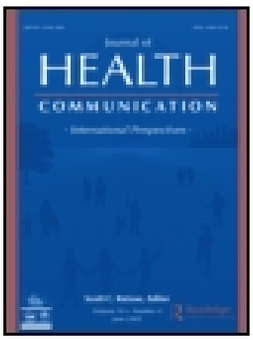

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Understanding Barriers to Preventive Health Actions for Occupational Noise-Induced Hearing Loss

DHAVAL S. PATEL, KIM WITTE, CYNTHIA ZUCKERMAN, LISA MURRAY-JOHNSON

Department of Communication
Michigan State University
East Lansing, Michigan, USA

VICTORIA ORREGO

School of Communication
University of Miami
Miami, Florida, USA

ANDREW M. MAXFIELD, SUZANNE MEADOWS-HOGAN, JULIE TISDALE

Centers for Disease Control and Prevention (CDC)
National Institute for Occupational Safety and Health (NIOSH)
Washington, DC, USA

EDWARD D. THIMONS

Dust and Toxic Substance Control Branch
Pittsburgh Research Lab
National Institute for Occupational Safety and Health (NIOSH)

A theoretically based formative evaluation was conducted with coal miners in the Appalachian Mountains who were at high risk for noise-induced hearing loss (NIHL). The results of four focus groups indicate that despite high levels of knowledge, strong perceived severity of negative consequences, and strong perceived susceptibility to hearing loss, two main categories of barriers (environmental and individual) keep coal miners from using their hearing protection devices (HPD). Further analysis suggests that the environmental factors, rather than individual variables, more

Address correspondence to Dhaval S. Patel, Department of Communication, Michigan State University, Communication Arts and Sciences Building, E. Lansing, MI 48823-1212, USA. E-mail: pateldh1@pilot.msu.edu

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strongly influence decisions against protective actions. Recommendations and practical implications are offered.

Occupational hearing loss in adults is a serious health problem in America (Rekus, 1998; Scheller, 1997). Current estimates indicate that approximately 28 to 33 million Americans experience severely impaired hearing from all causes, which significantly alters the quality of life for these individuals (Batz, 1998; Miller, 1997). In fact, narratives of hearing-impaired patients suggest that hearing loss alters physiological states (increased blood pressure, decreased vision), produces psychological and emotional problems (increased stress, elevated feelings of isolation), and adversely affects speech patterns and daily communication (Miller & Silverman, 1984; Rekus, 1998).

Although the hearing sciences extensively study the medical and social stigmas of hearing loss (Dolan & Maurer, 1996; Jones, 1996; Madigan, 1998), considerable literature also exists on the causes and sources of these problems (Kuhar, 1996; Lusk, Kerr, & Kauffman, 1998). Specifically, exposure to high levels of noise over an extended period of time is a major cause of sensorineural hearing loss. Individuals who consistently are exposed to occupational environments with potentially hazardous levels of noise are susceptible to experiencing hearing loss (Suter, 1994).

Within occupational settings, noise levels are measured in terms of quantity (loudness). The loudness of the sound is measured on the decibel (dBA) scale, from barely audible (10 decibel-whisper) to earsplitting (140 decibel-jet taking off). Under the guidelines of the Occupational Safety and Health Administration (OSHA), employees are at risk of hearing loss if they are exposed without hearing protection to more than 85 decibels averaged over an eight-hour day (Lowey, 2000). However, many industries (i.e., manufacturing, agriculture, transportation, military, construction, and mining) expose individuals to far greater noise levels than OSHA's safe standard. For example, blacksmiths work at 100 dBA, agricultural mowers operate heavy equipment between 95 and 100 dBA, and construction and mining employees handle machinery, which produces sounds from 80 to l20 dBA (Neitzel, Seixas, Camp, & Yost, 1999; Nielsen, 1995). Without using proper hearing protection, individuals employed by these occupations are potentially at risk for NIHL.

Noise-Induced Hearing Loss (NIHL)

NIHL is a distinctive type of loss resulting in the gradual reduction in hearing sensitivity usually beginning in the high-frequency range. In many cases, individuals may be unaware of their slow, progressive hearing loss. Eventually the damage may cause severe impairment (Valoski, 1997). Following acute (short-term) noise exposure, hearing can temporarily diminish but may recover with the removal of the individual from the noisy environment. However, years of high level noise exposure eventually cause permanent, sensory damage and NIHL. As such, NIHL is a chronic health condition for which no medical remedy exists. Fortunately, the routine use of properly selected and fitted HPDs, such as muffs and plugs, can effectively prevent and reduce such damage. Although hearing protection is provided by employers (as mandated by law), employees often fail to utilize safety devices (Davis & Sieber, 1998; Forrest, 1998). The purpose of this study is to understand why coal miners who have access to HPDs fail to use them.

Coal Mining Industry

As early as the 1960s, the National Institute for Occupational Safety and Health (NIOSH) reported a noise exposure study suggesting that working coal miners had substantially poorer general health, including damaged hearing capacity, than the public, which resulted in coal miners facing a serious disability and a compromised quality of life, including hearing loss. Even with this information, efforts to improve the coal miner's hearing ability do not originate until the early l980s. Today, because NIOSH labels NIHL as one of the top 10 work-related diseases and injuries (Centers for Disease Control, 1983) and identifies hearing loss as an irreversible but preventable health problem, NIOSH targets NIHL in the coal mining industry as a starting point for public health interventions.

Since the 1980s, hearing conservation programs (HCPs) have attempted to improve the miner's quality of health by preventing hearing loss. Voluntarily established programs have been created and implemented in the coal mining industry. The objective of HCPs is to prevent permanent hearing impairment as a result of excessive exposure to noise at the workplace (Miller & Silverman, 1984). Previous HCP efforts include, but are not limited to, attempts to enact federal amendments and to adopt new engineering controls that reduce machine noises (Chiusano, Lees, & Breysse, 1995; NIOSH, 1972). However, because past approaches did not involve miners, they had little effect on preventing NIHL within this population. Even as early as 1975, Mass concluded that more than 50% of all HCPs in the United States did or would fail within the next decade (1975–1985). More alarmingly, Royster and Royster (1982) contend that only 10% of HCPs are effective for miners.

To increase the effectiveness of HCPs, public health campaigns targeting the individual miner are now being implemented. One prelude to public health campaigns is formative research, where campaigners learn the target audience's attitudes, beliefs, and behaviors regarding the health issue—in this case, hearing loss in the coal mines. Past research has shown that theoretically guided formative evaluations, coupled with theoretically developed campaign messages, result in effective campaigns because theories "tell us which beliefs to target, what direction the beliefs need to go, and the types of arguments that are most likely to lead to desired beliefs and behaviors" (Witte, 1997, p. 138). Thus, a formative evaluation that discovers theoretically specified beliefs and perceptions can result in theoretically developed messages that target these specific beliefs and perceptions.

Barriers: A Conceptual Understanding

Barriers, or factors that block one from engaging in a certain action, have been identified as a key theoretical variable in many health behavior change theories (Green & Simons-Morton, 1991; Hyman & Sheatsley, 1947). According to the Health Belief Model (HBM), barriers to performing a health behavior must be low, benefits must be high, and individuals must perceive that the health issue is significant and relevant before a health behavior will be adopted (Clark, 1983; Janz & Becker, 1984; Rosenstock, 1974; Sereno & Dunn, 1994). A review of the literature appears to suggest that barriers emerge as the strongest predictor of health-related behaviors (Carmel, 1990/1991; Janz & Becker, 1984; Montgomery et al., 1989). Researchers have found the barriers' dimension of the HBM to be

more consistently associated with behavior change than either perceived severity or vulnerability (Wulfert & Wan, 1995). Because barriers have been shown to be the strongest influence on health-related behaviors, they will be the focus of this study.

Although barriers to action have been studied across a number of health-related issues, such as immunizations, HIV/AIDS prevention, condom use, alcohol/drug abuse, and medical regime adherence (Brien, Thombs, Mahoney, & Wallnau, 1994; Cameron, Witte, Lapinski, & Nayuko, 1996; Choi, Rickman, & Catania, 1994; Janz & Becker, 1984; Jayanti & Burns, 1998; Weinstock, Lindan, Bolan, Kegeles, & Hearst, 1993), no consistent conceptualization or definition of the variable has emerged. Instead, scholars typically only identify what a barrier is by listing examples of barriers (i.e., a barrier is the economic cost of treatment, a barrier is the lack of access to preventive health care, social norms can be barriers, embarrassment is a barrier to action, and so on). Across a multitude of health problems, no single, systematic definition is available, which leads Melnyk (1988) to state with regard to barriers that there is "considerable confusion . . . both theoretically and empirically, which results from a lack of methodological rigor in defining and operationalizing the concept" (p. 196).

In this study, we propose a grounded theory approach to understanding, defining, and explaining barriers. According to grounded theory, researchers approach formative research with no preconceptions (Glaser, 1992, 1999). They ask questions and allow the data to emerge and speak for itself. In this study, four focus groups were conducted with coal miners in the Appalachia region on the issue of barriers (and other health-related constructs not reported in this manuscript). Based on analysis of the focus group transcripts and videotapes, we will generate a definition of barriers and develop a typology of the construct.

Method

Overview

Four focus groups were conducted with coal miners randomly selected from two mines located in Appalachia (two focus groups per mine). Two researchers, a moderator and an observer, conducted the focus group with each session having 7 to 10 participants. Videotapes and audiotapes were transcribed from each session for further analysis. Trained coders analyzed the data, identified themes, developed a coding scheme of barriers, and then coded each barrier independently to assess its fit to the coding scheme.

The Qualitative Approach: Focus Groups

Unlike the quantitative methods of many social science approaches, focus groups were used as the methodology to understand the population's knowledge of attitudes and perceptions about a particular health topic. Because we do not yet have a good and clear definition of barriers, this research method allowed us to gather large amounts of in-depth information on the construct that could not be gathered otherwise with close-ended survey instruments (Krueger, 1988). Because numerous individuals were interviewed in an open-discussion format, the focus group sessions served as formative research to guide the development of future effective public health campaigns.

Focus Group Protocol

An interdisciplinary team of researchers and experts from Michigan State University, the NIOSH, and the United Mine Workers of America (UMWA) developed the focus group protocol, which was based on the Extended Parallel Process Model (Witte, 1992) and the HBM (Janz & Becker, 1984; Rosenstock, 1974). It was pretested for flow, length, and understandability and refined slightly before actual use.

The protocol focused on four key issues. The first section assessed knowledge and perceptions of individual susceptibility and severity of NIHL. The second section attempted to determine the levels of self-efficacy and response efficacy toward recommended responses. The third group of questions assessed whether barriers inhibited the wearing of protective devices, and, if they did, what types of barriers inhibited actions. Finally, the fourth section elicited ideas and suggestions from participants on strategies for developing effective hearing conservation campaigns. For the purposes of this article, we will focus on the third section of the protocol only. The other sections have been reported elsewhere (Murray-Johnson et al., 1999).

Participants

Thirty-two miners volunteered to participate in the focus group sessions. Miners were selected from two mines in Pennsylvania and West Virginia. Participants included 31 males and one female coal miner. The average age of the miners was 37 years, and most workers ($n = 23$) had spent between l5–30 years employed in the coal mining industry. The participants were 97% Caucasian American ($n = 31$) and 3% African American ($n = 1$). All were members of the UMWA, and all said they had experienced some degree of hearing loss already due to working in the mine. Fewer than 10% of the participants mentioned that they regularly wore hearing protection.

Procedure

Each focus group lasted approximately one-and-one-half to two hours. The moderator began the discussion by building rapport and introducing himself or herself. Miners were reminded that their responses would remain anonymous, and their supervisors would not be privy to the information. This statement encouraged truthful responses to questions as the miners gave informed consent. Additionally, participants were told they would be videotaped and audiotaped during the session to ensure accurate transcription for future analysis. The assistant researcher observed and took thorough notes of the session. When the session was over, the participants were thanked, compensated for their time ($25), and told they would be able to receive the results of the project if interested.

Analysis

Typical focus group analytical procedures were followed. The audiotapes were professionally transcribed. A research team of five read through the transcripts several times to gain familiarity with the responses. Further, three of the team members had participated in the focus group sessions themselves, so their observations were discussed. Barrier themes were independently identified by each member of the research team and brought back to the group for discussion. Based on the theme analysis, two major categories of variables were identified, defined, and explicated: environmental barriers and individual barriers. These barrier categories

TABLE 1 Definitional Differences between Environmental and Individual Barriers

Environmental barriers	Individual barriers
Objective reality	Subjective reality
Preexisting conditions	Perceived conditions
Independent of individual's presence	Dependent on individual's presence
Externalization	Cognitive and emotional internalization
Minimal option to gain control	Maximal option to gain control

are hypothesized to be mutually exclusive (meaning they do not overlap) as well as additive in their effects (meaning that individually they produced a negative effect on health-related behaviors and combined they produce an even stronger effect). Table 1 gives an overview of the two kinds of barriers identified in the analyses.

Briefly, the data suggest that *environmental barriers are external realities that act as systemic constraints against behavioral change*. They exist regardless of whether the individual is present in the target environment. The factors are external to the individual, represent the true nature of the reality of the situation, and are not subject to perceptual interpretation. Moreover, environmental barriers typically do not afford the individual the option to control or minimize the external forces. Environmental barriers are preexisting, uncontrollable realities that act as objective constraints against health-related behavioral change.

On the other hand, *individual barriers are internally perceived cues that prevent engagement of healthy actions*. These cues exist and are triggered only after the individual is present in the target environment because he or she is cognitively and emotionally internalizing the environmental realities. The individual does have the option to control his or her own perceptions, which suggests that the individual will be able to successfully overcome the negative cues. In this case, a subjective reality exists for the individual who negatively associates cues that prevent engagement of healthy actions.

Based on these definitions of barriers, a coding scheme was developed, in line with Table 1. Two trained researchers independently coded the transcripts for barriers. Inter-rater reliability was high, with the coders agreeing 86% of the time. An additional reliability check, Cohen's kappa (an inter-rater reliability measure that ranges from -1.00 to $+1.00$ and corrects for chance), was calculated. According to Landis and Koch (1977), ranges of agreement for kappa are as follows: poor = -1.00–.00, slight = .00–.20, fair = .21–.40, moderate = .41–.60, substantial = .61–.80, and almost perfect = .81–1.00. To have an acceptable kappa, a score of .21 or above is needed. In this study, kappa was found to be acceptable at .53, falling in the moderate range of reliability.

Results

Overview

Table 2 gives an overview of how coal miners described and defined barriers to wearing hearing protection and barriers to preventing hearing loss. The consistency across the four focus groups was remarkable, especially given the variation in the two focus group sites.

TABLE 2 Environmental and Individual Barriers with Examples of Coded Statements

Barrier type	Focus group discussion
Environmental	
Economics	
Medical visits are too costly Possibility of job loss or demotion	"Labeled a troublemaker... then you get blacklisted, now you gonna lose your job... which is better—my job or the safety issue."
Medical concerns	
Protection causes ear infections and headaches	"You have ear infections, you know... and it happened to me a few times."
Technology	
Protection devices are too bulky Protection devices are too uncomfortable	"They were like real bulky and heavy."
Federal regulations	
No mandatory laws exist Management does not enforce or use protection regularly	"It's never going to be mandatory for us to wear."
Organizational structure of work groups	
Functional and interactional working relationships demand hearing ability.	"It's hard to carry on a conversation... hear orders to be able to work together."
Individual	
Perceived hearing ability	
Protection limits my hearing Protection makes it hard to hear	"I didn't wear 'em so that I could hear better my crew and the roof talk."
Emotional experience	
Fear, isolation, frustration	"I was always afraid that protection would isolate me from my team who depends on me."
Perceived subjective norms	
Perceptions of nonhabitual use is the accepted norm	"Most guys on my crew don't wear 'em... at all... they never started young... because workers rely on each other... bosses never wear 'em... so the guys don't wear 'em."

Background

All workers ($n = 27$) who had been in the mines five years or longer stated that they suffered some form of hearing loss. Younger miners were highly aware of NIHL and its effects on coworkers. All participants appeared knowledgeable about hearing loss and HPDs (for detailed description, see Murray-Johnson et al., 1999).

Environmental Barriers

Using our grounded theory definition of environmental barriers (i.e., *environmental barriers are external realities that act as systemic constraints against behavioral change: they occur outside of the miner's body or mind*), we found five distinct types of environmental barriers that emerged in the focus group discussions: economics, medical concerns, federal regulation, technology, and organizational structure of work group. Table 2 identifies the type of environmental barrier, gives examples of it, and provides a quote from one of the focus groups. Each environmental barrier is discussed below.

First, the miners mentioned that economic issues played a crucial role in their decision to not protect their hearing. Mainly, they were concerned about the possibility of job loss or demotion because they felt that if they complained about not being able to hear, then they might be demoted to a less desirable position or fired for safety reasons. Also, they worried that if they complained about available protective devices, they might be labeled a troublemaker and laid off, passed over for advances, or passed over for overtime. A few worried about the economic cost of wearing earplugs (as opposed to earmuffs), because their use often caused infections (see next paragraph), resulting in doctor's visits that they could not afford. (The doctor visits were expensive because the miners would have to take time off from work.)

Second, miners reported that medical issues prevented them from using hearing protection. When miners wore earplugs (instead of earmuffs), dust was often trapped in the outer ear, causing severe pain and outer ear infections. By simply not using the plugs, miners claimed that they alleviated the possibility of future occurrences of ear infections and pain. Because dirt/dust was an uncontrollable, environmental reality, medical issues acted as barriers against consistent HPD use.

Third, a lack of enforced federal regulations often was cited as a significant reason why miners failed to protect themselves. Many miners said they did not use protection because there were no laws that mandated the consistent use of HPDs. Unfortunately, this deficiency created an environment where foremen or supervisors enforced safety regulations regarding eyewear, heavy gloves, and proper footwear, but nothing in relation to hearing. Many miners suggested that the only way to get somebody to do something was to make a law about it. Otherwise, if they did not have to do it, they would not.

Fourth, the results indicated that miners felt that HPDs themselves were uncomfortable, bulky, heavy, and restrictive. They called for improvements in the design of hearing protection muffs that facilitated their long-term use. Over a 10-hour day, many miners claimed that it was physically difficult to tolerate the hearing muffs; thus, they avoided using them.

Fifth, the work group was identified as a significant barrier to wearing protection. Specifically, the miners stated that they had developed a system, over the years, of efficiently working with crews and machinery to fulfill their tasks. Any changes to this system were seen as detrimental to their overall quality of work life. Because wearing hearing protection would necessitate a change in work habits (because they would have to use hand signals instead of their voice), they were reluctant to wear protection.

These five types of environmental barriers were identified as such because they occurred *outside* of the miner, meaning that she or he did not have control over the factors that caused them to not wear protection. Of course, one could always argue

that the miners have control over their actions. However, these environmentally related barriers stemmed from things the miners did not have control over, such as dust, dirt, costs, quality of ear protection, laws, or structure of the mine or work groups; therefore, these barriers fall under the category of environmental barriers.

Individual Barriers

Using our grounded theory definition of individual barriers (i.e., *internally perceived cues that prevent engagement of healthy actions: they are perceptions, subjective realities*), we found three distinct types of individual barriers that emerged in the focus group discussions: perceived hearing ability, emotional experience, and perceived subjective norms. Table 2 identifies the type of individual barrier, gives examples of it, and provides sample quotes from one of the focus groups. Interestingly, although the barriers were identified as individual because they originated from the internal cognitive and emotional processing of perceptions, miners continued to blame environmental constraints as causing their individual perceptions. Each individual barrier is discussed below.

First, the perceived loss of hearing ability was a commonly cited factor for why miners failed to wear protection. Most miners believed that when they wore hearing protection, they would not be able to hear important sounds, such as verbal commands from colleagues or machinery gone awry. Miners said they needed to hear what was going on in the mine and could not afford to muffle their hearing. They were most concerned about listening for "roof talk," which is the sound of the tunnel settling. If the roof begins to talk loudly (walls crack and collapse), miners need to evacuate immediately or they may be injured or die. Ironically, miners who suffer hearing loss (as most do) cannot hear the roof talk any better than miners who wear hearing protection. However, the myth remains strong that one cannot wear protection because one has to be able to hear the roof talk. Interestingly, the few miners who reported wearing hearing protection noted that they could still hear verbal orders and the roof talk through muffs. However, the vast majority of miners refused to wear hearing protection for fear of filtering out all sounds.

Second, miners' perceived emotional experience of wearing hearing protection prevented many miners from doing so. Many miners feared that if they wore protection, they would experience negative emotions such as pain, fear, loneliness, and isolation. They suggested that protection prevented hearing so significantly that the miners would feel isolated from their coworkers. Interestingly, this barrier was voiced only by those who did not regularly wear hearing protection. Those who consistently used hearing protection said they could still hear what their colleagues said and did not feel isolated.

The third and final individual barrier was perceived social norms regarding hearing protection. Although their opinion was rarely voiced, some miners suggested that a lack of a hearing protection norm prevented many from wearing protection. They made these claims more from a habit than from an influence point of view. Specifically, the miners said that when they began working at the mine they engaged in the same safety practices as other miners did (e.g., eyewear, gloves, wearing breathing kits, and so on). If others did not engage in certain safety practices (like wearing hearing protection), neither did they. They suggested that if newcomers observed everyone wearing hearing protection on their first week on the job, then these newcomers would be likely to get into the habit of wearing hearing protection. But now, the miners claimed, it was too late as their habits were already formed from

their 15–30 years in the mine. They all recommended establishing new normative environments for new workers.

These results indicated that these three types of individual barriers existed in the miner's subjective or perceptual reality. If campaigns can change this internal reality, then perhaps hearing protection would be adopted.

Discussion

Overview

This study suggests that barriers act as strong hindrances to the use of hearing protection devices for Appalachian coal miners. The results of the focus groups show that barriers have to be eliminated first, before other theoretical variables (i.e., self-efficacy, response efficacy, susceptibility, and severity) can be addressed in a campaign because, barriers tend to prevent miners from even considering the use of protective devices.

Specific Recommendations

Two main categories of barriers with respect to hearing loss and coal miners were identified and defined in this study: (a) environmental barriers, or barriers that occurred outside the miners; and (b) individual barriers, or barriers that occurred because of the miners' subjective reality or perception of events or both. Specifically, this study identified five specific types of environmental barriers (i.e., economics, medical concerns, federal regulation, technology, and organizational structure of work group) and three specific types of individual barriers (i.e., perceived hearing ability, emotional experience, and perceived subjective norms).

First, future researchers should consider using the external/internal barriers perspective, in combination with other theories, because it may provide greater understanding to what specifically blocks preventive action in occupational environments. Although other frameworks (i.e., HBM, Diffusion of Innovations, Theory of Reasoned Action, Stages of Change) do consider a number of factors, mechanisms, and motivating influences on health behavior, they may not have been created or are not able to provide specific information on different external and internal barriers. Generally, other conceptualizations group barriers collectively into a single variable or factor, and, as a result, they are not independently examined by campaigns. However, the external/internal classification allows scholars and practitioners to identify which barriers more significantly hinder action and need to be addressed more critically. For example, in this study, the external/internal approach points to economic issues (i.e., perceived loss of income or job) and medical concerns (i.e., ear infections and pain) as the strongest environmental inhibitors of protective action. In terms of individual barriers, the perceived loss of hearing ability and negative emotional experiences appeared to be the biggest blocks to the use of hearing protection. Overall, the internal/external approach may be an excellent method of classifying precisely the environmental realities and individual perceptions.

Second, health communication interventions aiming to effectively promote hearing protection among miners should address both the external and internal barriers with a special emphasis on the four barriers listed above. If a campaign has limited resources, targeting external factors may be more valuable at motivating protective behavior because coal miners report more external than internal barriers.

However, because barriers are significant determinants of behavior, communication messages should be designed that show how the external and internal barriers can be overcome, eliminated, or exposed as myth. By using individuals who are similar to the coal miners, interventions may be able to change attitudes, beliefs, and myths about certain barriers while increasing effectiveness as well.

Third, future program interventions should consider overcoming the existence of a form of the fundamental attribution error (Lee & Nisbett, 1991; Wyer & Carlston, 1979) that emerged in this study and that may develop in other occupational settings as well. Miners tended to blame all of the problems associated with wearing hearing protection to outside forces, not to internal drives or perceptions. For example, throughout the focus groups, miners gave themselves credit for the good things that happened regarding safety, but they blamed uncontrollable outside forces for the bad things that happened to them, such as losing their hearing, which they felt was an unavoidable side effect of being a miner. Even for the individual barriers, which were defined as *internal perceptions* regarding hearing protection, the miners still blamed outside environmental factors for preventing them from wearing protection. For example, they said that the reason they could not wear protection was because the roof might talk (collapse), and if they wore protection, they would not be able to hear the roof talk and save themselves. Thus, the outside force—the roof talk—was responsible for them not wearing protection, even though their *perception* that hearing would be completely blocked with protection (an *internal perception*) was inaccurate. Effective campaigns should address this form of fundamental attribution error by pointing out myths and misperceptions and promoting individual responsibility among miners for their own health and safety.

Finally, preventive health interventions can consider motivating the coal miner through a secondary target audience. Because most of the eight categories of barriers in this study involved another person (i.e., doctor, spouse, management, coworker, manufacturer), future interventions may be able to encourage other individuals to communicate interpersonally with the primary target audience (coal miners) to change attitudes, beliefs, and myths about the barriers in order to motivate preventive action. Because a fundamental attribution error (external blame) exists, channeling persuasive health messages through the secondary audience who is also external to the miner may prove to be an effective process.

Limitations

Although this study provides valuable insights and recommendations for future campaigns, a few limitations must be mentioned. First, the findings from this qualitative investigation should not be overly generalized to all occupational environments. Although individuals in other industries (i.e., construction, engineering, metal fabrication, aviation) may be at risk or suffer from occupational hearing loss, public, health communicators cannot assume that persons working in settings other than mining claim the same barriers cited in this study. New interventions should consider conducting their own formative evaluation to help determine the specificity and the strength of barriers within a certain occupation. Second, this study's methodology limits the researchers' ability to draw more conclusions through certain types of analysis. Because the focus group protocol was designed to elicit responses about a number of health issues (i.e., threat, attitudes, efficacy, norms, and so on), each focus group session contains only a brief discussion on barriers specifically. Because of an overall low number of responses about barriers, quantification

(i.e., percentages, correlations, trends) of this study's qualitative data is not significantly meaningful or valuable to future health campaigns. Although this study did conduct four focus groups, health promotion programs may consider creating methods and protocols that allow researchers more time for responses specifically about barriers. Eventually greater data specifically about external and internal barriers could allow substantive quantitative analysis, which would supplement qualitative findings.

Conclusion

In summary, this study offers advice on eight specific barriers to address in hearing conservation campaigns targeted toward Appalachian coal miners. This formative evaluation also offered theoretical suggestions by defining two main categories of variables and by identifying the potential role of fundamental attribution error in the rationalization of perceived barriers. Future research should further examine these issues.

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