliefs statements were mapped onto the constructs that were targeted in the digital graphic novella, including the definition of hazardous noise, effects of noise on hearing, preventable nature of NIHL, limiting noise exposure, and myths about HPD use. The items were put on a 4-point scale (1 = disagree, 4= strongly agree), and some items required reverse scoring (e.g., construct negative items or false items). The possible range of scores for the Hearing Protection Beliefs statements was from 0 to 56. The scores from pretest and posttest were used to calculate gain scores (posttest–pretest).

Participants

Thirty-one Spanish-speaking agricultural workers from the Mountain–West region of the United States participated in the study. **Table 1** presents a summary of basic characteristics of the sample. The sample included 16 women and 15 men, and all identified as of Hispanic and Mexican or Mexican American background. All participants were born in Mexico; two participants received some schooling in English (presumably in the United States on the basis of years of residence in the United States reported). No data on literacy abilities were collected; however, the average number of years of schooling was 7.7 years. Participants spoke Spanish at work and at home more frequently than English, with 28 (90%) of the participants reporting that they spoke Spanish only, both at home and at work. The other participants reported that they spoke some English (up to 40% of the time), either at home or at work.

Table 1. Means, standard deviations, minimum, and maximum values for key demographic variables.

Variable	*M*	*SD*	*Minimum*	*Maximum*
Age	50	14	21	76
% Spanish at work	95	13	60	100
% Spanish at home parents	94	19	60	100
Years of schooling	7.70	3.04	1	12
Number of years living in United States	17.65	13.41	0	60
Number of years working in agriculture	15.74	13.95	0	60

N = 31.

Procedure

The University of Wyoming Institutional Review Board approved this study and its procedures. Several farms and a state department of rural health agreed to assist with participant recruitment. Given the season and the availability of workers, the study took place on a large multisite farm in the Mountain–West region. A Spanish-speaking farm foreman informed workers of the voluntary study in which they could participate. Individuals who indicated interest in the study and who met the selection criteria of being Spanish-speaking were orally presented with the Institutional Review Board–approved informed consent form in Spanish. Participants who wished to participate and met the criteria were included, and no attempt at randomization or other selection criteria was implemented for this preliminary study. Upon giving consent or shortly after, individuals participated in the study during their morning, lunch, or afternoon break. Data collection occurred in a secluded area in a large employee break room at the farm. Survey questions were collected via interview format to circumvent challenges associated with literacy. The researchers, a bilingual speech-language pathologist and a bilingual audiologist, conducted the interviews. Basic demographic and health information was collected, as well as responses to the pretest Hearing Protection Usage questions and the Hearing Protection Beliefs statements prior to the participants watching the graphic novella. These pretest interviews generally took 5–10 min. Participants watched the digital graphic novella on an iPad and listened by using headphones. The investigators asked participants if they would like the volume adjusted higher or lower and also showed them how to turn the volume up or down if they would like to adjust it themselves. Immediately after viewing the graphic novella, participants answered the

four posttest Hearing Protection Usage questions and the Hearing Protection Beliefs statements. This second interview generally took 5–8 min. Participants were given $10 compensation for participation in the study. Participants could discontinue participation at any time; all of the individuals who began participation completed all tasks.

Preliminary Data Analysis

Preliminary data analyses are described below; however, note that these analyses were meant to be a first step in gathering information on how workers responded to the graphic novella, as part of the development of this intervention. Before the graphic novella can be recommended for use with other populations or before this method could be described as effective or ineffective, additional studies with more controls and precautions would need to be implemented. The researchers used a pretest–posttest design for this study. Pretest–posttest designs are widely used in behavioral research to compare groups or to establish change resulting from experimental interventions (Dimitrov & Rumrill, 2003; Smolkowski, 2010). These types of studies use gain scores (posttest–pretest scores) to measure increases in groups. Power was calculated for the proposed analysis with 30 participants using a .05 significance level. The estimated power for analyses, with a large-medium effect size assumed (w = .5), was greater than .90 (Dewberry, 2004). These analyses indicate that a sample size of 30 should be adequate to detect pretest–posttest differences. After the data collection was complete, data were entered into an SPSS file (IBM, Chicago, Illinois) for analysis. Participants' responses to each survey question were coded. As a first step, demographic information and other sample characteristics were reviewed. Next, central tendency coefficients were calculated for pretest measures (HPD usage patterns, influences, and beliefs). Posttest responses were then reviewed for relevant variables. Also, a within-participant design using gain scores was applied with a paired-samples *t* test, comparing hearing beliefs before and after exposure to the digital graphic novella.

Results

Analyses were organized by research questions: (a) What HPD usage patterns and hearing protection beliefs were reported by participants? (b) What immediate influence did the digital graphic novella have on participants?

Pretest Hearing Protection Usage and Hearing Protection Beliefs

Pretest survey responses were reviewed to establish participants' pretest profiles. Responses to the pretest Hearing Protection Usage questions revealed that 58% of the participants indicated that they had been exposed to loud noise at work in the last year, but only 39% reported doing something to protect their hearing, and 39% reported using HPDs. However, 83% of the participants indicated they would use HPDs if their employers provided them. Questions that explored the influences of HPD usage showed that 35% of the participants had access to HPDs at work, and 50% reported they could obtain HPDs someplace close to their work. Over half, 55% of participants, indicated that employers generally provided HPDs.

Next, participant pretest Hearing Protection Beliefs statements were examined. The four constructs that these questions were meant to measure included: effects of noise on hearing, preventable nature of NIHL, limiting noise exposure, and myths about HPD usage. For these items, higher scores reflect better understanding of the given construct. **Table 2** presents the pretest scores for the beliefs scores by the four constructs. Pretest results are summarized as follows. As a group, participants had some awareness of the effects of noise on hearing but did not consistently strongly agree or agree that noise would damage hearing. Participants also generally agreed that NIHL could be prevented. The participants had mixed understanding of the importance of limiting exposure to noise. For example, over a quarter of the sample did not agree with the statement "If you are directly next to a loud noise, you are at a greater risk of hearing loss than if you are further away." Also, participants indicated that they believed many myths related to HPD usage, such as "Using hearing protection interferes with my performance at work."

Table 2. Pretest and posttest Hearing Protection Usage questions.

Question	*Pretest (%)*	*Posttest (%)*
Exposure to loud noise	58	65
Do something to protect hearing	39	100
Use of HPDs	39	97
Use HPDs if free and available at work	83	97

N = 31. HPD = hearing protection devices.

Immediate Influence of the Digital Graphic Novella

Responses to the posttest Hearing Protection Usage questions are presented in Table 2. Several differences from pretest responses were noted in posttest HPD responses. For example, at posttest, 65% of participants indicated they had been exposed to loud noise at work, whereas at pretest, 58% indicated exposure. This may reflect an increased awareness of loud noise. Also, 100% indicated that from now on, they would do something to protect their hearing, with 97% reporting they would use HPDs and 97% indicating that if they were available at work, they would access and use HPDs. Overall, these responses reflect an increase in reported prospective usage of HPD.

Next, posttest Hearing Protection Beliefs statements were examined. **Table 3** presents the central tendency coefficients, as well as the gain scores for these variables. Gain scores were observed for all of the constructs measured. An 18% gain for effects of noise on hearing was observed. For example, at posttest, 90% of participants indicated that they believed that hearing loss can make it more difficult to communicate with family and friends. A 16% gain for the preventable nature of NIHL was observed. At posttest 100% of participants indicated agreement with the statement "If you have any hearing loss, it is equally important to wear hearing protectors so your hearing does not get worse." A 17% gain in limiting noise exposure and a 21% gain for myths about HPD usage were observed in respondents' posttest scores. For example, at posttest, 93% of participants indicated that it was possible to communicate with another person without taking hearing protection out. Overall, Hearing Protection Beliefs scores increased in each of the four areas, with a 16% gain in total scores observed.

Having established the improvement in individual constructs and totals in posttest scores, preliminary analyses for a one-group pretest–posttest within-participant design was completed, comparing Hearing

Table 3. Central tendency coefficients for hearing protection constructs.

Construct	Possible score	Pretest			Posttest			% gain
		M (SD)	Median	Mode	M (SD)	Median	Mode	
Effects of noise on hearing	0–16	11.06 (2.50)	12	12	13.09 (2.55)	14	14	18
Preventable nature of NIHL	0–8	5.90 (1.19)	6	6	6.87 (0.97)	7	6	1
Limiting noise exposure	0–12	8.48 (1.48)	9	9	9.97 (1.47)	10	9	18
HPD myths	0–20	12.55 (1.95)	12	12	15.23 (2.54)	15	14	21

N = 31. NIHL = noise-induced hearing loss; HPD = hearing protection devices.

Protection Beliefs scores before and after exposure to the digital graphic novella. Given the study design and the near normal distribution of total scores, a paired-samples t test was determined to be a parsimonious approach for analyses (Dimitrov & Rumrill, 2003; Gliner, Morgan, & Leech, 2009; Smolkowski, 2010). As **Table 4** presents, posttest scores were significantly higher than pretest scores, $t(30) = 7.95$, $p = < .01$. The group's growth score (posttest score – pretest score) was more than 1 SD of the mean at pretest, which is a general indicator of an intervention's influence for a preliminary pretest–posttest study. The posttest Hearing Protection Beliefs scores were significantly better than pretest scores, with a large effect size observed ($d = 1.26$; Dunlap, Cortina, Vaslow, Burke, 1996).

Discussion

This study was designed to develop and test the immediate influence of a digital graphic novella on overcoming language and literacy barriers that impede the transmission of hearing loss prevention education to Spanish-speaking agricultural workers. The self-reported HPD usage by participants parallel results from earlier studies that document the underuse of HPDs by this population (Rabinowitz et al., 2005). Results from the current study suggest that not only are common HPD myths prevalent among the population but that there is also a general misunderstanding of HPD usage, NIHL, and myths that influence HPD usage. These results point to the need for improved NIHL education with Spanish-speaking farm workers.

Limitations

This study was limited by several factors. First, the small sample and homogeneity of the sample in terms of nationality limit how these results can be generalized to other populations and participants of other

Table 4. Preliminary analyses and paired-samples t test of pretest–posttest of hearing protection beliefs.

Pretest		*Posttest*					
M	*SD*	*M*	*SD*	*N*	*t*	*Degrees of freedom*	*d*
38	4.84	45	6.12	31	7.95*	30	1.26

* $p < .01$

nationalities. Future studies should include larger, more diverse samples, a more robust design that includes random selection of participants, and perhaps a control group. There are limitations to using interview surveys in studies. For example, the pretest Hearing Protection Usage questions yielded an inconsistent finding. It was not clear why if most employers provide HPDs that respondents reported that HPDs are not available at work; it may be because respondents work for multiple employers throughout the year. Additional questions about employment may have helped explain this inconsistency. Also, another drawback to using interview surveys is that participants may have felt obliged to respond in a way that the researchers would view positively. They also may have felt this need to respond positively because they were given $10 for participation. Another drawback to the design of this study is that it did not include follow-up measures to establish if the positive impacts were sustained. Future studies should consider this, expand sample size and diversity, and apply a more robust design. However, this study was a first step at developing and testing a digital graphic novella, and these results should be viewed as preliminary.

Conclusions

This preliminary study demonstrated not only the feasibility of a digital graphic novella but also showed that the digital media may help overcome language barriers between Spanish-speaking workers and professionals who are not bilingual. The current study showed that a digital graphic novella had immediate influences on Spanish-speaking workers' reported beliefs and prospective hearing protection usage. Providing hearing loss prevention education through a digital graphic novella may be an effective way to bridge language barriers by providing critical health information in Spanish.

The literacy level of Spanish-speaking immigrants is a substantial obstacle to health education (Barrera-Anderson et al., 2007). Indeed, the pretest results suggest that individuals from the current sample had not been successfully educated about NIHL or hearing protection usage. Results from this preliminary study suggest that a digital graphic novella may be a means of overcoming literacy barriers.

The overall results of this preliminary study are promising. Results suggest that a digital graphic novella had a positive impact on participants' NIHL and HPD knowledge and prospective use of HPDs. This study showed that beliefs about the preventable nature of hearing loss were

changed for the better. A future study might extend this result by asking whether participants felt they were personally able to prevent their own hearing loss. Future studies should also add a follow-up component and investigate the maintenance of intent to use HPDs.

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Appendix A

Hearing Protection Usage Questions

Pretest

In the last 12 months, have you been exposed to loud noise at work?[a]
When in loud noise, how often do you use hearing protection, such as earplugs or earmuffs?[b]
Hearing protection is made available in my workplace.[b]
I can obtain hearing protection somewhere near where I work.[b]
Generally, my employers provide hearing protection.[b]

Posttest

From now on, will you do something to protect your hearing?[a]
From now on, will you wear hearing protection?[a]
If hearing protectors are made available and free, would you use them?[a]
In the last 12 months, have you been exposed to loud noise at work?[a]

The Hearing Protection Usage questions were used for descriptive purposes.
a. Yes or no.
b. Always, frequently, sometimes, or never.

Appendix B

Hearing Protection Beliefs Statements

Using hearing protection could cause me to miss hearing warning sounds of equipment problems.
Being exposed to noise can make my ears ring or whistle.
Hearing loss can make it more difficult to communicate with family and friends.
Hearing protectors can make it easier to hear alarm sounds and communicate in noise.
Using hearing protection interferes with my performance at work.
Hearing loss can change how social a person is with other people.
If you are directly next to a loud noise, you are at a greater risk of hearing loss than if you are further away.
Hearing loss caused by noise exposure is permanent and irreversible, but it is preventable.
Wearing hearing protection is a nuisance, and it is not worth it.
There are some sounds that are so loud that they can damage your hearing within minutes.
If you have any hearing loss, it is equally important to wear hearing protectors so your hearing does not get worse.
You can communicate with other people without removing your hearing protection.
To avoid hearing loss, it is important to limit the time you are exposed to noise.
A hearing loss can isolate a person in social situations.

Items were on a 4-point scale (1 = disagree, 2 = somewhat disagree, 3 = agree, 4 =strongly agree). Some items required reverse scoring (e.g., construct negative items or false items). The possible range of scores for the Hearing Protection Beliefs statements was 0 to 56.