FACTORs RELATED TO MEXICAN AMERICAN WORKERS' USE OF HEARING PROTECTION

by

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CHAPTER I
INTRODUCTION

Background and Significance

Use of personal hearing protection equipment is a worker's only defense against noise-induced hearing loss once engineering controls have been exhausted. Yet many workers do not regularly wear hearing protection when they are exposed to noise. It is estimated that 14 million workers in the U.S. are exposed to hazardous noise (OSHA, 1980). According to Healthy People 2000 (USDHHS, 1990), approximately 10 million Americans suffer hearing impairments associated with noise, either occupational or recreational. Work-related hearing loss can be prevented because occupational deafness can be traced to a single causative agent, noise (NIOSH, 1986).

The worker population of interest to this researcher is Mexican Americans1, the largest Hispanic subgroup living in the United States. Mexican Americans comprise 13.5 of the 22.4 million Hispanics in the U.S., according to the 1990 Census (U.S.D.C., 1992). Hispanics are termed the "emergent majority" by one Hispanic public health activist (Hayes-Bautista, 1993). They are the second largest ethnic/racial minority in the United States and the fastest growing. Estimates based on the current level of immigration and fertility indicate that by the year 2020 Hispanics will number 47 million and comprise 15 percent of the population (Davis, Haub & Willette, 1988). A corresponding growth in the

1For the purpose of this study, Mexican Americans are defined as residents of the United States who are of Mexican birth or ancestry.
Hispanic labor force is expected to increase the Hispanic share of the labor force to 10.2% by the year 2000 (Knouse, Rosenfeld and Culbertson, 1992). Significant numbers of Mexican Americans work in areas where they are exposed to noise: Mexican American men work primarily as operators, fabricators and laborers (28.1%) and in precision production, crafts and repair (20.5%) and 13.6% of the Mexican American women in the labor force work as assemblers and machine operators (U.S. Dept. of Labor, 1991).

Lee, Carlson, Lee et al. (1991), analyzed data from the Hispanic Health and Nutrition Examination Survey of 1982-1984 (HHANES) to identify the prevalence of hearing loss among Hispanic subgroups. They determined that hearing loss (>25 db pure tone average, age adjusted) is prevalent among Mexican Americans aged 20 to 74, 10.9% for women and 15.8% for men. Compared with the other Hispanic subgroups of the HHANES, Mexican Americans were like Cuban Americans in prevalence of hearing loss and the trend of increasing hearing loss by age group. However, prevalence of hearing loss was remarkably lower in Puerto Ricans, possibly due to protective genetic characteristics or less lifetime exposure to damaging levels of noise (Lee et al., 1991).

Direct comparisons of Mexican Americans with the general population prevalence in the Health and Nutrition Examination Survey of 1971-1975 (HANES) are not possible due to measurement differences; for example, the HANES reported a prevalence of hearing loss (> 21 db, not age adjusted) at 500 Hertz of 13.8% for women and 10.7% for men (DHEW, 1980). Neither of the surveys (HANES or HHANES) estimates the proportion of hearing loss that could be noise-induced. In summary, Mexican American workers are at risk for noise-induced hearing loss, a condition that is preventable with the practice of a health behavior, wearing hearing protection when exposed to noise.

The current study builds on a program of research by Lusk and colleagues who found that components of the Health Promotion Model (Lusk & Kelemen, 1993) and the entire model (Lusk, Ronis, Kerr & Atwood, 1994) were useful in predicting and understanding the use of hearing protection among primarily non-Hispanic White factory
workers. These predictors have provided the focus and content for a hearing protection training program (Lusk, Ronis & Kerr, 1993). The current study is an important precursor to an intervention targeting Mexican American workers because Mexican American cultural, socio-economic or other background factors may affect the relative influence of Health Promotion Model factors.

**Research Purpose**

Occupational health professionals need an understanding of the factors influencing the use of hearing protection among Mexican American workers in order to develop more effective programs to increase the use of hearing protection. To date, no studies have examined such factors among Mexican American or other Hispanic workers. Therefore, the purpose of this study is to identify factors that influence the use of hearing protection among Mexican American workers.

The specific aims of the study are to:

1. Describe the use of hearing protection for a sample of Mexican American workers.
2. Describe the cognitive-perceptual and modifying factors from the Health Promotion Model for a sample of Mexican American workers.
3. Identify components of the Health Promotion Model (Pender, 1987) most strongly related to use of hearing protection among Mexican American workers.
4. Examine the validity of the the instruments measuring the theoretical constructs for a sample of Mexican American workers.
5. Derive patterns and themes from focus group data in order to verify and add to the concepts in the theoretical model by using methodological triangulation.

**Theoretical Framework**

The theoretical framework for this study is a model derived from the Health Promotion Model (Pender, 1987), as used in Dr. Sally L. Lusk's NIH-funded grant Nursing Model to
Figure 1.1 Theoretical Model

MODIFYING FACTORS

COGNITIVE-PERCEPTUAL FACTORS

USE OF HEARING PROTECTION

Perceived control of health
Perceived self-efficacy in the use of hearing protection
Definition of health
Perceived health status
Perceived benefits of use of hearing protection
Perceived barriers to use of hearing protection

Likelihood of using hearing protection

Demographic characteristics
Interpersonal influences on use of hearing protection
Situational influences on use of hearing protection

Prevent Noise-Induced Hearing Loss (Figure 1.1) (Lusk, 1988). Recently the issue of cultural appropriateness of research theories was raised in the Surgeon General’s National Hispanic/Latino Health Initiative (USDHHS, 1993) and the group of over 200 Hispanic leaders recommended studying the applicability of existing constructs and theories to the Hispanic/Latino population. The relevance of the Health Promotion Model to Mexican American workers is unknown; therefore in the current study, the validity of the instruments measuring the theoretical constructs and the cultural relevance of the theoretical model will be threads woven through the specific aims, design and results.
CHAPTER II
REVIEW OF THE LITERATURE

This section reviews the theoretical and research literature related to the determinants of a specific health behavior among Mexican American workers, the use of hearing protection. First, a description of Hispanic ethnicity and acculturation will provide a background for the literature reviewed. Second, the Health Promotion Model (Pender, 1982, 1987) will be described. Third, the author will critically review the literature on determinants of Hispanic health behavior from the Health Promotion Model. Following a definition and a review of relevant articles for each concept, results will be summarized and critiqued.

Hispanic Ethnicity and Acculturation

"Hispanic" is a relatively recent label given by the United States Office of Management and Budget (OMB) to "a person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race" (Federal Register, 1978, p. 19269). Confusion over the definition of the term Hispanic and the resulting operational definitions used in research has lead to controversy over this ethnic identifier, but as yet there is no agreement by scholars on a clearer term and definition (Hayes-Bautista, 1980). For the purposes of this review of the literature, Hispanics residing in the fifty United States will be referred to by the commonly used subgroup names which reflect their national (e.g. Mexican American, Cuban American, Puerto Rican) or regional (e.g. Central American, South American) origin (personal or ancestral).
Hispanic ethnicity goes beyond race and national origin to denote a group of important cultural values shared by a group of individuals. It is these cultural values that help Hispanics self-identify as members of one ethnic group despite their diversity. The following cultural values are shared by most Hispanics independent of national origin, birthplace, dominant language, or any other demographic characteristics (Marin & Marin, 1991):

- **Allocentrism (collectivism):** a cultural trait associated with the preference for interpersonal relationships in ingroups that are nurturing, loving, intimate and respectful.
- **"Simpatia":** a Hispanic cultural script that emphasizes the need for promoting and maintaining harmonious and pleasant interpersonal relationships.
- **Familialism:** a key Hispanic cultural value that emphasizes the importance of the family in the individual's life, including strong feelings of loyalty, reciprocity, and solidarity among members of the family unit.
- **"Respeto":** a construct from high power-distance cultures, addresses the need to maintain one's own integrity and that of others. Power-distance is defined as "a measure of interpersonal power or influence that exists between two individuals and it implies a society's support of power differentials (Marin & Marin, 1991).
- **"Machismo":** a Hispanic gender role behavior, refers to the assumed cultural expectation for men to be strong, in control, and the providers for their families.

Cultural values are important characteristics for researchers to examine when formulating research questions, planning data collection methods, and analyzing study results (Marin & Marin, 1991).

Although Hispanics are alike with respect to certain cultural values, they are heterogeneous in other respects. Ancestry and acculturation are two important ways to differentiate among subgroups of Hispanics in the United States. Ancestry refers to
personal or ancestral national (or regional) origin, e.g. Mexican, Puerto Rican, Cuban, Central or South American. Demographic and socioeconomic differences by ancestry have been identified by the Current Population Survey (1989) as cited by Knouse, Rosenfeld and Culbertson (1992). Labor force participation rates in the United States vary by ancestral origin; Central or South Americans (73.5%), Mexican Americans (67.8%), Cuban Americans (62.3%) and Puerto Ricans (54.2%). Educational levels vary for Hispanic males 25 years and over; 55.6% of Mexican Americans have a high school diploma, compared to 74.7% of Cuban Americans, 74% of Puerto Ricans and 70% of Central or South Americans.

Acculturation refers to a process of learning and behavioral adaptation to a new culture as individuals are exposed to that culture. Although there is general agreement on the definition, there are differing ideas about the process and outcomes of acculturation (Marin & Marin, 1991). Berry (1980) suggests that upon contact with a new culture, individuals undergo a process of change in language use, attitudes, and any of several other areas such as cognitive style or identity. For example, in the area of attitudes, Berry describes a two-dimensional framework of acculturation in which one can identify strongly or weakly with both the majority group and the ethnic group. Strong identification with both groups indicates integration, identification with neither group shows marginality, an exclusive identification with the majority culture indicates assimilation, and an exclusive identification with the ethnic group indicates separation. Similarly, in terms of language use, Hispanics may adopt English, become bilingual, or maintain Spanish as their primary language (Marin & Marin, 1991). Since language use and preference is one of the most easily measured changes produced by acculturation, it has been widely used as an index of acculturation level. In the current study, acculturation is an important variable to consider because of its potential effect on the Mexican American workers' attitudes and behavior (Marin & Marin, 1991).
Health Promotion Model

The Health Promotion Model as adapted by Lusk (1988) is the theoretical framework for this study and for the literature review on the factors influencing health behavior of Mexican Americans and other Hispanics. Derived from social cognitive theory (Bandura, 1986), the Health Promotion Model (HPM) (Pender, 1982, 1987) is a useful middle-range theory with wide boundaries. Pender proposed the HPM as a complementary counterpart to existing models such as the Health Belief Model that explained health-protecting behavior but were inadequate to explain health-promoting behavior. The theoretical framework includes three major components as noted in Figure 1; cognitive-perceptual factors, modifying factors and likelihood of using hearing protection. In the HPM, modifying factors affect the cognitive-perceptual factors which directly influence the health behavior (Pender, 1982, 1987). Cognitive-perceptual factors are described as the "primary motivational mechanisms for acquisition and maintenance of health-promoting behaviors". In the HPM modifying factors such as demographic factors (e.g. ethnicity) and interpersonal influences are proposed as indirect influences on health behavior exerting their influence through the cognitive-perceptual factors that directly affect behavior. Using this definition, Hispanic cultural factors such as familialism and "respeto" may be important aspects of interpersonal influences in the HPM modifying factors. In this study, the concept of acculturation will be included as an additional demographic factor, as Padilla & Lindholm (1983) recommend for any psychobehavioral research with Hispanics.

Pender's model was designed to explain health-promoting behavior defined as behavior “directed toward increasing the level of well-being and self-actualization....”. In contrast, health-protecting behavior is “directed toward decreasing the probability of experiencing illness by active protection of the body against pathological stressors or detection of illness in the asymptomatic stage” (Pender, 1987, p. 57). In the current study, use of hearing protection is clearly a health-protecting behavior using Pender's definitions.
However, a rationale for using the HPM as a theoretical framework for explaining a health-protective behavior are outlined in the following paragraph.

Lusk and colleagues (Lusk, Ronis, Kerr, & Atwood, 1994) gave two reasons for using the HPM to explain use of hearing protection, a health-protective behavior. First, health-promoting and injury protection behaviors are similar in duration and source of control. That is, use of hearing protection is controlled by the individual and requires continuous individual action, similar to behaviors viewed as health-promoting, such as exercise and nutrition. Second, studies have documented significant relationships between variables unique to the HPM and behaviors which prevent disease or disability, pointing to the potential usefulness of the HPM in predicting health-protecting behavior as well as the health-promoting behavior for which it was designed. For example, perceived internal control was related to use of seat belts (Langlie, 1977), and perceived self-efficacy was related to smoking reduction (Blittner, Goldberg & Merbaum, 1978; Strecher, Becker, Kirscht, Eraker & Graham-Tomasi, 1985).

Furthermore, the study by Lusk et al. (1994) found that the HPM provided an excellent fit for the data, (Chi²/df=1.53; normed fit index .94; non-normed fit index .96; comparative fit index .98). The model accounted for 49.3% of the variance in use of hearing protection. The analysis suggested use of hearing protection was increased by low perceived health competence, high self-efficacy, high value of use, and low perceived barriers. White collar workers and those with more education had higher health competence and were less likely to use hearing protection. Older workers used hearing protection less than younger workers. Gender had a small indirect effect on use, indicating women were slightly more likely than men to use hearing protection. Situational influences had positive or negative effects on use, depending upon the mediating cognitive-perceptual factor. Thus, the current study will further assess the usefulness of Pender's model in predicting a health-protecting behavior by Mexican Americans.
According to Lusk et al (1994), their work added to three other studies that provided tests of the HPM using a causal modeling approach. Two of the studies examined general health-promoting lifestyle and one examined a specific behavior, exercise. Johnson, Ratner, Bottorff and Hayduk (1993) selected items from the National Survey of Personal Health Practices and Consequences (NSPHPC) 1979-80 (National Center for Health Statistics, 1984) to test a causal model based on the HPM. They selected two modifying factors, demographic characteristics and biologic characteristics, to assess whether they indirectly affected lifestyle through three mediating cognitive-perceptual factors, perceived control of health, perceived self-efficacy, and perceived health status. Modifications of several constraints in the model resulted in an adequate fit of the model to the data, but little of the variance in health-promoting behavior was explained.

Pender, Walker, Frank-Stromborg, and Sechrist, (1990) selected only those components of the HPM measured across four samples of volunteer participants (working adults [full-time clerical, operations and managerial employees who were enrolled in a worksite fitness program], older adults, cardiac rehabilitation clients, and cancer clients) for inclusion in structural equation modeling (LISREL) with health-promoting lifestyle. In addition, several paths were eliminated as the model was refined using path analysis. Variables with significant paths included three cognitive perceptual factors, perceived control of health, perceived health status, and definition of health, and four demographic characteristics, age, gender, family income, and education. As an example of the reported fit indices, the adjusted goodness of fit ranged from .862 to .882 in the four samples and the variance accounted for ranged from 17.6% to 29.4%.

Pender, Walker, Frank-Stromborg, and Sechrist, (1990) also used structural equation modeling to explore the direct and indirect effects of selected HPM variables on exercise behavior (those measured in all four groups and significant in the multiple regression analysis in at least one group). The variables evaluated were (a) five cognitive/perceptual factors: health locus of control (internal), definition of health
Perceived Control of Health

Locus of control had its origins as an element in Rotter's social learning theory and the concept has received considerable attention as a determinant of health behavior (Wallston, 1992). Health locus of control was conceptualized in order to increase the
predictive ability of the locus of control concept for health-related behaviors (Wallston, Wallston, Kaplan & Maides, 1976). In later development, the locus, or place of control of health was conceptualized as multidimensional: 1) internal dimension (IHLC) - the belief that one's health status is affected by one's own behavior, 2) powerful others dimension (PHLC)- the belief that powerful other persons influence one's health and 3) chance dimension (CHLC)- the belief that fate, luck or chance influences one's health (Wallston, 1992). In a primarily Anglo (non-Hispanic White) sample, perceived internal control was related to preventive health behaviors such as seat belt use, medical and dental checkups, immunizations, and smoking behavior (Langlie, 1977).

Weitzel & Waller (1990), using stepwise multiple regression, studied predictive factors for health-promoting behaviors among a convenience subsample of Hispanic blue collar workers. The independent variables included health locus of control, age, income and other cognitive-perceptual factors. The sample size (n=48) was inadequate for the number of independent variables using Harris' (1985) rule-of-thumb of 10 cases per predictor. Perceived control of health was measured with the Multidimensional Health Locus of Control Form A with variable reliability coefficients, (IHLC $\alpha=.77$, PHLC $\alpha=.67$, CHLC $\alpha=.53$) and no reported validity (Weitzel, 1989). An internal health locus of control explained 44% of the variance in the Self-Actualization subscale of the Health-Promoting Lifestyle Profile for the Hispanic subsample.

Although no other studies could be identified that reported health locus of control for Hispanics, the related concepts, fatalism, external locus of control and destiny have had attention in the literature on Hispanics. However, there is disagreement about the existence of fatalism, with arguments suggesting that low income rather than culture is the source, if there is such a phenomenon. For example, Garza and Ames (1976) compared 47 Anglo-Americans with 47 Mexican-Americans matched on socioeconomic background and gender to find that Mexican-Americans scored less external than Anglo-Americans on the total score, and on luck and fate subscales using Rotter's Locus of Control Scale. The authors
concluded that the findings contradict the stereotype that Mexican-Americans are fatalistic and controlled by external forces, and suggested that their culture actually contributes to a greater perception of internal control. In contrast, Mirowsky and Ross (1984) (n=463) using a causal modeling approach demonstrated the influence of Mexican heritage on external control both directly and indirectly through income. Colon (1992), in a pilot study (n=1063, 6.1% Hispanic), found that when belief in destiny was controlled, differences in seat belt use by race disappeared (White, Black/Hispanic). Colon concluded that racial differences in seat belt use can be accounted for by belief in destiny.

**Critique**

In summary, there has been limited study of health locus of control and health behavior among Hispanics. One study examined health locus of control among Mexican American workers but the sample size and measurement of the concepts were inadequate. A review of related research shows disagreement about the stereotypical fatalistic attitude of Hispanics. Further study is needed to determine the salience of perceived health locus of control for Hispanics.

**Perceived self-efficacy**

Bandura introduced the concept of self-efficacy, or efficacy expectation, as distinct from outcome expectation within his social cognitive theory (SCT) (Bandura, 1977). Efficacy expectation is a self-referent thought about the capability to perform specific behaviors in particular situations, whereas outcome expectation is the belief that a particular behavior will result in a given outcome. Self-efficacy refers to beliefs about ability to perform specific behaviors in particular situations rather than a personality characteristic or global trait (Strecher, DeVellis, Becker & Rosenstock, 1986). Strecher et al. (1986) emphasize that self-efficacy is dependent on the particular task and situation confronting the person and therefore it is inappropriate to refer to self-efficacy without specifying the specific behavior and circumstance. Perceived self-efficacy has been shown to be related to
a number of health behaviors in predominantly Anglo groups, for example smoking reduction (Blittner, Goldberg, & Merbaum, 1978; Chambliss & Murray, 1979a; Strecher, Becker, Kirsch, Eraker, & Graham-Tomasi, 1985) and weight reduction (Chambliss & Murray, 1979b; Jeffrey et al., 1984). Recently, enthusiasm for the self-efficacy concept has developed among researchers interested in Hispanic health behavior, judging from the number of research articles published in the past three years.

In a study on the frequency of breast self-examination (BSE) among low-income, primarily Spanish-speaking Mexican American women (n=106) attending a local health clinic, Gonzalez (1990) used bivariate correlation and ANOVA to identify the relationships of BSE self-efficacy and English language proficiency to the behavior. English language proficiency provided a measure of acculturation using a 5-item instrument developed for this study; alpha reliability was excellent (α=.95) but validity was not reported. The authors report a Cronbach's alpha of .82 for the 11-item bilingual self-efficacy of breast examination instrument. Additional psychometrics are reported elsewhere (Gonzalez & Gonzalez, 1990); test-retest reliability was not measured, content and construct validity were confirmed appropriately, however, concurrent validity was inconclusive due to low inter-rater reliability on the criterion measure which involved answers to open-ended questions about BSE performance. Results showed that self-efficacy had a central role in the frequency of BSE and that English-language proficiency had no direct effect on frequency of BSE. That is, even when a woman was not proficient in English, if she felt self-efficacious, she was likely to practice BSE more frequently.

Hovell et al. (1991) examined self-efficacy for exercise as a determinant of two types of exercise, vigorous activity (times per week) and walking (minutes per week), with a subsample of 127 Hispanics (62% male), through a randomly mailed community survey. Using stepwise multiple regression, the researchers explored the relationship of exercise behavior with twenty-four independent variables including self-efficacy, age, gender and education. The sample size appears to be too small to obtain adequate power in the multiple
regression analyses (Harris, 1985). Test-retest reliability of the instruments was 81 to 100 percent for the independent variables and 69 percent for the walking. Internal consistency and validity are not reported by the authors. Self-efficacy was the strongest variable in bivariate correlations, with both types of exercise and the most powerful correlate in the multiple regression equation involving vigorous physical activity but not walking.

Perceived self-efficacy to avoid cigarette smoking was studied by Sabogal et al. (1989) through interviews with a convenience sample of 263 Hispanic (58% male) and 150 non-Hispanic White smokers. The DiClemente Self-Efficacy to Avoid Smoking scale was factor analyzed separately for Hispanics and non-Hispanic Whites to identify common factor structures, a procedure used in cross-cultural research to assure conceptual equivalence of the measures. The analysis resulted in two culturally appropriate subscales, Self-efficacy when Socializing and Self-efficacy during Negative Emotional States, with Cronbach's alphas of .78 and .73 for Hispanics and .75 and .81 for non-Hispanic Whites. Two way MANOVA was performed using gender and ethnic group as independent variables and the total scale of 11 self-efficacy items as the dependent variable. The results showed a significant difference in efficacy by ethnic group, but not by gender. Hispanics reported higher levels of self-efficacy for smoking avoidance than non-Hispanic Whites. Perceived self-efficacy to avoid smoking was negatively related to the perceived level of addiction and self-reported cigarette consumption (number of cigarettes smoked per day) in both ethnic groups.

Weitzel and Waller (1990), (see perceived control of health) examined general self-efficacy in their study with a subsample of Hispanic blue collar workers. A limitation is that the sample size (n=48) was inadequate for the number of independent variables (Harris, 1985). Self-efficacy was measured with the the 17-item General Self-Efficacy subscale of the General Self-Efficacy Scale; Cronbach's alpha for this study was .83, validity was not reported. General self-efficacy appeared as the first predictor of Hispanic health-promoting behavior in five of the seven regressions, accounting for 10% to 17% of
the variance in Health-Promoting Lifestyle and four of its subscales: self-actualization, nutrition, interpersonal support and stress management.

Critique of Research on Hispanic Self-Efficacy and Health Behavior

The emergent research on Hispanic self-efficacy and health behavior, all published in the past three years, appears to be proceeding in a sound and useful direction. All the articles referred to Social Cognitive Theory and the literature on self-efficacy as the basis of their research. Sample sizes were adequate for the multiple regression and ANOVA analyses with the exception of two studies (Hovell et al., 1991; Weitzel & Waller, 1990). A shortcoming of most of these studies is that the samples are identified as Hispanic without describing the ethnic subgroup. The one exception (Gonzalez, 1990) identified the entire sample as Mexican-American without noting whether respondents were asked their ethnic origin. The omission of ethnic subgroup could leave unexplained some of the health characteristics that differ among Hispanic subgroups.

Reliability and validity of the measurements are essential in order to develop confidence in the findings of research. Instrument development to assure reliability and validity for Hispanic populations is exemplified in one study that made a contribution to the knowledge base by assuring cultural equivalence of the Self-Efficacy Questionnaire (Sabogal, 1989). While most of the studies documented using reliable measures of self-efficacy, validity was shown in only two studies (Sabogal et al., 1989, Gonzalez, 1990). Self-efficacy was measured for a specific behavior in all but one study in which a general self-efficacy measure was used; Weitzel and Waller (1990) acknowledged this limitation in their discussion.

In summary, recent studies examining self-efficacy for health behavior among Hispanics showed a positive relationship with various health behaviors. Methodological limitations were absence of Hispanic subgroups (e.g. ancestry), operationalization of self-efficacy as a global rather than specific health behavior concept, lack of validity testing for the instruments and small sample size. Overall, the studies indicate confidence in the ability
of self-efficacy to explain health behavior among Hispanics. Attention to describing the Hispanic subgroups, including acculturation and national origin, would improve the generalizability of the findings to similar groups. The instruments developed to measure self-efficacy did not have reported validity testing, therefore conclusions about self-efficacy as a determinant of Hispanic health behavior must be tentative as the instruments may not have been measuring self-efficacy.

**Definition of Health**

In the Health Promotion Model, definition of health refers to a person's conception of health and is hypothesized to determine patterns of health behavior (Pender, 1987). Definitions of health have been operationalized by Laffrey (1985) using a typology by Smith (1983) that describes four dimensions of health conception; (1) clinical health: absence of signs and symptoms of illness, (2) role performance/functional health: ability to perform the requirements of a social role adequately, (3) adaptive health: adaptation to the social and natural environment and (4) eudaimonistic health: exuberant well-being. Smith suggested that these four models are not mutually exclusive, but instead build upon each other with clinical as the least inclusive and eudaimonistic as the most inclusive model. Smith's typology has a distinctive individual focus. Viewed from a Hispanic perspective where familialism and allocentrism feature more of a collective focus, its cultural relevance is a concern.

In their study of 589 predominantly Anglo employees enrolled in employer-sponsored health promotion programs, Pender, Walker, Sechrist and Frank-Stromborg (1990) found high intercorrelations among the role performance, adaptive, and eudaimonistic subscales of the Health Conception Scale (Laffrey, 1986). As a result, they combined these three to form a "wellness" subscale, as recommended by Walker and Volkan (1989). The alpha coefficient for the wellness subscale was .95 and clinical
They found that those who defined health as wellness were more likely to report health-promoting lifestyle behaviors.

No studies could be identified which examined the relationship of definition of health with health behavior among Hispanics, therefore, descriptive literature relating to conceptions of health among Hispanics was sought. In a qualitative study, Boyle (1989) investigated constructs of health promotion in a sample of Salvadorans living in the United States. Based on interviews with 53 individuals, a concept synthesis identified personal health-promoting practices of fresh air, sleep and nutrition, and environmental contexts of family, supportive networks of friends, religious affiliations and work opportunities that contribute to well-being. The constructs of health promotion identified in Boyle's study are different from the dimensions of health promotion found in the professional literature, therefore it is likely that conceptions of health would also be different.

In an exploratory qualitative study, Kerr (1989) found varying definitions of health in the verbal descriptions of four Mexican American migrant farm workers; "See my family happy", "happy, "contento", "in good spirits", "feel good with energy", "live well with my family". These workers suggest a multidimensional definition of health including a family context, not clearly included in Smith's typology.

Critique

Definitions of health among Hispanics have not been explicated in the literature, therefore it is not known if they would correspond to Smith's typology. Further study is needed to describe and explain the relationship of health conception with health behavior among Hispanics.

Perceived Health Status

The HPM postulates that perceived health status, the person's conception of their health status, affects the performance of health behavior. In predominantly non-Hispanic samples, a positive perceived health status has been associated with behavioral intention to
attain or maintain recommended weight (Pender & Pender, 1986), health-promoting lifestyle (Pender, Walker, Sechrist & Frank-Stromborg, 1990; Weitzel, 1989) and exercise behavior (Dishman, Sallis & Orenstein, 1985).

Only one study examined the relationship of perceived health status with behavior among Hispanics. Although Weitzel and Waller (1990) found that perceived health was significantly and positively related to total Health-Promoting Lifestyle and three of its subscales among their non-Hispanic White subsample, they did not find a significant association of perceived current health with health-promoting behavior in their Hispanic subsample. Perceived health status was measured with the Health Scale (Lawton et al., 1982), a subscale of the Multilevel Assessment Instrument. Reliability was adequate, (α=.72), but validity was not reported.

The perception of current health was investigated in two studies of Mexican Americans by the Human Population Laboratory reported by Roberts and Lee (1980). They found the perceived health of Mexican Americans to be lower than that of Anglos using a single item with a 4-point scale (excellent, good, fair, poor). In the two studies, higher percentages of excellent or good ratings were given by Anglos (86.1% & 75.7%) compared to Mexican Americans (77.7% & 61.6%).

More recently, perceived health status was included in the Hispanic Health and Nutrition Examination Survey (HHANES), a large comprehensive survey (1982-1984) of three major Hispanic subgroups; Mexican Americans, Puerto Ricans and Cuban Americans. HHANES found that the majority of Mexican Americans (70%), Puerto Ricans (67%) and Cuban Americans (77.7%) judged their current health to be excellent, very good, or good on a single item with a 5-point scale (COSSMHO, 1988).

Critique

In summary, one study of Hispanics with an inadequate sample size did not find a relationship of perceived health status with health-promoting behavior (Weitzel, 1989). According to COSSMHO (1988) the general sense of satisfaction with health among the
three Hispanic subgroups of the HHANES suggests further study of the measures used by individuals to rate their health status. Further study is needed to examine the relationship of perceived health with health behavior among Mexican Americans.

**Perceived Benefits and Perceived Barriers**

Perceived benefits, the expected positive effects of health action, and perceived barriers, the potential negative aspects of a particular health action or deterrents to it, are hypothesized to be important determinants of behavior (Rosenstock, 1990, Pender, 1987). Benefits and barriers have their origins in the Health Belief Model (HBM) and have received support in a critical review by Janz and Becker (1984) of 24 HBM studies conducted between 1974 and 1984. They constructed a significance ratio, dividing the number of positive statistically significant findings for an HBM dimension by the total number of studies reporting significance levels for that dimension. Using the significance ratio, perceived barriers was the most powerful single predictor of the HBM dimensions across all studies and behaviors. Perceived benefits, also an important predictor, was a stronger predictor of sick-role behavior than preventive behavior. None of the studies in the review included Hispanic samples. Perceived benefits of and barriers to the specific health behavior in question have been related to preventive health behavior (Langlie, 1977), swine flu inoculation (Aho, 1979; Crabtree & Wagner, 1987; Rundall & Wheeler, 1979a), attendance at high blood pressure screening (King, 1982), physician visits for preventive care (Rundall & Wheeler, 1979b), and breast self-exam (Ronis & Harel, 1989). Barriers were also related to breast cancer detection behaviors; breast self-examination, mammography, and professional breast examination (Champion, 1991).

Benefits and barriers concepts were examined in three studies of Hispanic health behavior. Two studies cited the Health Belief Model as the conceptual framework and one cited "learning theories" in general.
Sweeney and Gulino (1987) used the Health Belief Model to examine determinants of breast-feeding decision among Mexican and Mexican-American primiparas. They found that the benefits variable (reasons for selection of feeding method) but none of the four barriers variables contributed significantly to explanation of breast-feeding at six weeks postpartum. Measurement issues are a serious limitation of this study. Operational definitions are not included for the instrument which is comprised of a combination of short-answer, multiple-choice, and Likert-type rating scale items derived from two interview guides used in clinical practice. Although adequate content validity for the instrument was mentioned, other measures of validity and reliability were not. Furthermore, the dependent variable, breastfeeding at six weeks, appears to be a dichotomous variable and the authors do not explain how they met the assumption of normality required for multiple regression (Lewis-Beck, 1980).

In a study assessing the influence of psychological barriers, socioeconomic status and ethnic differences in mammography use, a barrier "fear of pain" was significantly correlated with two different measures of mammography usage for the subsample of 150 Hispanic women (Stein, Fox, & Murata, 1991). Other barriers variables that were not significantly related to mammography usage were: embarrassment, radiation fear, cost concerns, and anxiety about the results and effectiveness of the procedure. This comparative study is exemplary in the use of psychometrics to assure that a standardized instrument held conceptual equivalence for the three cultures (non-Hispanic White, Black, Hispanic) examined. According to Marin and Marin (1991, p. 79), "standardized instruments are commonly used by researchers without considering differences in the psychometric characteristics of their instruments when used with culturally different groups." The researchers performed confirmatory factor analysis using an EQS covariance structure analysis program to ascertain whether different psychological variables could be combined meaningfully into latent factors. Latent factors in confirmatory factor analysis are analogous to factors found through traditional exploratory factor analysis but they are
hypothesized in advance of the analysis. The researchers found that the variables were adequately related to each other in the factor structures, providing a test of reliability. Next, they compared the factor patterns of the three ethnic groups to assess factor invariance across groups. They found that the factor structures was similar for the three groups, indicating that the factors of the thirteen items of the barriers to mammography instrument held equivalent meaning for the three different groups.

Hovell et al. (1991) (described above under self-efficacy) examined benefits (10 items) and barriers (15 items) as determinants of two types of exercise, vigorous activity (times per week) and walking (minutes per week) among Hispanic adults. Perceived barriers to exercise were significantly related to minutes of walking but not vigorous activity. Perceived benefits had no significant relationship with activity. Reliability and validity of the instruments were not reported by the authors.

**Critique**

Reliability and validity of the instruments were adequately reported in only one of the three studies reviewed in this section (Stein, Fox, & Murata, 1991). The study on barriers to mammography by Stein and colleagues was exemplary in the use of confirmatory factor analysis to establish reliability and validity of the instrument for the three cultural groups in their study (Stein, Fox, & Murata, 1991). This study lends some support to the relationship of perceived barriers with health behavior among Hispanics. However, benefits had weak support in one of the two studies that measured it and the instruments had inadequate documentation of reliability or validity. Future studies are needed to develop reliable and valid instruments and examine further the relationship of benefits and barriers with health behavior of Hispanics.

**Modifying Factors and Health Behavior**

Modifying factors such as demographic factors, interpersonal influences, and situational influences are proposed in the Health Promotion Model as indirect influences on
health behavior. The following section includes reviews of the literature on these factors followed by a critique of the literature.

**Demographic Factors**

Age, gender, socio-economic status, ethnicity and culture are proposed by the Health Promotion Model as affecting health behavior indirectly through the cognitive-perceptual factors.

**Age and Gender**

In a descriptive study on health-promoting lifestyle with a Mexican-American sample (n=425), Kerr (1991) found that there were significant age-group differences in frequency of health-promoting behaviors in the health responsibility and stress management dimensions; adults age 55 and older had the highest scores. Gender differences were also identified, with Mexican-American males reporting significantly more frequent behaviors in the self-actualization and exercise dimensions of health-promoting lifestyle compared to females.

In the study by Weitzel and Waller (1990), age was significantly and negatively related to the exercise subscale of the Health-Promoting Lifestyle Profile for the Hispanic subsample, but not for non-Hispanic Whites and Blacks.

Several studies controlled for age and gender and found no significant differences in the correlates of physical activity or perceived self-efficacy to avoid cigarette smoking (Hovell et al, 1991, Sabogal et al, 1989). Other studies included samples of only one gender because of the gender-specific nature of the behavior; BSE (Gonzalez, 1990), breastfeeding (Sweeney & Gulino, 1987) and mammography (Stein, Fox & Murata, 1991). Sweeney & Gulino (1987) also controlled for age and found a positive relationship between age and decision to breastfeed.
Socio-economic status

Socio-economic status (SES) and ethnicity are intimately intertwined, therefore it is important to identify both when studying Hispanic health (Angel, 1983). In their study on mammography use Stein, Fox, & Murata (1991) (see benefits & barriers) examined socioeconomic and cultural determinants of mammography using logistic regression. SES was not correlated substantially with mammography use by the non-Hispanic White and Black women, but was by far the largest correlate for the Hispanic women. SES, measured by education and household income, had a strong positive relationship with mammography use and a significant interaction with Hispanic ethnicity. The Hispanic women were poorer and less well educated than either the Black or the non-Hispanic White women. The authors inferred that the Hispanic women being more impoverished, were less likely to have sources of care and health insurance.

Weitzel & Waller (1990), (see self-efficacy), found that household income was significantly and positively related to Health-Promoting Lifestyle total scale and Self-Actualization subscale for the Hispanic subsample. Annual household incomes for Hispanics and Blacks were in the $10,000 to $30,000 range whereas incomes for the non-Hispanic White sample were distributed evenly between $10,000 to $30,000 and $30,000 to $50,000. Income did not add to the prediction of Health-Promoting Lifestyle for non-Hispanic Whites or Blacks.

Ethnicity

Two measures of ethnicity appear in the literature on Hispanic health behavior, acculturation and national origin. Acculturation has been hypothesized as a factor influencing health behavior in many studies of Hispanics and has brought mixed results. While two studies found no effect of acculturation level on health behavior (Deyo, Diehl, Hazuda and Stern, 1985, Gonzalez, 1990), others have found significant relationships of acculturation and health behavior. Kerr and Ritchey (1990) found that acculturation as measured by language use made a significant difference in dimensions of health-promoting
lifestyle among migrant farm workers; lower acculturation was associated with more frequent health-promoting behaviors in the self-actualization, exercise and stress management dimensions. Ruiz, Marks, and Richardson (1992) in their study on screening practices of elderly Hispanic women using the Acculturation Rating Scale for Mexican-Americans (Cuellar, Harris, & Jasso, 1980) had two findings; acculturation was related to amount of media exposure relating to screening practices, and media exposure was related to screening practices and symptom knowledge when acculturation and demographics were controlled. Marin & Marin (1992) found that acculturation was significantly and positively related to keeping or carrying condoms for females only. Sabogal et al. (1989) (see self-efficacy) using a short acculturation scale, found that low acculturation Hispanics had the highest levels of self-efficacy to quit cigarette smoking and the lowest addiction levels when compared to high-acculturation Hispanics and to non-Hispanic Whites. The HHANES found strong positive correlations between acculturation and increased alcohol consumption, (particularly for women), and lower diet scores (less balanced, more "junk food") for Mexican American men and women (Marks, Garcia & Solis, 1990).

National origin is another aspect of ethnicity that differentiates among Hispanic subgroups. Interesting demographic differences exist among the subgroups (Davis, Haub & Willette, 1988). For example, in 1985 in the U.S., Mexican American families were the largest among the Hispanics with 4.15 persons; Central and South Americans had 3.74, Puerto Ricans had 3.62 and Cuban Americans had 3.13. The median age was lowest for Mexican Americans at 23.3, next were Puerto Ricans at 24.3, Central and South Americans at 27.1 and Cubans at 39.1 (Davis, Haub & Willette, 1988).

Health risk behaviors and disease rates also vary among Hispanic subgroups. According to the HHANES, heavy cigarette smoking was most prevalent for Cuban American men, and heavy drinking most prevalent for Mexican American and Puerto Rican men (Marks, Garcia & Solis, 1990). On the other hand, Mexican American women have a very low prevalence of smoking compared to all other subgroups. Lastly, the HHANES
revealed that 26.1% of Puerto Ricans, 23% of Mexican Americans and 15.8% of Cuban Americans aged 45 to 74 years have diabetes (Council on Scientific Affairs, 1991).

**Interpersonal Influences**

Interpersonal factors that are proposed within the HPM as modifying influences include expectations of significant others, family patterns of health care, and interactions with health professionals. Several studies in the Hispanic health literature examined interpersonal influences on health behavior.

In a classic study with sugar cane workers (n=115) in Puerto Rico, Suchman (1967) examined interpersonal factors influencing acceptance or rejection of a protective glove. He found that the higher the worker's score on a scale of social participation (visit non-family friends, make trips outside the community, attend church), the more likely he was to accept the glove. Likewise, workers who had discussed the glove with other sugar cane cutters, or with non-sugar cane cutting friends and with their wives and family, were more likely to accept the glove than those who did not have such discussions.

Gonzalez (1990) in her study on the frequency of BSE (see self-efficacy) examined the effect of social support on BSE frequency. Using items adapted from Norbeck's social support scale, she asked individuals to rate health-related and material support received from the five most important people in their lives (9 items; 1=not at all to 5=a great deal). Reliability and validity for the social support scale were not reported. Social support was not significantly related to BSE frequency in a bivariate correlation.

Hovell et al. (1991) (described under self-efficacy) examined friend support for exercise (3 items) and family support for exercise (3 items) as determinants of two types of exercise, vigorous activity (times per week) and walking (minutes per week). Reliability and validity were not reported. In the multiple regressions, friend support was significantly related to both types of exercise but family support was not. The authors note that their sample represented "middle class", well-educated (mean=13.6 years) and healthy
individuals, not precisely reflective of the general Hispanic population, therefore
generalizations should be limited to a similar subset of this population.

Sweeney and Gulino (1987) (see benefits and barriers) found that the influence of
the husband or partner contributed significantly and positively to breast-feeding at six
weeks postpartum. However, the lack of operational definition, reliability and validity
information make these conclusions tentative.

Two reports on family diet and exercise behavior from the San Diego Family Health
Project showed family aggregation, or a similarity of the frequency or pattern of behaviors,
within families. Both studies used measures with adequate reliability and validity. For
example, the Physical Activity Recall (PAR), an interviewer-administered one-week
activity recall, had a two week test-retest reliability of .66 and an inter-rater reliability of .81
and evidence of discriminant and concurrent validity (Sallis, Patterson, Buono, Atkins, &
Nader, 1988). In the study by Sallis and colleagues (Sallis et al., 1988) there were higher
intrafamily correlations of physical activity habits among Mexican American families
compared to Anglo families and energy expenditure was significantly correlated for fathers
and older children, for mothers and both younger and older children, and for sibling pairs.
Similarly, there were aggregations of change in diet and exercise behavior within
generations of families in the other study from the San Diego Family Health Project
(Patterson, Sallis, Nader, Kaplan & Rupp, 1989). Siblings and spouses showed the
greatest concordance in change, suggesting that modeling by similarly-aged models may
be important in behavior change. Mexican American families appear to share similar health
patterns and behavior change patterns when the family unit is the target of the intervention.

Situational Influences

Situational or environmental determinants of health behavior include the availability
of health-promoting options and ease of access to alternatives (Pender, 1987).
Only one study of Hispanics specified situational influences in the theoretical model. Hovell et al. (1991) (see self-efficacy) in their study on physical activity, examined three situational influences: home equipment (10 items), neighborhood environment (3 items) and convenience of facilities (15 items). Reliability and validity are not reported. None of the situational influences was significantly related to exercise.

Critique of Modifying Factors

Age, gender and SES are standard background demographic factors that most researchers would include in psychobehavioral research. There was support for inclusion of demographic variables in the studies reviewed. For Hispanics, SES is a very important variable to include because of its impact on health and health behavior.

Acculturation is an important factor that may affect health behavior and attitudes of Hispanics. Psychobehavioral studies of Hispanics that omit this important variable run the risk of misspecifying their predictive models. The inconsistency of findings in the present review may partially represent invalid or unreliable instruments and variability in operational definitions. In a recent review of the literature on acculturation in research, Negy and Woods (1992) stated that measurement of the acculturation construct is as variable as the authors' perspectives of the variables that are most indicative of cultural change. According to Negy and Woods (1992, p. 227), "the apparent lack of agreement among researchers on an operational definition and assessment device for acculturation has led to conflicting findings". The variability in measurement of acculturation was evident in the present review, as all seven studies used different measures of acculturation. Much would be gained by agreement on the operational definition and measurement of acculturation. A recently developed acculturation scale by Marin et al. (1987) ameliorates three frequent limitations of acculturation measures; they have been created for only one Hispanic subgroup (e.g. Cuellar, Harris & Jasso, 1980 for Mexican Americans), they lack appropriate or extensive psychometric analyses, or they include, as part of the scale, demographic factors (e.g. generation of the respondent) that are also used in validity
testing, thus inflating the correlations between the criterion and the scale. The acculturation scale by Marin et al. (1987) measures behavioral acculturation in three dimensions; proficiency and preferences for speaking a given language in a number of settings, use and preference of English/Spanish language media, and preferred ethnicity of those with whom the respondent interacts. Given its good psychometrics and ability to tap several dimensions, the Marin et al. (1987) scale seems very promising for further research.

Further research to develop the concepts of ethnicity and culture within the Health Promotion Model would contribute to the understanding of health behavior among Hispanics. The knowledge base for Hispanic health promotion and protection would be advanced by studies examining the dynamics of acculturation and health behavior within a culturally relevant theoretical framework.

There is mixed support for the importance of interpersonal influences on Hispanic health behavior, perhaps due to different operationalizations of the concepts. Instrument development is needed to assure the cultural relevance as well as reliability and validity of the measures of interpersonal influences. An area for hypothesis generating and model discovery would be to explicate (make more explicit, Nunnally, 1978, p. 105) the construct of interpersonal support that is consistent with Hispanic cultural values of familialism and allocentrism. An interesting area of research would be to explore the mechanisms involved in aggregation of family behavior change. Identification of these mechanisms would be the key to interventions that would enhance the process and bring about family health behavior change.

Only one study represented research on situational influences (Hovell et al, 1991). Situational influences were not associated with health behavior in this study.

**Summary**

In summary, self-efficacy, barriers and acculturation had at least modest support as factors influencing the health behavior of Hispanics in this review of the literature.
Interpersonal influence had mixed support but deserves further study in view of the important cultural values of familialism and allocentrism. Other variables in the HPM were unsupported because they have not been sufficiently tested.

This review of the literature generated an assessment of the state of knowledge in health determinants among Hispanics. The theoretical and methodological issues raised were considered in the design of the present study.
CHAPTER III

METHOD

Design

Two study designs were chosen to examine relationships among variables in the Model (Figure 1), a correlational and an exploratory design (Brink & Wood, 1989). Correlational designs are used to define the relationship between variables when there is a well developed theoretical framework, or one can be devised to justify studying specific variables (Wood & Brink, 1989). Correlational designs utilize quantitative data collection methods and multivariate statistical techniques. On the other hand, exploratory designs use qualitative data collection methods such as unstructured interviewing, focus groups and unstructured observation. An assumption underlying exploratory designs is that "the topic has not previously been studied or explored, or has not been studied from the point of view of the participant or informant" (Brink, 1989). Data analysis in exploratory research requires "a fluid, flexible, somewhat intuitive interaction...between the investigator and the data" (Brink, 1989, p. 151). The research design for this study is two-pronged: Part A. A correlational descriptive design using primarily instruments with established reliability and validity when used with non-Hispanic samples, and Part B. An exploratory descriptive design which explores experiences and perceptions of Mexican American workers that may not have been addressed in the first part of the study.

Methodological triangulation, the use of two or more methods of data collection (Duffy, 1987), was used to allow analysis to go beyond the initial theoretical framework. The between-methods design has two purposes according to Breitmayer, Ayres, and Knafl
(1993). The first purpose is confirmation or convergent validity; the data from qualitative and quantitative methods are brought together to see if the findings converge between methods. A second purpose is to provide completeness and detail about the varied dimensions of a phenomenon. In summary, the merging of results from two different methodologies will allow the researcher to verify and extend empirical findings.

**Part A**

A correlational descriptive design was used to determine the relationships between cognitive-perceptual factors, modifying factors and use of hearing protection. The cognitive-perceptual factors assessed were: perceived control of health, perceived self-efficacy in the use of hearing protection, definition of health, perceived health status, perceived benefits of use of hearing protection and perceived barriers to the use of hearing protection. The modifying factors tested were: demographic characteristics, interpersonal influences on the use of hearing protection and situational influences on use of hearing protection.

**Part B**

The purpose of this part of the investigation is articulated well by Silva and Sorrell (1992) in their article on nursing theory testing. One of the alternative empirical research approaches they recommend is "Testing to verify nursing theory through description of personal experiences". They suggest that through an inductive process, personal experiences can be analyzed in order to verify theory, elaborate concepts, or develop theory.

An exploratory descriptive design was used to describe Mexican American workers' experiences related to noise exposure at work and attitudes toward the use of hearing protection. Specifically, the focus group probes asked participants about: sounds they like and dislike, experiences with work-related noise, experiences with wearing
hearing protection at work, factors that support their use of hearing protection and program or resource ideas for promoting hearing protection use in their workplace.

Sample

A sample of 123 workers was recruited from a garment industry in the South-Western U.S. where Mexican Americans comprised a large portion of the workforce. According to Cohen, (1977) a sample of 120 workers provides sufficient statistical power (92%) to detect medium sized correlations (r=.30, two-tailed p=.05). This is adequate since the focus of the study is on identifying strong predictors of use of hearing protection that would be important in designing an intervention.

Workers in two plants who were exposed to noise at their work were solicited by the industry management to complete the survey instruments. Criteria for selection were: Mexican-American workers, exposed to high noise in their work, with the ability to read English. Because of the low proportion of workers who could read English (10%) and an even smaller proportion of those who were required to wear hearing protection (approximately 30 individuals) in the two plants, workers who were not required to wear hearing protection in the first two plants were included and the sample was extended to a third plant where almost all workers were required to wear hearing protection. Hearing protection policy became evident in interviews with the plant management. In Plant 1 most of the workers had the option of wearing hearing protection or not, whereas in Plant 2 all workers in the plant were encouraged to wear hearing protection and received safety training on hearing protection. In Plant 3, a facility with higher noise levels, all workers in the sample were required to wear hearing protection. An interview with the corporate nurse manager indicated that the manufacturing plants were undergoing a process of change from a traditional assembly line where noisy operations were isolated to certain areas, to a new model which integrated the noisy operations throughout the plant. For this reason, the
corporate nurse anticipated that hearing protection policy might need to extend to larger areas in the plants, affecting more workers in the future.

**Procedure**

In a recent guide for nursing research with Hispanics, Porter and Villaruel (1993) emphasize the importance of stating the ethnic/racial identity of the researcher and team members in research reports as these have a potential impact on all aspects of the research. In the current study, the data collection team consisted of the non-Hispanic White researcher and two Mexican American students interested in the health professions who were recruited from the local community college employment service.

**Part A. Questionnaire**

Questionnaire and focus group sessions took place in conference rooms at the manufacturing plants as part of the workers' shift (days or evenings). Management personnel were informed that workers would be away from their work for an hour. Questionnaires were provided in an attractive, 20 page spiral-bound booklet and samples of the response formats were shown with an overhead projector and reviewed with participants. Following explanation of the informed consent (Appendix A), the researchers were available throughout the session to answer questions and provide assistance with reading. In order to prevent respondent fatigue, a snack break of juice and a fruit breakfast bar were provided when each participant reached the half way point in the survey. When participants completed the survey, a researcher team member reviewed their booklet with them to assure completion of any missing data and they were given an incentive, a University of Michigan pen. Participants took an average of 45 minutes to complete the questionnaire, with a range of 20 minutes to an hour. Management personnel assisted the researcher by defining the hearing protection requirement status for each study participant so that data could be analyzed according to hearing protection requirement. Although
probability sampling (e.g. random, systematic, stratified) is preferable because it avoids biases in sample selection (Babbie, 1979), the only feasible mechanism of attaining the needed sample in this study was relying on an available pool of subjects.

Part B. Focus Groups

Focus group participants were recruited by the researcher from the workers in the first two plants who completed the questionnaire. A pool of volunteers was obtained using the following question at the end of the written questionnaire:

Would you be willing to participate in a 30-45 minute discussion group about using hearing protection? (Yes, No, Maybe)

From those who volunteered, the researcher chose a random sample of four men and four women in each plant and an alternate list of two others to assure a group of 8. Alternate participants were called upon only if needed due to absence from work of the original eight workers. A group size of eight was expected to be small enough to allow all participants to contribute yet large enough to provide some diversity of opinion (Krueger, 1988). The list was presented to the plant management who arranged for the workers to take an hour from work to participate. After the researcher described the purpose of the research and reviewed the consent form (Appendix A), all eight workers in the original sample agreed to participate in each of the groups. The researcher conducted the focus groups in English with the help of the data collector who managed the audiotape recording and took field notes. Participants were invited to use Spanish phrases or sentences if they found it easier to express a thought. A script of the open-ended focus questions is included in Appendix B. The 45 minute focus group sessions were audiotaped with the consent of the group. Juice and a muffin were provided prior to the group session and each focus group participant received a University of Michigan souvenir at the end of the session.
Instruments

The instruments measuring the concepts from the theoretical model and the reliability coefficients for each scale are described in the following section. A complete set of the instruments used in this study can be found in Appendix C. Multiple item instruments were examined for internal consistency using Cronbach's alpha and theta coefficients. Theta is a special case of Cronbach's alpha which is appropriate for scales with few items or when it is anticipated that a scale may be multifaceted (Carmines & Zeller, 1979). For comparative purposes, alpha and theta coefficients for scales in the current study are compared in table 3.1 with theta coefficients for Lusk's sample of blue collar workers (Lusk, Ronis & Kerr, 1993). In the current study, internal consistencies of 0.70 are considered acceptable for this early stage of research (Nunnally, 1978).

Cognitive-Perceptual Factors

Perceived Control of Health. Perceived control of health was measured by the Multidimensional Health Locus of Control (MHLC) Form B, an 18-item, 6-point Likert scale, in which the responses range from “strongly disagree” (1) to “strongly agree” (6) (Wallston, Wallston & DeVellis, 1978). The MHLC includes three 6-item subscales to assess beliefs that one’s health is controlled by (a) oneself, (b) chance, and (c) powerful others. Theta coefficients for this study were as follows: (a) internal locus of control, .69; (b) powerful others, .58; and (c) chance locus of control, .53. As noted in table 3.1, the comparison sample also showed poor reliability of the MHLC. Scale statistics provided by the SPSS (1990) Reliability program indicated that the exclusion of two items would have improved the alpha coefficients of the Internal and Chance subscales by .04 and .03 respectively; "If I become sick, I have the power to make myself well again" (Item-total r = .16) and "Even when I take care of myself, it's easy to get sick" (Item-total r = .10).

Lusk et al. (1994) added an alternate measure of perceived control of health, the Personal Health Competence scale as recommended by one of the authors of the MHLC.
Table 3.1 Reliability Coefficients

<table>
<thead>
<tr>
<th>Scale</th>
<th>Current Study</th>
<th>Blue Collar Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alpha</td>
<td>Theta</td>
</tr>
<tr>
<td>Acculturation</td>
<td>.87</td>
<td>.88</td>
</tr>
<tr>
<td>Social Norms for HP</td>
<td>.83</td>
<td>.83</td>
</tr>
<tr>
<td>Interpersonal Support for HP</td>
<td>.82</td>
<td>.91</td>
</tr>
<tr>
<td>Social Models for HP</td>
<td>.87</td>
<td>.87</td>
</tr>
<tr>
<td>Situational Influences for HP</td>
<td>.66</td>
<td>.68</td>
</tr>
<tr>
<td>MHLC Internal</td>
<td>.65</td>
<td>.69</td>
</tr>
<tr>
<td>MHLC Chance</td>
<td>.49</td>
<td>.53</td>
</tr>
<tr>
<td>MHLC Powerful Others</td>
<td>.58</td>
<td>.58</td>
</tr>
<tr>
<td>Health Competence</td>
<td>.64</td>
<td>.68</td>
</tr>
<tr>
<td>Self-efficacy in use of HP</td>
<td>.59</td>
<td>.62</td>
</tr>
<tr>
<td>HCS Clinical</td>
<td>.86</td>
<td>.87</td>
</tr>
<tr>
<td>HCS Overall Wellness</td>
<td>.85</td>
<td>.86</td>
</tr>
<tr>
<td>Perceived Health Status</td>
<td>.56</td>
<td>.59</td>
</tr>
<tr>
<td>Benefits of Use of HP</td>
<td>.56</td>
<td>.64</td>
</tr>
<tr>
<td>Value of use of HP</td>
<td>.89</td>
<td>.89</td>
</tr>
<tr>
<td>Barriers to use of HP</td>
<td>.79</td>
<td>.80</td>
</tr>
<tr>
<td>Use of HP</td>
<td>.99</td>
<td>.99</td>
</tr>
</tbody>
</table>

n/a=concept not measured
HP=hearing protection

(K. Wallston, personal communication, December 20, 1990). This 8-item 6-point Likert scale had a theta coefficient of .68 in this sample. The exclusion of one item would have improved the alpha coefficient from .64 to .69 according to the scale statistics, "I find efforts to change things I don't like about my health are ineffective" (Item-total r = .03).

**Perceived Self-Efficacy.** This 6-item, 6-point Likert scale was developed by Lusk and colleagues (Lusk et al, 1994) to measure self-efficacy in the use of hearing protection. For this sample, the theta coefficient was .62. According to the scale statistics, no deletion
of items could improve the alpha and all item-total correlations were considered acceptable
at a .25 or higher level (Nunnally, 1978, p. 282).

**Definition of Health.** Definition of health was measured by the Reduced Health
Conception Scale (Lusk, Kerr & Baer, in press), an instrument originally developed by
Laffrey (1985) and adapted with permission of the author. The reduced instrument
measures two dimensions of health conception, clinical and overall wellness. For the
current study the theta coefficient for the clinical subscale was .87 and for the overall
wellness subscale, .83.

**Perceived Health Status.** This was measured by the Self-Rated Health Subindex of
the Philadelphia Geriatric Center Multilevel Assessment Instrument (Lawton, Moss,
Fulcomer, & Kleban, 1982) a four item scale with varying response forms. The theta
coefficient for this sample was .59. Deletion of the item "Would you say your health is
better, about the same, or not as good as most people your age?" would have increased the
alpha coefficient from .56 to .60. The item-total correlation for this item was .24.

**Perceived Benefits.** There were two measures of benefits; the first, Perceived
Benefits of Use of Hearing Protection, a 12-item, 6-point Likert subscale by Lusk et al.
(1994). This subscale had a theta of .64 in the current study. Two items were depressing
the internal consistency of this scale by .01 and .04 respectively according to the scale
statistics; "I like wearing hearing protection"(Item-total r = .11) and "When I use hearing
protection, it does not effectively block out noise for me"(item-total r = -.02).

The second measure of benefits was the Value of Use of Hearing Protection
measure, a 6-item, 10 cm visual analog scale with anchors “slightly important” and “highly
important” by Lusk et al. (1994). The theta coefficient for this sample was .89.

**Perceived Barriers.** This was measured by a 13-item, 6-point Likert scale by Lusk
et al. (1994). The theta coefficient for this sample was .80.
Modifying Factors

Demographic Characteristics. Data were collected for a number of demographic characteristics: age, gender, marital status, number of dependents, education, ethnic identification, and years employed at this plant.

Situational Influences. This 8-item, 6-point Likert scale was developed by Lusk and colleagues (1994) to assess perceptions of accessibility and availability of hearing protection equipment. The theta coefficient for this sample was .68. Two items were depressing the alpha coefficient by .02 each, "I have my own ear muffs assigned to me" (Item-total r=.15) and "I can get ear muffs if I ask for them" (Item-total r=.14).

Two scales not used in Lusk's (1994) study were added to measure additional modifying factors considered important in research with Mexican Americans, acculturation and interpersonal influences:

Acculturation In this study an acculturation scale (Marin, Sabogal, Marin et al, 1987) was used to measure language use as an index of the process of culture learning and behavioral adaptation to exposure to a new culture. The scale has a five-point response format (1=only Spanish to 5=only English). The 12-item scale has shown good psychometric characteristics with an alpha coefficient of .90, concurrent validity with respondents' generation in the U.S. (r=.69), or length of residence in the U.S. for foreign-born respondents (r=.76). A shortened version (five items) obtained by extraction of the first factor (language use) in factor analysis, explained 54.5% of the variance in the scale compared to 67.6% of the variance for the three factors. The authors recommend the shortened (five-item) scale within the context of studies where acculturation is one of many measures to be included (Marin, Sabogal, Marin et al, 1987). The shortened version was selected for the current study for economy of participants' time in completing the questionnaire. In the current study the theta coefficient was .88.

Interpersonal Influences on the Use of Hearing Protection This 28-item scale was adapted by the researcher from instruments developed by the Child/Adolescent Health
Behavior Research Center at the University of Michigan (personal communication N. J. Pender 3/16/93) to measure social support for exercise behavior. The instrument measures three sub-concepts; social norms (6 items), social models (4 items) and social support for the behavior (18 items) in 3-point response formats. It was piloted with seven workers and one revision was made; a category "I don't know" was added to the responses "not at all", "sort of" and "a lot" in the social norms and social models subscales to allow for individuals who had no such person in their support system. It was tested with approximately 150 non-Hispanic workers in August, 1993 with adequate reliability (social norms $\theta=.75$; social models $\theta=.75$; and social support $\theta=.89$). In the current study, theta coefficients for social norms was .83, social models .87 and social support .91.

**Dependent Variable**

Use of hearing protection was measured by workers' self-report of the percent of time (0 to 100%) they actually used hearing protection during the past week, the past month, and the past three months when they were in their work area. These three items did not differentiate between work areas where hearing protection was required, recommended, or not required. Workers were also asked what percent of time they wore hearing protection when they were away from their work area in areas where hearing protection was not required.

**Data analysis**

**Part A**

Data were analyzed using the SPSS (1990) statistical package to compute descriptive statistics, reliability estimates, tests of differences among subgroups and multiple regression. First, psychometrics of the instruments were examined. Reliability of
the instruments was examined using Cronbach's alpha. Theta was also calculated since several of the scales are multidimensional and have a small number of items.

Second, descriptive statistics were used to describe the patterns of responses to the questions about workers' use of hearing protection and attitudes relating to hearing protection.

Third, Pearson correlation coefficients calculated between scale scores were used to determine the extent to which variables were associated with use of hearing protection.

Fourth, path analysis using multiple regression was performed to estimate the magnitude of the linkages between the variables hypothesized in the Theoretical Model (Figure 1.1) to explain the use of hearing protection. A major advantage of path analysis is that it enables the estimation of both direct and indirect effects that one variable has on another (Asher, 1983). The major shortcoming is that path analysis assumes perfect measurement of the predictor variables, an impossibility with most of the variables measured in this study.

An additional exploratory multiple regression was done to test the hypothesis that modifying factors have direct effects on use of hearing protection. Several studies have suggested that modifying factors have direct effects on health behavior in addition to the indirect effects proposed in the Health Promotion Model (Johnson, Ratner, Bottorff & Hayduk, 1993; Lusk, Ronis, Kerr & Atwood, 1994; & Pender, Walker, Frank-Stromborg & Sechrist, 1990). Therefore, use of hearing protection was regressed on the modifying factors while controlling for the effects of the cognitive perceptual factors.

**Part B**

The qualitative analysis consisted of three concurrent activities as described by Miles and Huberman (1984, p. 21, 22):

- **Data reduction**: This refers to "the process of selecting, focusing, simplifying, abstracting and transforming the raw data".
Data display: This involves creating organized assemblies of information to permit decisions and conclusion drawing.

Conclusion drawing/verification. This is a two part activity. Decisions are made on the meaning, patterns, and regularities in the data. Conclusions are also verified by the researcher's reflection, by review with colleagues, or by replication with another data set.

Specifically, the procedure followed by the researcher is described in the next paragraphs. Since the process was iterative, occasional references to details of the procedure will be made as the results are presented in the next chapter.

**Data Reduction**

The focus group audiotapes were transcribed and entered into a qualitative data analysis software program, HyperQual2 Version 1.0 (Padilla, 1993). Data from each focus group were reduced by extracting segments of text or data chunks, defined by Tesch (1990, p.116) as "a segment of text that is comprehensible by itself and contains one idea, episode, or piece of information". For the current study a data chunk was defined as a statement or series of statements in sequence that are meaningfully related. The researcher decided to treat each group of eight workers as a unit of analysis, therefore consecutive responses by different individuals were kept together in a data chunk when they appeared to share one idea.

**Coding**

Each data chunk was assigned one or more codes, short labels describing the data. Whenever possible, the labels were derived 'in vivo', that is from words found in the data.

**Creating Categories**

The data chunks were sorted into provisional categories according to their codes and these provisional categories were displayed in table format to facilitate further analyses.

**Pattern Coding.** A review of the tables of provisional categories resulted in a reclassification of the data into pattern codes, a second, more meaningful level of coding. Pattern codes are described by Miles and Huberman, (1984, p.67) as "explanatory or inferential codes, ones that identify an emergent theme, pattern or explanation".
Conclusion drawing/verification. The resulting pattern categories were displayed in a dendrogram figure and summarized in a report of the results. The pattern categories and results summary were reviewed with the data by a Mexican American nurse researcher who looked for cultural patterns in the data.

Triangulation. The ultimate analysis involved triangulation of the results of the qualitative analyses with the results of the quantitative analyses to verify factors from the Health Promotion Model and examine additional factors generated by the qualitative data that might be of importance to the use of hearing protection among Mexican American workers.
CHAPTER IV

RESULTS

Results of the study will be described in the following chapter. Following a
description of the sample, the results will be organized according to the five specific aims
described in chapter 1.

Characteristics of the Sample

A total of 120 Mexican American garment workers responded to an invitation to
participate in the study. The questionnaire for one subject was eliminated due to missing
data on the use of hearing protection, therefore analyses are reported for 119 workers. The
three plant sites provided 30, 60 and 29 participants respectively. All participants included
in the sample identified their ethnicity as Hispanic and chose Mexican American as their
Hispanic subgroup. The participants were production workers who were exposed to noise
in their work; 91 were machine operators, 9 were mechanics, 3 were maintenance workers
and the remainder were other production workers (12) or unspecified (4). Selected
demographic characteristics are described in Table 4.1. The workers' ages averaged 35
years (19 to 55) and slightly more than half were female. The majority had at least a high
school education, were married, and had children (Mean 1.7, S.D. 1.3, 0 to 7). They had
worked at this company for an average of eight years with a range from 1 to 31 years.
Fifty-nine percent of the workers (70) reported having had a hearing test in the past five
years with fifteen percent (18) stating they had a hearing loss. Slightly less than half the
sample (45%) were required to wear hearing protection at work, for the remaining 55% use

45
of hearing protection was optional. Next, study results will be presented for each of the specific aims described in Chapter I.

Table 4.1 Demographic Characteristics of the Sample

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>n</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8th grade or less</td>
<td>7</td>
<td>5.9</td>
</tr>
<tr>
<td>some H.S.</td>
<td>20</td>
<td>16.8</td>
</tr>
<tr>
<td>H.S.</td>
<td>52</td>
<td>43.7</td>
</tr>
<tr>
<td>Trade S.</td>
<td>12</td>
<td>10.1</td>
</tr>
<tr>
<td>some College</td>
<td>23</td>
<td>19.3</td>
</tr>
<tr>
<td>Assoc. Degree</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>Baccalaureate</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>Grad Degree</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td>No response</td>
<td>1</td>
<td>.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>119</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>62</td>
<td>52.1</td>
</tr>
<tr>
<td>Male</td>
<td>57</td>
<td>47.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>119</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>73</td>
<td>61.4</td>
</tr>
<tr>
<td>Divorced</td>
<td>23</td>
<td>19.3</td>
</tr>
<tr>
<td>Never married</td>
<td>20</td>
<td>16.8</td>
</tr>
<tr>
<td>No response</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>119</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* percents may not add to 100 due to rounding error
Results by Specific Aim

1. Describe the use of hearing protection for a sample of Mexican American workers.

Use of hearing protection varied according to hearing protection requirement. On average, workers who were required to wear hearing protection wore it a significantly greater proportion of their time at work (72%) than workers not required to wear it (27%), as shown in Table 4.2. The distribution of self-reported use of hearing protection by the group required to wear hearing protection is displayed in Figure 4.1; the modal response was 100%. In contrast, self-reported use for the group not required to wear hearing protection (Figure 4.2) shows a modal response of 0%. Use of hearing protection also differed significantly when these two groups were away from their work areas: 14% for those required to wear protection, and 3% for those not required to wear it.

Table 4.2 Differences in Use of Hearing Protection by Hearing Protection Requirement

<table>
<thead>
<tr>
<th>Percent of Time Worn</th>
<th>Hearing Protection Required n=54</th>
<th>Hearing Protection Not Required n=65</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>Past week</td>
<td>70.8</td>
<td>35.6</td>
</tr>
<tr>
<td>Past month</td>
<td>72.2</td>
<td>34.4</td>
</tr>
<tr>
<td>Past 3 month</td>
<td>72.9</td>
<td>33.1</td>
</tr>
<tr>
<td>MEAN USE</td>
<td>72.0</td>
<td>33.9</td>
</tr>
<tr>
<td>Away from work area</td>
<td>14.3</td>
<td>28.4</td>
</tr>
</tbody>
</table>
Differences in use of hearing protection were anticipated in the three plants due to differences in the noise levels and the health and safety programs. Analysis of variance was calculated to determine the effect of plant site on use of hearing protection while controlling for hearing protection requirement. An independent effect of plant site was shown by a significant main effect for site ($F=8.61, (2,115), p<.001$) after the effect of the covariate hearing protection requirement was removed. Thus in subsequent analyses, hearing protection requirement and site were controlled in multivariate analyses.
2. Describe the cognitive-perceptual and modifying factors from the Health Promotion Model for a sample of Mexican American workers.

Mean scores of the eleven cognitive-perceptual factors in the theoretical model and one modifying factor, situational influences, were compared with those of a sample of 504 predominantly non-Hispanic White blue collar workers (Lusk, Ronis & Kerr, 1993). Cognitive-perceptual factor mean scores for both samples are displayed in Table 4.3 in the order presented in the theoretical model. Mean scores of the two samples were quite similar. The current study sample appeared to have a slightly higher Internal Locus of Control of Health and slightly lower Self-efficacy in the Use of Hearing Protection.

Details of item scores on the cognitive perceptual factors specifically addressing hearing protection will be presented in the following paragraphs. Participants agreed most with the Self-efficacy statements, "I can use hearing protection effectively" (Mean 4.9, S.D. 1.5) and "I do everything possible to make my hearing protection work effectively" (Mean 4.7, S.D. 1.4). Items from the Benefits of Use of Hearing Protection scale with the strongest agreement were, "Protecting my hearing is not important to me" (reverse scored) (Mean 5.5, S.D. 1.2) and "Wearing hearing protection protects me against hearing loss from noise exposure" (Mean 5.5, S.D. 1.0). On the other hand, Barriers to the Use of Hearing Protection with the strongest agreement were "It's difficult to talk with other people when I'm wearing my hearing protection." (Mean 4.1, S.D. 1.6) and "I do not like putting things in my ears" (Mean 3.5, S.D. 1.8). The items from the Value of Use of Hearing Protection scale with the highest importance scores were "Protection of the inner ear" (Mean 87.7, S.D. 19.8) and "Prevention of hearing loss" (Mean 87.0, S.D. 21.2).

Mean scores for the the five modifying factors measured by multi-item scales are included in Table 4.4. All but the acculturation scale were specific to use of hearing protection. There was a missing data problem with the Social Norms and Social Models subscales due to the "I don't know" option in the response format, with as many as
Table 4.3 Means and Standard Deviations of Cognitive Perceptual Factors:
Study Sample and Comparison Blue Collar Sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study Sample</th>
<th>Comparison Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>MHLC Chance</td>
<td>2.93</td>
<td>.88</td>
</tr>
<tr>
<td>MHLC Internal</td>
<td>4.60</td>
<td>.92</td>
</tr>
<tr>
<td>MHLC Powerful Others</td>
<td>3.42</td>
<td>.98</td>
</tr>
<tr>
<td>Health Competence</td>
<td>4.28</td>
<td>.73</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>4.03</td>
<td>.87</td>
</tr>
<tr>
<td>HCS Clinical</td>
<td>4.52</td>
<td>1.19</td>
</tr>
<tr>
<td>HCS Overall Wellness</td>
<td>4.77</td>
<td>.91</td>
</tr>
<tr>
<td>Perceived Health(^b)</td>
<td>2.38</td>
<td>.48</td>
</tr>
<tr>
<td>Benefits</td>
<td>4.48</td>
<td>.63</td>
</tr>
<tr>
<td>Value of Use</td>
<td>83.52</td>
<td>18.34</td>
</tr>
<tr>
<td>Barriers</td>
<td>2.88</td>
<td>.87</td>
</tr>
</tbody>
</table>

Note: Response formats (1=strongly disagree to 6=strongly agree) except where indicated
\(^a\) Lusk, Ronis & Kerr, 1993
\(^b\) Varying response formats e.g. (1=poor to 4=excellent)
\(^c\) Response format (000=slightly important to 100=highly important)
41 cases choosing this option on a single item. The solution chosen was to recode the "I don't know" responses to the neutral response, "None" or "Not at all" for the Social Norms and Social Models subscales respectively. The demographic variables were measured by single items and have been described above in characteristics of the sample; age, gender and hearing protection requirement. A detailed description of the modifying factors follows.

Table 4.4 Means and Standard Deviations of Modifying Factors

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>Possible range</th>
<th>Actual range</th>
<th>Skewness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acculturation</td>
<td>2.72</td>
<td>.84</td>
<td>1-5</td>
<td>1.0-4.8</td>
<td>.20</td>
</tr>
<tr>
<td>Social Norms</td>
<td>2.22</td>
<td>.61</td>
<td>1-3</td>
<td>1-3</td>
<td>-.49</td>
</tr>
<tr>
<td>Social Models</td>
<td>2.03</td>
<td>.73</td>
<td>1-3</td>
<td>1-3</td>
<td>.00</td>
</tr>
<tr>
<td>Interpersonal Support</td>
<td>2.09</td>
<td>.34</td>
<td>1-3</td>
<td>1.5-3.0</td>
<td>.55</td>
</tr>
<tr>
<td>Situational Influences</td>
<td>4.3</td>
<td>.99</td>
<td>1-6</td>
<td>1.8-6.0</td>
<td>-.475</td>
</tr>
</tbody>
</table>

Acculturation scores indicated that on the average the sample was moderately acculturated, using both English and Spanish equally (Mean=2.72, S.D.=.84, range 1-4.8). Mean scores on individual items from the acculturation scale are shown in Table 4.5. The greatest degree of acculturation was indicated by the item "In general, what language do you read and speak?" with a response average of 3.1 indicating "Both (English and Spanish) equally".

Table 4.5 Mean Scores on Acculturation Items.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>In general what language do you read and speak?</td>
<td>3.09</td>
<td>.85</td>
</tr>
<tr>
<td>What was the language you used as a child?</td>
<td>2.20</td>
<td>1.13</td>
</tr>
<tr>
<td>What language do you usually speak at home?</td>
<td>2.76</td>
<td>1.11</td>
</tr>
<tr>
<td>In which language do you usually think?</td>
<td>2.87</td>
<td>1.19</td>
</tr>
<tr>
<td>What language do you usually speak with your friends?</td>
<td>2.65</td>
<td>.94</td>
</tr>
</tbody>
</table>

Response format: (1=Only Spanish, 3=Both Equally, 5=Only English)
The effect of acculturation on the other predictor variables was investigated using Pearson correlations. Acculturation level had significant relationships with Social Norms (r=-.20, p<.05), Social Models (r=-.31, p<.01) and Value of Use of Hearing Protection (r=-.23, p=.05), indicating that the least acculturated individuals were more likely to report that others expected them to wear hearing protection, that others wear hearing protection and that use of hearing protection is very important to them. Among the demographic variables, lower acculturation level was significantly related with more dependent children (r=.20, p<.05) but not with education or age, and there was no difference by gender.

Among the Social Norms items, participants thought that safety personnel (Mean 2.3, S.D. .84) and health personnel (Mean 2.23, S.D. .86) were those who most expected them to wear hearing protection. Social Models who most often wore hearing protection were coworkers ( Mean 2.2, S.D. .80); mean scores for the others (supervisor, health personnel and safety personnel) were less than 2.0 indicating that they wear hearing protection less than "sometimes". Participants noted on the Interpersonal Support for Hearing Protection scale that health personnel (Mean 2.21, S.D. .80) and safety personnel (Mean 2.15, S.D. .86 ) were most likely to encourage hearing protection use and were also most likely to praise them for wearing it (Mean 1.78, S.D. .81 and Mean 1.74, S.D. .83 respectively). In general, workers did not perceive that family, friends, coworkers or management personnel criticized them for wearing hearing protection (Mean 1.17 -1.37).

Situational Influences, which were also measured in the comparison study by Lusk et al. (1993) (Mean 4.7, S.D. .88), received a slightly lower mean score in the current study (Mean 4.3, S.D. .99). Situational Influences with the most agreement were "ear plugs are available to pick up near my work station" (Mean 4.88, S.D. 1.6) and "there are not enough ear plugs available so that I can use several pairs in one day (reverse-scored) (Mean 4.83, S.D. 1.6).
3. Identify components of the Health Promotion Model (Pender, 1987) most strongly related to use of hearing protection among Mexican American workers.

In preparation for multivariate analysis, the distributions of all the variables were examined. One variable had a troublesome distribution for multivariate analysis; value of use had an extremely negative skew, that is, most workers valued use of hearing protection very highly. Since this scale was an additional measure of benefits of use, it was dropped from future multivariate analyses. Two dummy variables were created for data collection site (Site 2 and Site 3) with Plant 1 being the reference variable for site.

Pearson product moment correlations among the cognitive-perceptual factors and use of hearing protection were examined and are reported in Table 4.6. The relationships with use of hearing protection are all in the expected direction; Self-efficacy in the use of hearing protection, Benefits of use of hearing protection and a higher Perceived Health Status are positively related to use and the Barriers to use of hearing protection scale is negatively related to use.

Measurement error of either or both variables in a bivariate correlation attenuates the correlation between the two variables (Pedhazur, 1982, Nunnally, 1978). In order to gain an estimate of what the correlations of cognitive-perceptual factors with use of hearing protection would be if the constructs were measured perfectly, disattenuated correlations were calculated (Nunnally, 1978, p. 220, 237-9) and are compared with Pearson correlation coefficients in Table 4.7. Use of hearing protection was not corrected for attenuation since the alpha coefficient of .99 probably represents some correlated error. Although most of the correlations increased when corrected for measurement error, the increases for Self-efficacy (.09) and Benefits (.10) are most notable.

Multiple regression was used to estimate the paths in the theoretical model. The initial multiple regression of use of hearing protection on cognitive-perceptual factors had surprising results. Two of the variables with the strongest bivariate correlations with Use of Hearing Protection, Benefits and Barriers, did not have significant paths to the
Table 4.6. Pearson Correlations Among Cognitive-Perceptual Factors and Use of Hearing Protection

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mean use of hearing protection</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. MHLC Chance</td>
<td></td>
<td>-.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. MHLC Internal</td>
<td></td>
<td></td>
<td>.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. MHLC Powerful Others</td>
<td></td>
<td>.04</td>
<td></td>
<td>.35**</td>
<td></td>
<td>.24**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Health Competence</td>
<td></td>
<td>.11</td>
<td></td>
<td>-.16</td>
<td></td>
<td>.23*</td>
<td></td>
<td>-.24**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Self-efficacy</td>
<td></td>
<td>.31**</td>
<td></td>
<td>-.18*</td>
<td></td>
<td>.21*</td>
<td></td>
<td>-.07</td>
<td></td>
<td>.38**</td>
<td>1.00</td>
</tr>
<tr>
<td>7. HCS Clinical</td>
<td></td>
<td>.25**</td>
<td></td>
<td>.09</td>
<td></td>
<td>.17</td>
<td></td>
<td>.03</td>
<td></td>
<td>.18*</td>
<td>.27**</td>
</tr>
<tr>
<td>8. HCS Overall Wellness</td>
<td></td>
<td>.12</td>
<td></td>
<td>.15</td>
<td></td>
<td>.32**</td>
<td></td>
<td>.16</td>
<td></td>
<td>.23*</td>
<td>.34**</td>
</tr>
<tr>
<td>9. Perceived Health</td>
<td></td>
<td>.22*</td>
<td></td>
<td>.08</td>
<td></td>
<td>.06</td>
<td></td>
<td>-.07</td>
<td></td>
<td>.41**</td>
<td>.07</td>
</tr>
<tr>
<td>10. Benefits</td>
<td></td>
<td>.31**</td>
<td></td>
<td>-.43**</td>
<td></td>
<td>-.02</td>
<td></td>
<td>-.15</td>
<td></td>
<td>.34**</td>
<td>.47**</td>
</tr>
<tr>
<td>11. Barriers</td>
<td></td>
<td>-.27**</td>
<td></td>
<td>.28**</td>
<td></td>
<td>-.20*</td>
<td></td>
<td>.19*</td>
<td></td>
<td>-.46**</td>
<td>-.38**</td>
</tr>
</tbody>
</table>

* p ≤.05, ** p≤.01
Table 4.7 Disattenuated Correlations Between Cognitive-Perceptual Factors and Use of Hearing Protection

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>Disattenuated Correlation</th>
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</thead>
<tbody>
<tr>
<td>MHLC Ch.</td>
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<td>-.07</td>
</tr>
<tr>
<td>MHLC Int.</td>
<td>.01</td>
<td>.01</td>
</tr>
<tr>
<td>MHLC P.O.</td>
<td>.04</td>
<td>.05</td>
</tr>
<tr>
<td>Health Comp.</td>
<td>.11</td>
<td>.14</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>.31**</td>
<td>.40</td>
</tr>
<tr>
<td>HCS Clinical</td>
<td>.25</td>
<td>.27</td>
</tr>
<tr>
<td>HCS Non-clin.</td>
<td>.12</td>
<td>.13</td>
</tr>
<tr>
<td>Perc. Health</td>
<td>.22*</td>
<td>.29</td>
</tr>
<tr>
<td>Benefits</td>
<td>.31**</td>
<td>.41</td>
</tr>
<tr>
<td>Barriers</td>
<td>-.27**</td>
<td>-.30</td>
</tr>
</tbody>
</table>

* p ≤ .05, ** p ≤ .01

dependent variable. This effect is suspicious of multicollinearity for reasons which will be explained. Several sources agree on the effect of multicollinearity: when independent variables are correlated, the regression coefficients tend to have larger standard errors, resulting in smaller t ratios and thus regression coefficients that are not significant (Schroeder, Sjoquist & Stephan, 1989; Gordon, 1968; Pedhazur, 1982). However, according to Pedhazur (1982) there is no agreement on a definition of multicollinearity, for example some use it to refer to any correlation between independent variables while others reserve it for high correlations. In the current study Benefits and Barriers had a bivariate correlation of -.54, considered a sign of redundancy (.5 or more) when comparing the relative importance of variables (Alwin, 1988). Given these two signs of collinearity, the remedy chosen was to subtract the mean Barriers to Use scale score from the mean Benefits of Use score, creating a single scale measuring Benefits Minus Barriers. This transformation of the data was consistent with the theoretical relationship of Benefits and Barriers as counteracting cognitive-perceptual factors.
The final model results are depicted in a path model in Figure 4.3. First, use of hearing protection was regressed on the nine variables representing ten cognitive-perceptual factors (Benefits and Barriers were combined). Twenty five percent of the variance (adjusted $R^2=.19$) in use of hearing protection was explained by the Clinical subscale of the Health Conception Scale, Benefits Minus Barriers, Self-efficacy in the Use of Hearing Protection, and Perceived Health Status ($F(9,109)=4.00$, $p<.01$) as shown in Table 4.8. Standardized regression coefficients (beta weights) are used so that the relative importance of the predictors can be assessed. The size of the regression coefficients is very likely biased by the unreliability of some of the instruments. However, unlike the case of bivariate correlation described earlier in this section, in the case of multiple regression, the magnitude and direction of bias in the estimation of regression coefficients cannot be estimated because the effects of the errors are complicated (Pedhazur, 1982, p. 231).

Table 4.8. Effect of Cognitive Perceptual Factors on Use of Hearing Protection

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCS Clinical</td>
<td>.28**</td>
</tr>
<tr>
<td>Benefits Minus Barriers</td>
<td>.28*</td>
</tr>
<tr>
<td>Perceived Health</td>
<td>.20*</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>.22*</td>
</tr>
<tr>
<td>Health Competence</td>
<td>-.15</td>
</tr>
<tr>
<td>HCS Overall Wellness</td>
<td>-.13</td>
</tr>
<tr>
<td>MHLC Powerful Others</td>
<td>.11</td>
</tr>
<tr>
<td>MHLC Internal</td>
<td>-.09</td>
</tr>
<tr>
<td>MHLC Chance</td>
<td>.04</td>
</tr>
<tr>
<td>$R^2=.25$, Adj. $R^2=.19$</td>
<td>F(9,109)=3.99($p&lt;.01$)</td>
</tr>
</tbody>
</table>
* $p <.05$, ** $p<.01$

A set of regressions was used to estimate paths from modifying factors directly to cognitive-perceptual factors in the theoretical model. Only one path was significant to any
Figure 4.3. Path Model from the Theoretical Model

Clinical Definition of Health

Benefits minus Barriers

Use of Hearing Protection

Demographic Characteristic: Education level

Self-efficacy in the use of hearing protection

Perceived Health Status

Paths significant at * p<.05 **p<.01

Note: Constructs not included did not have significant direct or indirect paths to use of hearing protection
of the four variables in the previous regression results. Educational level explained twenty four percent of the variance (adj. $R^2=.16$) in Self-efficacy ($F[11,106]=2.98$, $p<.01$).

A second model was tested in order to estimate direct paths from modifying factors to use of hearing protection. Since the sample size (119) was too small for the number of predictor variables (20), this model was considered exploratory. When all cognitive perceptual factors and modifying factors were simultaneously entered in the equation, 55% of the variance (adj. $R^2=.45$, $F[20,97]=5.88$, $p<.01$) in use of hearing protection was explained by three variables representing four cognitive-perceptual factors in the model, Benefits Minus Barriers ($b=.21$), Clinical Conception of Health ($b=.25$), Perceived Health ($b=.16$) and two modifying variables, Hearing Protection Requirement ($b=.29$) and Plant Site (Plant 2 $b=.27$, Plant 3 $b=.30$).

4. **Examine the validity of the instruments measuring the theoretical constructs for a sample of Mexican American workers.**

Examination of the applicability of existing constructs and theories to Hispanic populations is a goal articulated by a recent gathering of Hispanic leaders (USDHHS, 1993). An important component of the cultural appropriateness of theories is the extent of the validity of the instruments for a given population. For this reason, a separate specific aim has been devoted to examination of the validity of instruments used in this study for a sample of Mexican American workers. An instrument is valid to the extent that it reflects the abstract construct being examined, although validity has come to have many different meanings (Nunnally, 1978; Burns & Grove, 1993). According to Nunnally (1978, p. 87), validity is a matter of degree, and validation is an unending process involving surveillance of the instrument's behavior and modification of the measurement. Furthermore, validity varies from one sample or situation to another, therefore validity is evaluated in terms of a specific group or purpose (Burns & Grove, 1993). The following sections will define methods of validity evaluation used in this study and will report the results.
Evidence of Validity from Factor Comparison Across Groups

According to Alwin and Jackson (1980), the analysis of responses to instruments across different groups raises the issue of the generality of the measurements chosen. In other words, the question raised is "Is what is being measured the same for all groups?" Interpretation of results without examination of the validity of the instruments measuring theoretical constructs can result in bias when comparisons are made across studies. Evaluation of validity is particularly important in the context of building a science based on theoretical models. In this section, assessment of the similarity of factor structures across two studies will be used to examine whether the instruments hold the same meaning for the current sample and the comparison sample.

According to Rummel (1970), intuitive comparison of factors from different studies involves a visual matching of factor loadings and a judgment of their similarities. In this way, the investigator can look for subtle differences of meaning in the research domains across studies. In the current study, two different exploratory factor analysis procedures provided a mode of comparison of the structure of the variables in the study sample and the comparison sample. Principal components extraction and varimax rotation were performed in order to calculate the number of factors and percent of variance explained. Results of the first exploratory factor analyses are shown in table 4.9. The number of factors, amount of variance explained and factor loadings of items were visually compared. Three of the scales had the same number of factors in both samples and the same pattern of item loadings on the factors; the Clinical subscale of the HCS, Perceived Health Status, and Value of Use. The majority of the scales had essentially the same factor structure with the minor differences specified in the next paragraph.

Situational Influences, the Internal subscale of the MHLC and Self-efficacy had one item each that loaded on a different factor across studies. The Powerful Others subscale of the MHLC had two items that exchanged places on factor loadings. In the Health competence scale two of the three factors in the current study merged into one factor in the
### Table 4.9 Number of Factors and Variance Explained in Two Samples

<table>
<thead>
<tr>
<th>Scale</th>
<th>Current Sample</th>
<th>Blue Collar Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Factors</td>
<td>Percent of Variance Explained</td>
</tr>
<tr>
<td>Situational Influences</td>
<td>3</td>
<td>58</td>
</tr>
<tr>
<td>MHLC Internal</td>
<td>2</td>
<td>57</td>
</tr>
<tr>
<td>MHLC Chance</td>
<td>3</td>
<td>66</td>
</tr>
<tr>
<td>MHLC Powerful Others</td>
<td>2</td>
<td>41</td>
</tr>
<tr>
<td>Health Competence</td>
<td>3</td>
<td>66</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>2</td>
<td>59</td>
</tr>
<tr>
<td>HCS Clinical</td>
<td>1</td>
<td>55</td>
</tr>
<tr>
<td>HCS Nonclinical</td>
<td>1</td>
<td>47</td>
</tr>
<tr>
<td>Perceived Health</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>Benefits</td>
<td>5</td>
<td>62</td>
</tr>
<tr>
<td>Value of use</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>Barriers</td>
<td>3</td>
<td>53</td>
</tr>
</tbody>
</table>

### Table 4.10 Variance Explained by One Factor Solution in Two Samples

<table>
<thead>
<tr>
<th>Scale</th>
<th>Current Sample</th>
<th>Blue Collar Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percent of Variance Explained</td>
<td>Range of Factor Loadings</td>
</tr>
<tr>
<td>Situational Influences</td>
<td>32</td>
<td>.2-.7</td>
</tr>
<tr>
<td>MHLC Internal</td>
<td>40</td>
<td>.3-.8</td>
</tr>
<tr>
<td>MHLC Chance</td>
<td>33</td>
<td>.2-.7</td>
</tr>
<tr>
<td>MHLC Powerful Others</td>
<td>33</td>
<td>.5-.7</td>
</tr>
<tr>
<td>Health Competence</td>
<td>32</td>
<td>-.07-.8</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>34</td>
<td>.5-.7</td>
</tr>
<tr>
<td>HCS Clinical</td>
<td>56</td>
<td>.5-.8</td>
</tr>
<tr>
<td>HCS Nonclinical</td>
<td>46</td>
<td>.6-.8</td>
</tr>
<tr>
<td>Perceived Health</td>
<td>45</td>
<td>.5-.7</td>
</tr>
<tr>
<td>Benefits</td>
<td>21</td>
<td>-.2-.7</td>
</tr>
<tr>
<td>Value of use</td>
<td>66</td>
<td>.6-.9</td>
</tr>
<tr>
<td>Barriers</td>
<td>32</td>
<td>.2-.8</td>
</tr>
</tbody>
</table>
comparison sample. In the Nonclinical subscale of the HCS the one factor split into two for the comparison sample. The remaining 3 subscales, the Chance subscale of the MHLC, Benefits and Barriers, had different numbers of factors and different patterns of variable loadings, indicating a notably different structure of the variables.

Since each scale was hypothesized to represent one theoretical construct, a second set of factor analyses was done using principal components extraction and forcing the solution to one factor (Table 4.10). The factor loadings of items and amount of variance explained were visually compared. Six scales appeared very similar across the two studies when comparing amount of variance explained (>30%) and the strength of the item loadings on the factor (> .4): the Powerful Others subscale of the MHLC, the Clinical subscale of the HCS, the Overall Wellness Subscale of the HCS, Perceived Health Status, and Value of Use of Hearing Protection. Two scales had similar factor structures in that they shared items with low loadings (< .4). The item "If I become sick, I have the power to make myself well again" from the Internal subscale of the MHLC loaded weakly (.3, .3) on the factor in both studies. The Barriers scale item "Pressure from co-workers can often get in the way of wearing hearing protection", loaded weakly (.2, .3) on the factor in the current study and comparison study respectively.

Most of the remaining scales had only one or two items with low factor loadings in either or both studies: Situational Influences, the Chance subscale of the MHLC, Health Competence, Self-efficacy, and Benefits. Only one of these scales included more than two items with low factor loadings; the Benefits scale had five items in the current study and three from the comparison study that loaded weakly on the factor. In addition, the Benefits scale exhibited the least amount of variance explained in the factor, 21% for the current study and 28% for the comparison study. A review of the items in the current study that loaded less than .4 on the single factor revealed two trends that may have compounded the reading difficulty of the items. Three of the items included the word "effective", for example "it does not effectively block out noise for me". Five of the items were reversed,
increasing their complexity, for example, "It's debatable if wearing hearing protection will lessen my chances of becoming hard of hearing". Other items may not have been relevant to the worker situation, for example two situational influences items referred to ear muffs, yet they were not routinely available in the plants and workers may not have known what they were. The only items that may have been related to Mexican American culture are two items on Locus of Control of Health, "If I become sick, I have the power to make myself well again" and "Even when I take care of myself, it's easy to get sick".

In summary, the first factor analyses determined that the majority of the scales had essentially the same factor structure between the two studies; exceptions were the Chance subscale of the MHLC, Benefits and Barriers which had different factor structures. The second factor analyses suggested that six of the scales appeared very similar across the two studies and two additional ones, the Internal subscale of the MHLC and Barriers, were similar in that they had the same item with a low loading on the factor. Five of the scales had items not loading strongly on the one factor in either or both studies; Situational Influences, the Chance subscale of the MHLC, Health Competence, Self-efficacy, and Benefits.

**Evidence of Validity from Prediction**

Predictive validity is important to evaluate when the purpose of an instrument is to establish a statistical relationship with a particular variable (Nunnally, 1978). In the current study, the instruments are intended to measure theoretical constructs related to the use of hearing protection, therefore predictive validity is an important issue.

First, an examination of the current study's correlation matrix of the "predictor variables" and use of hearing protection (Table 4.6) indicates small (.10) to moderate (.30) correlations of several variables with the dependent variable (Cohen & Cohen, 1975). These modest correlations with the dependent variable suggest that the instruments are useful in predicting use of hearing protection. Next, the correlation matrix of a comparison
sample of primarily non-Hispanic White blue collar workers (Lusk et al., 1993) (Table 4.11) is compared with that of the study sample (Table 4.6). Differences are noted in the direction of 11 of the relationships between variables. The correlation matrices provided the data for a correlogram, a simple technique used in this case to reduce the data and explore the structure of the set of variables in each sample in order to facilitate comparison. All Pearson correlation coefficients above 0.2 were depicted as linkages drawn between circles representing Use of Hearing Protection and cognitive-perceptual factors. Figure 4.4 displays the cluster of relationships among cognitive-perceptual factors and Use of Hearing Protection.

In comparison, the correlogram depicting Use of Hearing Protection and cognitive-perceptual factors of the comparison sample are shown in Figure 4.5. The visual displays show similarity in the configuration of use of hearing protection and three of the variables: self-efficacy, benefits and barriers. Relationships unique to the study sample are those of a Clinical Definition of Health and Perceived Health Status with Use of Hearing Protection. Similarly, one variable was unique to the comparison sample, Value of Use of Hearing Protection. In summary, the interrelationships of the variables were similar in the current study and the comparison study.

5. Derive patterns and themes from focus group data in order to verify and add to the concepts in the theoretical model by using methodological triangulation.

Data Reduction

The data reduction process converted the 332 statements in the raw data to 152 chunks of data; 53 chunks (segments of text) from Group 1 and 99 chunks from Group 2. Gender representation in the data was examined by sorting and counting the statements by gender of the speaker. In the first group, the majority of the statements were made by women (77) whereas men had made 48 statements. In the second group more of the
Table 4.11 Pearson Correlations Among Cognitive-Perceptual Factors and Use of Hearing Protection of Comparison Sample a

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mean use of hearing protection</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. MHLC Chance</td>
<td></td>
<td>-.14**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3. MHLC Internal</td>
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<td>-.03</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. MHLC Powerful Others</td>
<td></td>
<td>.05</td>
<td>.22**</td>
<td>.21**</td>
<td>1.00</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5. Health Competence</td>
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<td>.10*</td>
<td>-.42**</td>
<td>.20**</td>
<td>-.15**</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Self-efficacy</td>
<td></td>
<td>.50**</td>
<td>-.16**</td>
<td>.10*</td>
<td>-.02</td>
<td>.32**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. HCS Clinical</td>
<td></td>
<td>-.01</td>
<td>.10*</td>
<td>.10*</td>
<td>-.03</td>
<td>.05</td>
<td>-.02</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. HCS Overall Wellness</td>
<td></td>
<td>.10*</td>
<td>-.11</td>
<td>.28**</td>
<td>.07</td>
<td>.30**</td>
<td>.18**</td>
<td>.50**</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Perceived Health</td>
<td></td>
<td>.10*</td>
<td>-.27**</td>
<td>.22**</td>
<td>-.09</td>
<td>.51**</td>
<td>.24**</td>
<td>.11*</td>
<td>.23*</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>10. Benefits</td>
<td></td>
<td>.51**</td>
<td>-.29**</td>
<td>.11*</td>
<td>.01</td>
<td>.25**</td>
<td>.50**</td>
<td>-.05</td>
<td>.15**</td>
<td>.18**</td>
<td>1.00</td>
</tr>
<tr>
<td>11. Barriers</td>
<td></td>
<td>-.59**</td>
<td>.29**</td>
<td>-.11*</td>
<td>-.01</td>
<td>-.25**</td>
<td>-.56**</td>
<td>.04</td>
<td>-.12**</td>
<td>-.18**</td>
<td>-.68**</td>
</tr>
</tbody>
</table>

* p ≤ .05,  ** p ≤ .01

a Lusk, Ronis & Kerr, 1994
Figure 4.4. Correlogram of Cognitive Perceptual Factors and Use of Hearing Protection in the Study Sample.

Self-efficacy

Benefits

Barriers

Clinical Definition of Health

Perceived Health Status

Use of Hearing Protection

Note: Based on Pearson correlation coefficients of .2 or higher.
Figure 4.5. Correlogram of Cognitive Perceptual Factors and Use of Hearing Protection in the Comparison Sample.

Note: Based on Pearson correlation coefficients of .2 or higher.
statements were made by men (117) compared to women (90). Combining data from the two groups resulted in an approximately equal distribution of statements by gender.

**Provisional Categories**

The next step involved two processes, coding and sorting, in order to achieve provisional categories of data. Data chunks were given one or more short codes to summarize their contents, yielding 17 codes derived from the two focus groups.

Next, the data chunks were sorted into categories according to their codes. This was an iterative process as there was initially considerable redundancy of data chunks among the lists due to multiple codes. Care was taken to preserve redundancy of a data chunk in different categories when it was indicative of different concepts within a chunk. However, an attempt was also made to assure that the data in each category were similar to each other, yet distinct from the other categories. In order to identify any cultural patterns in the data that might have been missed by the author, a Mexican American researcher familiar with qualitative methodology reviewed the provisional categories and raw data. No additional categories emerged.

**Emergent Patterns**

The provisional categories of data chunks served as the medium for conclusion drawing and further verification through the researcher's reflection, consistent with the methodology proposed by Miles and Huberman (1984). The categories were scanned for patterns within categories and among categories. Three operations took place in this phase; some categories were split, other categories were merged and all resulting categories were redefined with pattern codes and narrative to describe the emergent patterns.

As shown in Table 4.12, 16 pattern codes were derived from the data and half the pattern codes were common to both focus groups while four were unique to Group 1 and three were unique to Group 2.
Table 4.12 Emergent Pattern Categories Derived from Focus Group Data

<table>
<thead>
<tr>
<th>Table</th>
<th>Emergent Pattern Categories</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Noise hinders concentration at work.</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>2</td>
<td>Concentrating at work, able to ignore noise</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>3</td>
<td>Mood affects how much noise bothers me</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>4</td>
<td>Noise causes a bad mood</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>Hearing noise through the hearing protection</td>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td>6</td>
<td>Inconveniences of wearing hearing protection</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>7</td>
<td>Hearing protection preferences</td>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td>8</td>
<td>It's up to you</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>Awareness of high noise in plant</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>Awareness of consequences</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>You get used to the noise</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12</td>
<td>Plant management promotes hearing protection</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>Plant management doesn't promote hearing protection</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>14</td>
<td>Work team as modality for programs</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>15</td>
<td>Hearing protection not available</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>16</td>
<td>Hearing tests for all</td>
<td>O</td>
<td>X</td>
</tr>
</tbody>
</table>

X=pattern emerged in the group
0=pattern did not emerge in the group
The resulting pattern categories and examples of each will be described in the following section. Gender of the speaker is identified as (>F) female or (>M) male. In order to facilitate interpretation of the pattern categories, they are displayed in relation to emergent themes in a dendrogram (Figure 4.6). Exemplars of the pattern categories derived from the data are displayed in tables in Appendix D.

**Influence of Noise on Work**

**Noise Hinders Concentration at Work**

Workers described how noise affects their concentration at work:

1.1 >M Especially if your machine doesn't work good and you hear that noise, because you're not concentrating on your work, you're just hearing the noise of that machine that's not working right.

1.2 >F But if your machine has a loud noise, it gets to you, it gets to you. That's why I wear them. >L Ah, so you wear your plugs and that gets rid of some of the noise. >F If I don't wear them I can't do my quota, I can't go fast. It's too loud.

**Concentrating on Work, Able to Ignore the Noise**

Workers described concentrating at work and being able to ignore the noise. The initial statement describing a trance-like state met with much head-nodding and verbal agreement:

2.1 >M You get into a stage where you're in a limbo stage once you start working where it just drowns out all sound. Or at least to me it does. And ah somehow it just drains out, you don't even listen to it once you're in a pace, you pace yourself. After a while it's all gone, it's all gone. Or at least to me. I don't even listen to it. I don't even pay attention to it I guess.. because you're in a limbo stage as you're working. >M Me too, that's how I work.

In contrast workers described a "reality stage" where the workers realized they were at work. Associated with concentrating was a "rhythm" or a "pace". This rhythm was apparent on a tour of the work area as the researcher noticed a male worker who was operating a machine and sorting in such a way that he appeared to be playing a set of drums. The supervisor acknowledged this as a work style some workers adopt.
Figure 4.6 Dendrogram of Pattern Categories Related to Use of Hearing Protection

Factors Related to Use of Hearing Protection

- Influence of noise on work
  - Noise hinders concentration at work
    - Concentrating at work, able to ignore noise
    - Mood affects the bother of noise
    - Noise causes a bad mood
  - Hearing noise through the hearing protection
    - Inconveniences of wearing hearing protection
    - Hearing protection preferences
  - Personal attitudes
    - It's up to You
    - Awareness of high noise in plant
    - Awareness of Consequences
    - You get used to the noise
  - Work environment
    - Management promotes HP use
    - Management doesn't promote use
    - Work Team as Modality for Programs
    - Hearing protection not available
    - Hearing Tests for All
2.2 >F You're concentrating on your work, you don't concentrate on the noise. >F You get your rhythm going (quiet laughs). You don't care about the other ones.

In one case concentrating on work was helped by using hearing protection:

2.4 >F I think sometimes you could forget you're at work thinking of something else. You forget about everybody else around you. >L You just focus >F especially if you're wearing the plugs. I forget about everything else and I just concentrate.

A Bad Mood Increases the Bother of Noise

In one case, the participant noticed that a bad mood increases the bother of noise for her, whereas it doesn’t bother her if she’s in a good mood:

3.1 >F It just bothers you... It depends on the mood you're in. Cause if you're in a good mood it doesn't matter pero (but) if you're in a bad mood and you hear all that noise ... That happens to me.

Noise Causes a Bad Mood

Participants noticed that noise at work causes a bad mood for themselves and others as noted in the following examples:

4.3 >F When I don't have the plugs, I get in a bad mood... I think that's why you talk to somebody and they snap.

4.4 > M Especially now that everybody has to hear the different machines on the teams... everybody's kind of like getting on everybody's nerves

Personal Experience with Hearing Protection

Hearing Noise Through the Hearing Protection

Hearing protection does not eliminate some bothersome noise. The group collectively groaned in response to the following description of noise going through the plugs:

5.1 >M ...when you're running your machine and something goes wrong, and you get a sharp sound and even though you have the plugs it goes through the plugs it's so high. Because the low kind of sounds it can stop, the high pitched ones it can't it just goes through. >M The kind that make your teeth grind. (all) Oooo (chorus).
Inconveniences of Using Hearing Protection.

Participants described the inconveniences or discomforts related to use of hearing protection at work. During the work day inconveniences were: accidentally popping earplugs out by the string, feeling claustrophobic, ears hurting, itching, feeling pressure, hot and moist. At the end of the work day, bothersome effects described were: talking loud after work in the parking lot or at home, feeling like the ear canal was stretched, and a popping feeling in the ear when removing hearing protection. Participants related these inconveniences in a light-hearted manner, laughing at their stories, yet it seemed apparent that they wore hearing protection in spite of these inconveniences. Two women stated that they like hearing protection in spite of the inconveniences:

6.0 >F I like them ...but then again you can't hear other things
6.18 >F I can't work without them anymore because I even forget to take them off. But I'd rather wear that and feel "whatever" than hear all the noise inside.

In one case a woman described an inconvenience that prevents her from wearing hearing protection:

6.2 >F I have to use them and I don't wear it... (My job) it's very boring and so I try to hear the music so I don't fall asleep. That's why I don't wear it.

Hearing Protection Preferences.

Participants described experiences with different types of hearing protection and voiced their preferences. Wearing types with or without a string was the focus of much of the discussion, for example:

7.3 >F Ya, that's why I like these because of the string. >M It's easier to keep track of them.
7.4 >M I don't like those (with string) because if you work all of a sudden you pick up your hand "pow" it pops. Like those. You don't even know it's there and you turn around it pops right out and that's what he's talking about..it hurts.
Personal Attitudes

It's Up to You

Participants stated "it's up to you" when it comes to wearing hearing protection and
furthermore the consequence of not wearing it is losing your hearing:

8.1 >F They don't make it mandatory. It's up to you if you want to take
care of your ears. I do, I don't want to become a deaf person.

8.3 >M Nobody can make you wear them it's all up to you. >F It's up to
the individual. >M If you want to lose your hearing it's all up to you. If
you want to protect your ears that's the way you go about it.

Awareness of High Noise in the Plant

Awareness of High Noise in the Plant was a concern raised in relation to the
company's redistribution of workers and their jobs into a new team concept to replace the
traditional assembly line concept. As a result, noisy operations were being integrated
throughout the plant instead of being isolated in high noise areas. As one worker described
the noise with the new team concept, "Now it's like you're putting a symphony together".
Workers expressed concern that the team concept was exposing more workers to noise and
that workers could get hurt unless they wore hearing protection.

9.1 >F Well I think that inside the plant it is very loud, the noise is very
loud so eventually somebody who doesn't wear the plugs, they're going to
get hurt in the future, they're going to have problems eventually.

9.2 >M And most people in their operation they didn't need to use those
(earplugs) and now they have to use them because the machines are so close
to them and it's louder.

Awareness of Consequences

The participants suggested that raising awareness of the health consequences of
noise would promote use of hearing protection.

10.3 >F See that's what I meant by educating the people because some
people are going to say "I don't need it". There's people like that. And if
you explain to them what it's going to be hurting then they'll understand
and they'll say "Pues ya, it's for my own health".
You get used to the noise

A recurring phrase when referring to noise, “used to it”, suggested the notion that you can get used to the noise. However, the pattern seemed almost incidental and was not dwelled upon. A statement by a worker who had been at the company for 20 years suggests that “you get used to it” may have been a belief in this workplace some time ago:

11.1 >F Years back we didn’t wear those plugs...we were used to the noise pero (but) now we start working without them and we can’t stand it, I can’t stand the noise any more.

Work environment factors

Plant Management Promotes Hearing Protection

Plant management promoting hearing protection use is effective in helping a worker to wear it as illustrated in the following statement:

12.5 >F Well I have five years with (the company) and when I was hired they said I have to wear them, and it depends on the supervisor. There are supervisors that are going to enforce it more than others and the one I had enforced it. So I got used to it right away. She was always checking and since I have my hair over my ears all the time, she would even come and go like that you know (motions as if lifting up hair). She's not here any more.

Plant Management Doesn’t Promote Use of Hearing Protection

On the other hand, plant management not encouraging or not enforcing use was displayed in these statements:

13.1 >F You mean if they encourage you? Nobody does.>M They don't tell you. >M Not the supervisor, nobody tells you to wear them.

13.2 >M If the nurse said it was mandatory to wear it they'd probably give everybody one but they don't, you've got to go in there.

Work Team as Modality for Programs

The work team was suggested as the modality for promoting use of hearing protection as exemplified in the following statements: Evidence of mutual support in the work team in Plant 2 when workers were helping each other to problem solve choice of hearing protection related to the inconveniences they experienced, e.g. "Try these Joe".
14.2 >F I think through the teams we could get information, show us how it's going to be.

14.3 >F I think that now that we're working as a team and that we're all together actually, one thing that will help definitely is to educate, education for the people so they can understand why we should be wearing those things...they don't realize and education helps.

In one case, peers in the work team are suggested as the interveners who could talk to those who don't wear hearing protection:

14.1 >F The people that are wearing them now, for example like her, or the people that wear them, could talk to other people that don't wear them.

**Hearing protection is not available.**

Statements from Plant 1 centered around availability of hearing protection being only through the managers or the nurse.

15.0 >M Well, first of all it's not available to you right there so you could just go and can get it, you have to ask the managers and they'll go and get it for you but sometimes they won't even listen to you or they'll forget it.

15.1 >F I always go to the nurse and she always has some so I go get them from her.

In the Plant 2, where in addition to the nurse being a source, boxes of hearing protection were located in various areas of the plant, discussion focused on supply and demand of the popular types.

15.4 >F When I see the box I get enough (laughs) you know but sometimes you can't.

Participants laughingly suggested that people want "the ones that go with your clothes" or the ones that make a fashion statement:

15.7 >M I notice the orange ones go fast...almost like a fashion statement or something.

**Hearing Tests for All**

Several participants suggested and others agreed that hearing tests should be provided for all workers. The workers' concern over their increased exposure to noise in the plant was due to the recent change of distribution of noisy machines throughout the plant with the new team approach:
Triangulation

The purpose of using methodological triangulation was to verify and add to the factors related to use of hearing protection suggested by the Theoretical Model. Three concepts in the theoretical model received verification in the statements made by participants in two focus groups: Situational Influences for Use of Hearing Protection, Barriers to Hearing Protection and Interpersonal Influences on Use of Hearing Protection.

Situational Influences are broadly defined by Pender (1987), as situational or environmental determinants of health behavior. The pattern category "Hearing protection is not available" not only fits the definition of the theoretical concept, but also matches seven items in the Situational Influences instrument used in the current study. The focus group data also suggested that a more specific situational influence, availability of the preferred types of hearing protection, might be an issue affecting use of hearing protection.

The Perceived Barriers to Use of Hearing Protection concept, defined as the potential negative aspects of a particular health action (Pender, 1987) is verified in two pattern categories, "Inconveniences of wearing hearing protection" and "Hearing noise through the hearing protection". Several of the inconveniences mentioned in the focus groups are included in items in the instrument used to measure the Barriers concept in the current study; feeling closed off from the world, ears hurt, and not hearing what I want to. Hearing protection not effectively blocking out noise is also addressed in one of the instrument items.

The concept Interpersonal Influences on Hearing Protection, broadly defined as expectations of significant others, family patterns of health care, and interactions with
health professionals (Pender, 1987), is exemplified in two pattern categories; "Plant Management Promotes Hearing Protection" and "Plant Management doesn't promote use of hearing protection". The focus group data were very general on these matters, describing supervisors telling or not telling workers to wear hearing protection. Two of the instruments measuring Interpersonal Influences in the current study, Social Norms for Hearing Protection and Interpersonal Support for Hearing Protection, appear to reflect these two categories. Social Models, the modeling of hearing protection use, did not appear in the focus group data.

Pattern categories from the data that suggest additional factors related to use of hearing protection that are not encompassed by the theoretical model are listed in relation to their themes. The influence of noise on work might affect choices to use hearing protection: noise hinders concentration at work, yet people concentrate at work and are able to ignore the noise, mood affects the bother of noise, and noise causes a bad mood. Personal experience with hearing protection such as hearing protection preferences can influence use of hearing protection, for example in relation to hearing protection available. Personal attitudes can influence the frequency of use of hearing protection: it's up to you, awareness of high noise in the plant, awareness of the consequences, and you get used to the noise. Aspects of the work environment can influence hearing protection behavior: the work team as a modality for programs and hearing tests for all.

Summary

In summary, 16 pattern categories related to use of hearing protection were derived from statements made by participants in two focus groups. These pattern categories were displayed as clusters within four themes: the influence of noise on work, personal experience with hearing protection, personal attitudes and the work environment. The emergent patterns were related to three concepts in the theoretical model (Situational Influences for Use of Hearing Protection, Barriers to Hearing Protection and Interpersonal
Influences on Use of Hearing Protection) and the items in the instruments, providing verification of the theoretical concepts in the model. Proposed additional concepts related to use of hearing protection were derived from the pattern categories in all four themes.
The purpose of this study was to identify factors that influence the use of hearing protection among Mexican American workers. The following sections will offer limitations of the study, discussion of results and conclusions.

Limitations of the Study

The following limitations reduce the confidence with which the findings of this study can be generalized to other populations of English-speaking Mexican American workers. There was great difficulty in recruiting a company with large numbers of Mexican Americans exposed to noise in their work, in fact 23 companies in six states were contacted before a worksite was recruited. Once a company was recruited there was a limited choice of participants because of the small proportion of employees in the recruited company who spoke and read English. This limitation in turn resulted in a change in the definition of the sample with respect to hearing protection requirement. The intended sample would have been required to wear hearing protection. Instead, many of the participants were not required to wear hearing protection, thus adding another variable into the equation and decreasing the power of the analyses.

Instrument reliability was low on several scales. One explanation is that language or culture influenced the meaning of words or entire items in the instruments, resulting in unreliability. Alternatively, for the instruments specific to use of hearing protection, unreliability could be a result of the irrelevance of items about hearing protection for those who have never been required to wear it.
A limitation of the focus group data is that participants were not all required to wear hearing protection in one of the groups, therefore conclusions based on that group may represent a diversity of perspectives including those of individuals who choose to wear hearing protection although it is not required, and individuals who have never worn it because it is not required. Ideally the focus groups would have been homogeneous with respect to hearing protection requirement.

Lastly, within a cross sectional design, it is impossible to show the direction of causality of the variables, the causality is only implied by theory. For example, it is possible that behavior is influencing the attitudes and perceptions of workers rather than the reverse which is implied by the theoretical model of this study.

**Discussion of Results**

**Use of Hearing Protection**

An unexpected subcategory among workers in the sample, hearing protection required or not required, was responsible for significant differences in the frequency of use of hearing protection among workers. As expected, hearing protection requirement resulted in more frequent use of hearing protection than when it was not required. However, workers required to wear hearing protection only wore it an average of 72% of their work time, indicating that mandating hearing protection use does not guarantee the behavior. A surprising finding was the extent to which workers who were not required to wear hearing protection reported wearing it (Mean=27% of the time). Interviews with such individuals might provide insight into additional predictors of use of hearing protection not tested in this study.

The high reliability coefficient of the dependent variable, use of hearing protection, must be viewed with skepticism as it very likely represents correlated (systematic) error. One possible source of error is recall bias which may systematically influence the accuracy
with which participants report their use of hearing protection in the past week, past month and past three months. Inaccurate reporting of behaviors perceived as socially desirable is another systematic influence that could be operating. However, Lusk, Ronis and Baer (in press), in addressing this concern, found that observed use of hearing protection and self-reported use were highly correlated ($r=.89$) in a sample of primarily non-Hispanic White blue-collar workers. In the current study there is no way to estimate the extent of correlated error in the self-report measure.

**Descriptive Analyses of Cognitive-Perceptual and Modifying Factors**

The scores on all of the predictor variables in the current study correspond closely with those of the sample of non-Hispanic White blue collar workers (Lusk et al., 1993). Of special interest are the findings on Locus of Control of Health which agree with those of Garza and Ames (1976) in contradicting the stereotypes of Mexican American fatalism and external control. While the mean scores of all predictor variables were similar to those of the comparison sample, their comparability is a concern due to some low reliability coefficients and the issue of validity of the measures for Mexican Americans in the current study. In comparing scores across groups one must not assume that what is being measured is the same for both samples of workers. This concern was addressed through a comparison of factors across the two studies which indicated fairly consistent measurement for all but the Benefits scale.

Scores of two measures in this study can be compared with those of other Hispanic samples in the literature. Mean scores for the three Multidimensional Health Locus of Control subscales were very similar when compared to those of the Weitzel and Waller (1990) study of 48 Hispanic, primarily male skilled, semi-skilled and unskilled workers (ages 20's and 30's). Although direct comparison is inappropriate because of age group and employment differences, participants in this sample were slightly more optimistic about their health status than the Mexican American sample (age 12 to 74 years) in the HHANES
(COSSMHO, 1988); 75% thought that their health was excellent or good, whereas 70% of the HHANES Mexican American sample thought that their health was excellent, very good or good.

The lack of a significant relationship of education and acculturation level was in contrast with the usual finding that there is a positive relationship (Marin & Marin, 1991). Also surprising was the negative direction of the association, implying that the more educated the individual, the less acculturated in their language use. Further analysis indicated that one item was significantly and negatively related to education level, language spoken at home, implying that more educated individuals are more likely to speak Spanish at home. One explanation for this finding would be that more educated individuals value maintaining Spanish language for their children, therefore they speak it at home.

The relationship of lower acculturation level with higher scores on three of the other predictor variables; Social Norms, Social Models and Value of Use of Hearing Protection; might be explained by response styles. According to Marin & Marin (1991), there is some evidence that Hispanics prefer extreme responses on questionnaires, and that this tendency is more prevalent among less-acculturated Hispanics. For example, given a 6-point Likert scale, Hispanics would be more likely to choose "strongly agree" or "strongly disagree" whereas non-Hispanics would choose the other categories with equal probability. A cultural factor that sheds light on this tendency is a belief that extreme responses are more sincere and that middle-range responses are a way of hiding real feelings by presenting them in a moderated way (Marin & Marin, 1991). Acquiescence response set is a special type of extreme response set in which subjects are more likely to agree with a statement or answer yes in responses on surveys (Marin and Marin, 1991). In a recent analysis of four data sets including 1908 Hispanics, Marin, Gamba, and Marin (1992) also found that less acculturated Hispanics were more likely to give acquiescent responses. Positive responses to the Social Norms and Social Models scales would also be consistent with the Mexican
American value of "respeto" whereby deference and respect are held for others or the value "simpatia" representing harmonious and pleasant interpersonal relationships.

**Predictors of Use of Hearing Protection**

The most important predictors of use of hearing protection were the Clinical subscale of the Health Conception Scale and Benefits Minus Barriers followed by Self-efficacy in the Use of Hearing Protection and Perceived Health Status. Although the relative importance of the variables is different, comparison with the study of blue collar workers by Lusk et al. (1993) reveals some similarities: Benefits of Use of Hearing Protection, Barriers to Use of Hearing Protection and Self-efficacy in the Use of Hearing Protection were important predictors in both studies. These findings are consistent with the those of Pender, Walker, Frank-Stromborg & Sechrist (1990) that behavior-specific factors have the strongest direct relationships with behavior. In the Hispanic health literature, behavior-specific self-efficacy has been predictive of other health behaviors, performing breast self-examination (Gonzalez & Gonzalez, 1990), exercising (Hovell et al., 1991), and avoiding cigarette smoking (Sabogal et al., 1989). Similarly, behavior-specific barriers have been predictive of mammography use (Stein, Fox & Murata, 1991) and exercise (Hovell et al., 1991). The finding in the current study that a Clinical Conception of Health and Perceived Health Status influence a specific health behavior appears to be a new finding in Hispanic health research. Surprisingly, in view of the Mexican American cultural values of familialism and allocentrism, Interpersonal Support for hearing protection was not part of the explanatory model. Measurement of the construct may need to be refined to be sure it represents dimensions of Interpersonal Support that are relevant to Mexican Americans.

In this study the exploratory regression analysis of use of hearing protection on the modifying factors while controlling for the cognitive-perceptual factors yielded two additional predictors: hearing protection requirement and plant site. The effect of hearing
protection requirement on use of hearing protection is not surprising since this requirement represents an array of institutional influences designed to promote hearing conservation. However, the effect of plant site when other factors are controlled suggests that there are institutional effects on behavior that are not represented in the current theoretical model or the instruments measuring the theoretical constructs, a fact also noted by data collectors in the comparison study by Lusk et al. (1993). Policy and work environment factors represented by these two predictors need to be explicated in the model. Not surprisingly, the one predictor that dropped out of this model was self-efficacy, the only cognitive-perceptual factor significantly related to a modifying factor. Self-efficacy apparently functions as a mediator between education level and use of hearing protection (Lindley & Walker, 1993). The large amount of variance explained by the exploratory model ($R^2=.55$, adj. $R^2=.45$) compared to the theoretical model suggests that modifying factors influence health behavior directly in addition to the indirect effect through cognitive perceptual factors. The finding that modifying factors had significant direct paths to use of hearing protection is in agreement with recent empirical findings based on the Health Promotion Model (Johnson et al., 1993; Lusk et al., 1994; & Pender, Walker, Frank-Stromborg & Sechrist, 1990).

These results must be interpreted with caution due to the unreliability of some of the scales. For example, it is possible that other constructs would have been significant predictors of use of hearing protection had they been measured with less error. The strength of the relationships and therefore the order of importance of the variables might also have been different with more reliable measurement. Validity of the instruments is also a reason for cautious generalization of the results. Most concepts appeared to be equivalent to those in a comparison study of blue collar workers by Lusk et al. (1993) upon visual comparison of the factors using factor analysis. However the Benefits of Use of Hearing Protection concept may not have been measured adequately in this sample as evidenced by multiple items not loading adequately on the factor. Yet the significant
correlation of Benefits with use of hearing protection suggests that the concept as measured is useful in explaining hearing protection behavior, therefore instrument refinement and successive verification of the Benefits concept with other Mexican American samples is recommended.

**Focus Groups**

The approach taken in the focus groups was to trigger discussion about experiences with noise and hearing protection without imposing the theoretical model concepts on participants. Regardless of these precautions, the fact remains that all participants had completed a questionnaire based on the theoretical model prior to the focus group; therefore the content of the discussion may have been influenced by this fact. Pattern categories derived from the focus group provided the basis for triangulation with the quantitative research findings.

**Triangulation**

The concept Barriers to Use of Hearing Protection was verified in the focus group data and was also a significant predictor of use of hearing protection in the path analysis, confirming its importance in workers' decisions to use hearing protection. Additional concepts derived from the focus groups may be useful in explaining use of hearing protection. These concepts could serve as a beginning for further instrument refinement and theory development.

**Conclusions**

**Implications for Research**

Instrument refinement is needed for the instruments that demonstrated poor reliability or validity with this sample of workers. Unreliability may have come from
several sources, for example, changed meaning of items due to language or cultural factors, or irrelevance of items on hearing protection due to non-requirement of hearing protection for over half the sample. Focus group themes could provide direction for refinement of the Benefits and Situational Influences for Hearing Protection instruments. Improvement of the measure of Benefits might be attained by expanding the content to include affective benefits of use currently measured by items reflecting physiological benefits such as protecting hearing. For example, items measuring new dimensions of Benefits derived from the theme "influence of noise on work" would suggest that use of hearing protection prevents noise-related bad moods and promotes concentration at work. Similarly, the Situational Influences concept could be expanded to include availability of the worker's preferred type of hearing protection as suggested by the statements within the pattern category "hearing protection is not available".

Instrument development is needed for the plant site and hearing protection requirement variables both found to be significant predictors of hearing protection use in this study. These factors need to be measured more explicitly in order to describe the process of their effect on workers' use of hearing protection. Future research would sample multiple perspectives through interviews with corporate and plant health and safety personnel and interviews or focus groups with workers to define the domain of related variables for instrument development. From the current study, focus group pattern categories within the Work Environment theme could provide the content for some of the research questions for the interviews; for example, questions would reflect the degree to which the work team interacts on the issues of noise exposure and hearing protection and the workers' perceptions of the meaning of hearing tests in relation to their use of hearing protection.

Other concepts are promising as additional factors not currently included in the theoretical model and these would need instrument development if they are verified in future research. For example, the personal attitude "it's up to you" may be a powerful
predictor of use regardless of the extent of environmental factors affecting use. Another example comes from a rather intriguing pattern category, "concentrating at work, able to ignore the noise". Further verification of this phenomenon is important to determine its influence on acceptance of hearing protection equipment. For example, individuals who have developed the ability to concentrate and ignore noise over time may be reluctant to replace a comfortable work habit with the behavior change involved in wearing hearing protection every day.

Predictors of the use of hearing protection identified in the current study could be cautiously generalized to English-speaking Mexican American workers with a bicultural acculturation level. Further research is needed to replicate these findings with Mexican Americans representing a range of acculturation levels, from Spanish-speaking less acculturated to English-speaking more acculturated Mexican American workers. Cultural equivalence of the concepts and their measures could be achieved by adopting a decentered model of instrument development exemplified by Phillips, Luna de Hernandez and Torres de Ardon (1994) in which translation is iterative between two languages and concepts are added to the model to make the conceptualizations more comparable within the group. Although decentering is complex and time-consuming (e.g. 2 years), the research results are more valid and culturally equivalent.

Implications for Occupational Health Practice

These results suggest that for the current sample, workers' use of hearing protection could be supported by promoting benefits of use, decreasing perceived or actual barriers to use, promoting a sense of self-efficacy in use and relating a clinical conception of health to use of hearing protection. In addition, those with a lower educational level may be more likely to need interventions to increase their self-efficacy in using hearing protection.
Hearing protection requirement, an indicator of safety policy, did appear to have considerable impact on the use of hearing protection. All three plants followed the company policy based on OSHA (1980) requirements for hearing conservation programs. For workers in operations that were louder than 85 decibels, hearing protection was made available, hearing tests were done annually and hearing conservation education done annually. While safety policy did not result in 100% compliance with use of hearing protection, its effectiveness must be recognized by building future interventions in tandem with the standard safety policies.

Implications for Theory

Contrary to the theoretical model for this study, two modifying factors, site and hearing protection requirement, had direct relationships with the dependent variable when other modifying factors and cognitive-perceptual factors were controlled. Proposed revisions of the Health Promotion Model have incorporated direct effects of modifying factors on behavior (Pender, Walker, Frank-Stromborg & Sechrist, 1990). These two concepts could be explicated within the Health Promotion Model concepts Situational Influences and Interpersonal Influences on use of Hearing Protection.

In this study, two predictors were behavior-specific, Self-Efficacy in the Use of Hearing Protection and Benefits Minus Barriers and two were health-related, a Clinical Conception of Health and Perceived Health Status. These findings are consistent with revisions in the Health Promotion Model (Pender, Walker, Frank-Stromborg & Sechrist, 1990) proposing that behavior-specific influences have the strongest direct relationships to behavior and that health-related influences (non behavior-specific) have a direct relationship with behavior as well as an indirect relationship through behavior-specific influences.

Some of the pattern categories may add new concepts to the theoretical model, for example attitudes such as "it's up to you" and "you get used to the noise" do not appear to be represented in the current concepts. Further verification empirically to clarify their
meaning could be followed by determination of where they would fit within the theoretical model. Instrument development to measure these new concepts could strengthen the predictive ability of the theoretical model for Mexican American workers' hearing protection behavior.

**Summary**

A theoretical model adapted from the Health Promotion Model (Pender, 1987) provided the framework for the current study. Factors that influenced the use of hearing protection in a sample of Mexican American workers were Benefits of Use of Hearing Protection Minus Barriers to Use of Hearing Protection, a Clinical Conception of Health, Self-efficacy in the Use of Hearing Protection, Perceived Health Status and Educational Level indirectly through Self-efficacy. These factors together explained 25% (Adjusted $R^2=.19$) of the variance in Use of Hearing Protection. An additional multiple regression to explore direct effects of modifying factors on the dependent variable showed that two modifying factor variables, hearing protection requirement and plant site, and the cognitive-perceptual factors were directly related to Use of Hearing Protection ( $R^2=.55$, Adj. $R^2=.45$). These findings must be interpreted with caution due to unreliability of several of the instruments.

Focus group interviews provided the data to verify factors in the theoretical model and explore additional factors that could be related to use of hearing protection. Those verified in the data were Situational Influences for Use of Hearing Protection, Barriers to Use of Hearing Protection and Interpersonal Influences on Use of Hearing Protection. Additional factors suggested by pattern categories fit into four themes: personal attitudes, personal experience with hearing protection, influence of noise on work, and the work environment.

In summary, these findings demonstrate the complexity of human behavior and the richness of the worker's experience in relation to noise in the workplace. Directions for
future research with this worker population are suggested based on the study findings. Empirical verification of the concepts derived from the focus groups would provide new building blocks for a revised theoretical model. Instrument refinement to improve measurement of concepts in the current theoretical model and instrument development to create measures for the new concepts would pave the way for further testing of the model. Instrument development would be accomplished through interviews with key informants in the worksite and focus groups with Mexican American workers. In future focus groups, a recommendation is to assure that groups are homogeneous with respect to hearing protection requirement. Finally, findings from the current study could form the basis of a pilot intervention to promote use of hearing protection for English-speaking workers in the participating company. The pilot intervention would further test the theoretical model by verifying its "problem-solving effectiveness" (Silva & Sorrell, 1992, p. 19). Outcomes measured in a pilot intervention to increase use of hearing protection would be changes in cognitive-perceptual factors and intention to use hearing protection post-intervention.
APPENDICES
APPENDIX A

QUESTIONNAIRE
VOLUNTARY INFORMED CONSENT

I agree to participate in the research study conducted by Dr. Sally L. Lusk and Madeleine Kerr, nurse researchers at the University of Michigan School of Nursing. I understand that the study will explore beliefs about health and the use of protective equipment.

It will take 35-45 minutes for me to complete the written questionnaire today.

No risks or discomforts are expected as a result of this study. While it may not benefit me directly, the results of the study may help nurses in providing services and educational programs for workers.

If I should have any questions regarding this study, or wish to have my data withdrawn from the study, I can contact Madeleine Kerr this week at [phone number] or after that at [phone number] or by writing to her at the School of Nursing, Room 2153, 400 N. Ingalls Building, University of Michigan, Ann Arbor, MI 48109-0482.

I understand that I am free to decide to take part in the study or not take part in the study. The study can not be used to judge the quality of my work. Deciding not to participate can not cause me to be fired and will not change the care I receive from the nurses or doctors at the employee health center. I understand that I can withdraw my data until Sept. 15, 1993 when data analysis is expected to begin.

Data will be analyzed and reported as grouped data, with the confidentiality of individual participants assured by using only code numbers and no individual names.

I understand that I can read a report of the results of the study which will be sent to plant management for posting.

_________________________________________  _______________________________________
Printed Name                                              Researcher's Signature

_________________________________________  _______________________________________
Signature                                              Date

copy to participant and investigator's files

Code No._________________________
FOCUS GROUP

VOLUNTARY INFORMED CONSENT

I agree to participate in the research study conducted by researchers at the University of Michigan School of Nursing. I understand that if I agree to participate in the study, I will go to a group meeting with about 9 to 11 other workers. In the group meeting, called a focus group, we will discuss our experiences with hearing protection. This meeting will be tape recorded and written notes will be kept by one of the researchers. The notes will not use names and no one will be able to tell what any one person said.

No risks or discomforts are expected as a result of this study. While it may not benefit me directly, the results of the study may help nurses in providing services and educational programs for workers.

If I should have any questions regarding this study, or wish to have my data withdrawn from the study, I can contact Madeleine Kerr this week at [redacted] or after that at [redacted] or by writing to her at the School of Nursing, Room 2153, 400 N. Ingalls Building, University of Michigan, Ann Arbor, MI 48109-0482.

I understand that I am free to decide to take part in the study or not take part in the study. The study can not be used to judge the quality of my work. Deciding not to participate can not cause me to be fired and will not change the care I receive from the nurses or doctors at the employee health center.

Data will be analyzed and reported as grouped data, with the confidentiality of individual participants assured by using only code numbers and no individual names.

I understand that I can read a report of the results of the study which will be sent to management representatives for posting.

__________________________  __________________________
Printed Name                    Researcher’s Signature

__________________________  ________________________
Signature                    Date

cc: to participant and investigator’s files
APPENDIX B

FOCUS GROUP SCRIPT

As we explained after the questionnaire session a few days ago, we are interested in understanding workers' experiences of using hearing protection (ear plugs or muffs). We believe that good training programs can be designed with this information.

Before we get started with the discussion group I would like to explain this form called an informed consent. I want to be sure that each of you understands what you will be doing in this focus group and that you agree to participate. The group meeting will last about 30 to 45 minutes. During that time the group will talk about sounds they like and dislike, what they like and dislike about wearing hearing protection, things that help or don't help them to wear hearing protection at work, and types of programs or resources that they think would be helpful to encourage hearing protection.

You don't have to answer any questions you don't want to and you can stop being in the project at any time. No negative effects are expected whether or not you participate. You can ask questions at any time. The session will be tape recorded and all the information will be kept confidential. No names will be used in the research report. Do you have any questions? (If questions, answer them. If none or after answering the questions, have each participant sign two forms and give them one copy. The other copy goes back to the researchers' file).

To get started, would each of you please introduce yourself and tell us what kind of work you do and how long you have done this work.

Focus Group Questions:

1. Everyone has different likes and dislikes about everyday living. Sounds can be very pleasant or they can be a noisy nuisance to people. To start our discussion, we would like each of you to tell us about sounds that you like to listen to and sounds that you dislike.

2. All of you are exposed to noise (undesirable sounds) in your work but there can be many differences in how you experience noise and how you feel about hearing protection. We would like you to tell us about some of your experiences with working in noise and wearing hearing protection at work. (For example, some people have had to go through a time of adjustment until they became comfortable with a certain type of hearing protection, others have a type of work that depends on hearing certain noises and they worry about not being able to hear them with hearing protection on).

3. What kinds of things help you to wear hearing protection at work & what kinds of things do not help?

4. What kinds of programs or resources do you think would help workers to wear hearing protection at work?

Conclusion

Thank you for your participation in the focus group today. Your help is very important in the success of this project.
APPENDIX C
INSTRUMENTS

1. Demographic Characteristics
2. Interpersonal influences on use of hearing protection
3. Availability and Accessibility of Hearing Protection
4. MHLC Form B (Wallston & Wallston)
5. Perceived Health Competence (Wallston)
6. Self Efficacy in Use of Hearing Protection
7. Revised Health Conception Scale (Laffrey)
9. Benefits of Hearing Protection
10. Value of Use of Hearing Protection
11. Barriers to Use of Hearing Protection
12. Use of Hearing Protection
1. Demographics

1. Date of Birth: ___________________

2. Years of employment at this plant: ____________________________

3. Current job title: ____________________________

4. Marital status: (Circle number)
   1. Married
   2. Divorced
   3. Widowed
   4. Never married

5. Number of dependent children: ____________________________

6. Ethnic group: (Circle number*)
   1. Asian
   2. Black/African American
   3. White
   4. Hispanic (Please specify by circling letter)
      a. Mexican American
      b. Puerto Rican
      c. Central or South American
      d. Cuban
      e. Other. Please specify: _______
   5. Native American (American Indian)
   6. Other. Please specify: ____________________________

*If you feel that you belong to more than one ethnic group, circle the one which you identify with most strongly and write in the other here: ____________________________.

7. In general what language do you read and speak?
   1. Only Spanish
   2. Spanish better than English
   3. Both equally
   4. English better than Spanish
   5. Only English

What was the language(s) you used as a child?
   1. Only Spanish
   2. More Spanish than English
   3. Both equally
   4. More English than Spanish
   5. Only English
What language do you usually speak at home?
1. Only Spanish
2. More Spanish than English
3. Both equally
4. More English than Spanish
5. Only English

In which language do you usually think?
1. Only Spanish
2. More Spanish than English
3. Both equally
4. More English than Spanish
5. Only English

What language do you usually speak with your friends?
1. Only Spanish
2. More Spanish than English
3. Both equally
4. More English than Spanish
5. Only English

8. Education: (Circle the number for the highest level completed.)
1. Less than 8th grade
2. Completed 8th grade
3. Completed some high school
4. Graduated from high school
5. Completed trade school
6. Completed some college/university
7. Completed associate degree
8. Completed baccalaureate degree
9. Completed graduate degree
9. Gender: (Circle number)
   1. Male
   2. Female

10. Have you had a hearing test in the past five years?
    ______ NO (Stop Here)
    ______ YES (Please answer question #12)

11. Did you have any hearing loss in either ear?
    ______ NO (Stop Here)
    ______ YES (Please answer boxed questions #13 & #14)

12. Was this hearing loss in your **RIGHT EAR**?
    (Circle number)
    1. None
    2. Mild
    3. Moderate
    4. Severe
    5. I don't know

13. Was this hearing loss in your **LEFT EAR**?
    (Circle number)
    1. None
    2. Mild
    3. Moderate
    4. Severe
    5. I don't know
2. **Interpersonal Influences on Use of Hearing Protection**

How much do you think the following people expect you to wear hearing protection when you are in a noisy work environment? Place an X in the box for your answer.

<table>
<thead>
<tr>
<th>People Outside of Work</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Family members</td>
<td>Not at All</td>
<td>Sort of</td>
<td>A Lot</td>
</tr>
<tr>
<td>2. My closest friend</td>
<td>Not at All</td>
<td>Sort of</td>
<td>A Lot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>People At Work</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3. The worker I spend the most time with</td>
<td>Not at All</td>
<td>Sort of</td>
<td>A Lot</td>
</tr>
<tr>
<td>4. Supervisor at work</td>
<td>Not at All</td>
<td>Sort of</td>
<td>A Lot</td>
</tr>
<tr>
<td>5. Health clinic personnel (nurse, doctor)</td>
<td>Not at All</td>
<td>Sort of</td>
<td>A Lot</td>
</tr>
<tr>
<td>6. Safety personnel</td>
<td>Not at All</td>
<td>Sort of</td>
<td>A Lot</td>
</tr>
</tbody>
</table>
In general, how much do the following people do these things? Please put an X in a box under each person for your answer.

<table>
<thead>
<tr>
<th></th>
<th>Family</th>
<th>Friends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourage me to wear hearing protection</td>
<td>1. Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Praise me for wearing hearing protection</td>
<td>2. Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Criticize me for wearing hearing protection</td>
<td>3. Never</td>
<td>Sometimes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Coworkers</th>
<th>Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourage me to wear hearing protection</td>
<td>1. Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Praise me for wearing hearing protection</td>
<td>2. Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Criticize me for wearing hearing protection</td>
<td>3. Never</td>
<td>Sometimes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Health Personnel</th>
<th>Safety Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encourage me to wear hearing protection</td>
<td>1. Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Praise me for wearing hearing protection</td>
<td>2. Never</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Criticize me for wearing hearing protection</td>
<td>3. Never</td>
<td>Sometimes</td>
</tr>
</tbody>
</table>
In a normal week, how much do the following people wear hearing protection when exposed to noise? Please check a box under each person.

<table>
<thead>
<tr>
<th></th>
<th>Coworker I spend the most time with</th>
<th>Supervisor</th>
<th>Health Personnel</th>
<th>Safety Personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear hearing</td>
<td>Never</td>
<td>Sometimes</td>
<td>Often</td>
<td></td>
</tr>
<tr>
<td>protection</td>
<td>protection when</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>exposed to</td>
<td>Never</td>
<td>Sometimes</td>
<td>Often</td>
<td></td>
</tr>
<tr>
<td>noise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Multidimensional Health Locus of Control (MHLC) Form B

This is a questionnaire designed to determine the way in which different people view certain important health-related issues. Each item is a belief statement with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item we would like you to circle the number that represents the extent to which you disagree or agree with the statement. The more strongly you agree with a statement, then the higher will be the number you circle. The more strongly you disagree with a statement, the lower will be the number that you circle. Please make sure that you answer every item and that you circle only one number per item. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

Please answer these items carefully, but do not spend too much time on any one item. As much as you can, try to respond to each item independently. When making your choice, do not be influenced by your previous choices. It is important that you respond according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe.

1. If I become sick, I have the power to make myself well again.
2. Often I feel that no matter what I do, if I am going to get sick, I will get sick.
3. If I see an excellent doctor regularly, I am less likely to have health problems.
4. It seems that my health is greatly influenced by accidental happenings.
5. I can only maintain my health by consulting health professionals.
<p>| | |</p>
<table>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>I am directly responsible for my health.</td>
</tr>
<tr>
<td>7.</td>
<td>Other people play a big part in whether I stay healthy or become sick.</td>
</tr>
<tr>
<td>8.</td>
<td>Whatever goes wrong with my health is my own fault.</td>
</tr>
<tr>
<td>9.</td>
<td>When I am sick, I just have to let nature run its course.</td>
</tr>
<tr>
<td>10.</td>
<td>Health professionals keep me healthy.</td>
</tr>
<tr>
<td>11.</td>
<td>When I stay healthy, I'm just plain lucky.</td>
</tr>
<tr>
<td>12.</td>
<td>My physical well-being depends on how well I take care of myself.</td>
</tr>
<tr>
<td>13.</td>
<td>When I feel ill, I know it is because I have not been taking care of myself properly.</td>
</tr>
<tr>
<td>14.</td>
<td>The type of care I receive from other people is what is responsible for how well I recover from an illness.</td>
</tr>
<tr>
<td>15.</td>
<td>Even when I take care of myself, it's easy to get sick.</td>
</tr>
<tr>
<td>16.</td>
<td>When I become ill, it's a matter of fate.</td>
</tr>
</tbody>
</table>
17. I can pretty much stay healthy by taking good care of myself.

18. Following doctor's orders to the letter is the best way for me to stay healthy.
5. Perceived Health Competence

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>19. It is difficult for me to find effective solutions for the health problems that come my way.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>20. I find efforts to change things I don't like about my health are ineffective.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>21. I handle myself well with respect to my health.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>22. I am able to do things for my health as well as most other people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>23. I succeed in the projects I undertake to improve my health.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>24. Typically, my plans for my health don't work out well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>25. No matter how hard I try, my health just doesn't turn out the way I would like.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>26. I'm generally able to accomplish my goals with respect to my health.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
8. Self-Rated Health Subindex

Please answer the following four questions by placing a check (✓) next to the answer which you think best describes your own health.

1. How would you rate your overall health at the present time?
   a. _____ excellent
   b. _____ good
   c. _____ fair
   d. _____ poor

2. Is your health now better, about the same, or not as good as it was three years ago?
   a. _____ better
   b. _____ same
   c. _____ not as good

3. Do your health problems stand in the way of your doing the things you want to do?
   a. _____ not at all
   b. _____ a little
   c. _____ a great deal

4. Would you say that your health is better, about the same, or not as good as most people your age?
   a. _____ better
   b. _____ same
   c. _____ not as good
7. Reduced Health Conception Scale

DIRECTIONS: Below are 32 statements to describe the meaning that health or being healthy has for different people. Depending on your personal definition of health, you may either agree or disagree with the statements. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item, circle the number which best represents the extent to which you agree or disagree with the statement. The more strongly you agree with a statement the higher will be the number you circle. Please make sure that you answer every item and that you circle only one number per item. Since this is a measure of how you define health, there are no right or wrong answers.

Health or being healthy means:

1. Feeling great -- on top of the world. 1 2 3 4 5 6
2. Being free from symptoms of disease. 1 2 3 4 5 6
3. Not requiring a doctor's services. 1 2 3 4 5 6
4. Adjusting to life's changes. 1 2 3 4 5 6
5. Not requiring pills for illness or disease. 1 2 3 4 5 6
6. Not being under a doctor's care for illness. 1 2 3 4 5 6
7. Being able to change and adjust to demands made by the environment. 1 2 3 4 5 6
8. Not being sick. 1 2 3 4 5 6
9. Actualizing my highest and best aspirations. 1 2 3 4 5 6
**Health or being healthy means:**

<table>
<thead>
<tr>
<th></th>
<th>Adequately carrying out my daily responsibilities.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Adequately carrying out my daily responsibilities.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11.</td>
<td>I do not require medications.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>12.</td>
<td>Carrying on the normal functions of daily living.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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<tr>
<td>13.</td>
<td>Coping with changes in my surroundings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>14.</td>
<td>Fulfilling my responsibilities as a husband/wife/son/daughter/friend/worker, etc.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>15.</td>
<td>Having no physical or mental incapacities.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>16.</td>
<td>My mind and body function at their highest level.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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</tbody>
</table>
9. Benefits of Use of Hearing Protection and
11. Barriers to Use of Hearing Protection

DIRECTIONS: This questionnaire contains a series of statements about a person's beliefs about hearing protection (for example, earplugs or muffls). Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6). For each item, circle the number which best represents the extent to which you disagree or agree with the statement. The more strongly you agree with a statement the higher will be the number you circle. Please make sure that you answer every item and that you circle only one number per item. Since this is a measure of opinions, there are no right or wrong answers.

It is important that you respond according to your actual opinions and not according to how you feel you should believe, or how you think others want you to believe.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Moderately Disagree</th>
<th>Slightly Disagree</th>
<th>Slightly Agree</th>
<th>Moderately Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wearing hearing protection protects me against hearing loss from noise exposure.</td>
<td>1 2 3 4 5 6</td>
<td></td>
<td></td>
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<tr>
<td>2. Even if I wear my hearing protection at all times on the job, I will not reduce my chances of developing hearing loss.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>3. It's debatable if wearing hearing protection will lessen my chances of becoming hard of hearing.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<td>4. Pressure from co-workers can often get in the way of wearing hearing protection.</td>
<td>1 2 3 4 5 6</td>
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<tr>
<td>5. Even though it may be a good idea, I don't have time to use hearing protection.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>6. If I do not have a hearing problem now, I don't see any need to wear hearing protection.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td></td>
<td>Statement</td>
<td>Scale</td>
<td></td>
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<td>---</td>
<td>----------------------------------------------------------------------------------------------</td>
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<tr>
<td>7</td>
<td>It's difficult to talk with other people when I'm wearing my hearing protection.</td>
<td>1 2 3 4 5 6</td>
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<tr>
<td>8</td>
<td>The information on the benefits of using hearing protection is too inconclusive to encourage me to use hearing protection.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>9</td>
<td>I'm afraid I'll get an ear infection from wearing hearing protection.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>10</td>
<td>Wearing hearing protection is a nuisance.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>11</td>
<td>Regular use of hearing protection is beneficial to me because it helps protect my hearing.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>12</td>
<td>Hearing protection makes me feel like I am off-balance.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>13</td>
<td>Wearing hearing protection is unsafe because it blocks out danger signals and warning sounds.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>14</td>
<td>I am happy with how my hearing protection fits.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>15</td>
<td>When I'm careful about using my hearing protection, I feel better.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>16</td>
<td>Hearing protection keeps me from hearing what I want to hear.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>17</td>
<td>I feel too closed off from the world when I wear hearing protection.</td>
<td>1 2 3 4 5 6</td>
<td></td>
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<tr>
<td>18</td>
<td>Nobody at work cares if I wear hearing protection.</td>
<td>1 2 3 4 5 6</td>
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<tr>
<td>19.</td>
<td>My ears hurt when I wear hearing protection.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20.</td>
<td>I do not like putting things in my ears.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21.</td>
<td>Protecting my hearing is not important to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22.</td>
<td>In the long run, my hearing will decrease anyway so I need not bother to wear hearing protection.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23.</td>
<td>I like wearing hearing protection.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24.</td>
<td>When I use hearing protection, it does not effectively block out noise for me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
## 6. Self-Efficacy in the Use of Hearing Protection

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Self-Efficacy in the Use of Hearing Protection</td>
<td><img src="Image" alt="Rating Scale" /></td>
</tr>
</tbody>
</table>

25. I need to learn more so that I can use hearing protection effectively.  
26. I can use hearing protection correctly.  
27. I do not always use my hearing protection the way it should be used.  
28. I know how to use my hearing protection so that it works effectively.  
29. I do everything possible to make my hearing protection work effectively.  
30. I am not sure that I can use hearing protection correctly.  

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3. Availability and Accessibility of Hearing Protection

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>31. Ear plugs are available to pick up near my work station.</td>
<td></td>
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<tr>
<td>32. I have my own ear muffs assigned to me.</td>
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<tr>
<td>33. I have to make a request in order to obtain ear plugs.</td>
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<tr>
<td>34. I can get ear muffs if I ask for them.</td>
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<tr>
<td>35. There are not enough ear plugs available so that I can use several pairs in one day.</td>
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<tr>
<td>36. The supply of ear plugs is a long way away from my work station.</td>
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<tr>
<td>37. I am free to use as many pairs of ear plugs in a day as I want to.</td>
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<tr>
<td>38. There is a sign in my work area reminding me to use hearing protection.</td>
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</table>

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10. Value of use of Hearing Protection

Possible outcomes from using hearing protection are listed below. Please indicate your personal rating of the importance by placing an X on the line that best shows the value or importance of that outcome for you.

1. Protection of inner ear

2. Keep out noise

3. Increased feeling of well-being

4. Prevention of hearing loss

5. Keep out harmful noise

6. Reduce amount of hearing loss

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12. Use of Hearing Protection

This part of the questionnaire deals with use of hearing protection at the worksite. It is often difficult to use hearing protection all of the time it should be used. Please tell us about your actual use of hearing protection in percent of the time used.

1. During the past week in your work area, what percent of the time would you say you actually used hearing protection?

___________ %

2. During the past month in your work area, what percent of the time would you say you actually used hearing protection?

___________ %

3. During the past 3 months in your work area, what percent of the time would you say you actually used hearing protection?

___________ %

4. When you are away from your work area and in areas where hearing protection is not required (for example, restrooms, cafeteria, satellite areas) what percent of the time would you say you used hearing protection?

___________ %
APPENDIX D

EXEMPLARS OF PATTERN CATEGORIES

Table 1. Noise hinders concentration at work.

1.1 >M Especially if your machine doesn't work good & you hear that noise, because you're not concentrating on your work, you're just hearing the noise of that machine that's not working right.

1.2 >F But if your machine has a loud noise, it gets to you, it gets to you. That's why I wear them. >L Ah so you wear your plugs and that gets rid of some of the noise. >F If I don't wear them I can't do my quota, I can't go fast. It's too loud.

1.3 >F You don't concentrate good when the music is too loud too. >F Especially if you have the speaker right on top of your head. >M Sometimes they put it too loud. >F Even if it's oldies or classics >L Even if it's what you like? >F It also depends if you're hearing loud music where you're hearing it at. >L She's right under it, she doesn't have much choice.

Table 2. Concentrating at work, able to ignore noise.

2.1 >M You get into a stage where you're in a limbo stage once you start working where it just drowns out all sound. Or at least to me it does. And ah somehow it just drains out, you don't even listen to it once you're in a pace, you pace yourself. After a while it's all gone, it's all gone. Or at least to me. I don't even listen to it, I don't even pay attention to it I guess...because you're in a limbo stage as you're working.

2.2 >F You're concentrating on your work, you don't concentrate on the noise.

2.3 >F You get your rhythm going (quiet laughs). You don't care about the other ones.

2.4 >L It sounds like what you two are describing is that you get into a state where you're able to concentrate in spite of the noise

2.5 >M It's a mental block, that's what it is, because as a student, you're studying, you just block everything out. That's the way at work, at least to me. Once I start working I block everything out, automatically blocks out, unless something happens like the machine breaks down or something. >L Oh like he was describing earlier, that kind of noise is a warning signal something's gone wrong. >M Or you come back to your reality stage I guess. >M Oh, I'm at work (Laughs)

2.6 >F I think sometimes you could forget you're at work thinking of something else. You forget about everybody else around you. >L You just focus. >F especially if you're wearing the plugs..I forget about everything else and I just concentrate.

Table 3. Mood affects the bother of noise

3.1 >M It just bothers you. >L It bothers you?

3.2 >F It depends on the mood you're in. Cause if you're in a good mood it doesn't matter pero but if you're in a bad mood and you hear all that noise ... That happens to me.
Table 4. Noise causes a bad mood

4.1 >M It even gives you a headache.
>F Ya it does. It puts you in a bad mood. If you have mechanics that.. well..(all laugh) they take a long time. The bad mood.. They come in the morning and they're in a bad mood & you write your machine down and they go "Again" >M and then they make you work like that with a bad machine until they come.

4.2 >F That's what gets the people upset like aggressive. I know because it happens to me. >M It annoys people.

4.3 >F When I don't have the plugs, I get like in a bad mood and get real bad headaches. I think thats why everybody's like you talk to somebody they snap "Oof alright".

4.4 >M Especially now that everybody has to hear the different machines on the teams and they're not used to a certain sound with their machine and so everybody's kind of like getting on everybody's nerves

4.5 >M It's true because on the traditional line you were only with your line you listened to your machine. Now you've got all these people around you, like the thumping on him and the rivet, pow, pow, pow. Like you said it was far away from me. But the team, you can imagine that it gets on your nerves.
>F All the noises put together.

Table 5. Hearing noise through the hearing protection.

5.1 >M Well like the the hard pitched sounds, you know like metal and metal. Like when you're running your machine and something goes wrong, and you get a sharp sound and even though you have the plugs it goes through the plugs it's so high. Because the low kind of sounds it can stop, the high pitched ones it can't it just goes through.
>M The kind that make your teeth grind. (all) Oooo (chorus).

5.2 >M Right. Something like a thump it doesn't sound too much, it doesn't penetrate, but if you have a pencil you see how it makes a high pitched sound it goes right through?

5.3 >M It's the case with the rivet. Sometimes it hits differently and you're right there it goes right through the earplugs. I notice with different jeans it sounds different. It's sometimes higher. Like sometimes the machine, the pressure that's pushing the rivet down, it's sometimes higher. Sometimes if you don't have earplugs you have to stop. It's unbearable sometimes.
Table 6. Inconveniences of wearing hearing protection.

6.0 >F I like them because they I take them myself, but then again they can't hear other things and especially when they talk to you, you think you're going to talk louder and you're not even talking louder (laugh)

6.1 >L So is that one of the problems, what you were describing about hearing your voice louder and not hearing other people? >F Ya they tell you "Don't yell, I can hear you." What are you saying? Laugh.

6.2 >F I have to use them and I don't wear it. (laughs) >M She's the one with the loud noise.
>F She's the one with the loud noise. >L What's your work again? >M the hammer. (laughs) >F cut zip talon. >L cut zip >L And that is a loud one. >F Ya, It is. It's very boring and so I try to hear the music so I don't fall asleep. That's why I don't wear it. >L And if you have plugs in, have you tried it to see if you hear?
>F I don't hear, I don't hear when they're calling me.

6.3 >M But there's one problem with that cause you wear them all day long and then all of a sudden when you take them off it's like oh man all at once it hits you and your ears hurt or they pop. After using them all day long and then all of a sudden you just take them off and it just hits you all at once

6.4 >M And like the earplugs, they're made of some soft foam so that you squeeze it so it can get smaller so it's easier to put in your ear and after a while it stretches back to its normal size and after you take them off you feel like your ear's this big, the hole, and everyone can see your eardrum (laughs).

6.5 >F And you tend to talk louder.
>F Ya, when you have them on
>M You find yourself in the parking lot yelling at people, "Ya, ya" (laughs)
>F You know how you speak with them when you have them on, you get used to talking loud and like when I get home they say "why are you talking loud" I go to me I'm not talking loud, to me it's normal but yet to them at home it's like if I'm yelling at them.

6.6 >M I used to wonder when my Mom gets home from work she'd be talking loud. Now I know why ...cause she works at (the company) too. I never knew until now. I thought she was always yelling at me (laughs)
>M What did I do now? >F Ya ya.

6.7 >M Ya sometimes like hers they have that little cord and you just forget you know that they pop and finally yank it out "pop" >L Oh yes, that can really hurt your ear. It's like a vacuum. >F ya >M Its something like a suction cup

6.8 >M After a while they hurt when they're inside your ears, they hurt. They kind of like itch.

6.9 >L Oh, those are molded. >F Ya these are good. Try these ones Joe. >M those hurt. >F really?
>M Those are the ones that hurt. >F I think it depends on the size of your ear. >M It's like a plunger or something "pop".
6.10 >M I don't like those because if you work all of a sudden you pick up your hand "pow" it pops. Like those. You don't even know it's there and you turn around it pops right out and that's what he's talking about..it hurts.

6.11 >M It's uncomfortable.

6.12 >F In the beginning it's very uncomfortable. >L The pressure? >F You have to put them in right. Because sometimes I don't put it in right and I have to move it until it's comfortable. Because you can't go right away and put it in just like that.

6.13 >M The first time you put them in they're alright but the second time you take them off and you put them on that's when you start feeling uncomfortable and then you take them off again and you put them back on and it's even worse. So if you just put them on once and just leave them on I think it would be better for people than take them off, put them on, take them off, put them on. That's why I say it's so uncomfortable for some people. >L Anyone else notice that? >M Ya.

6.14 >M I think it's because of the thing you know since they stretch back in size they're always constantly applying pressure to your ear and then there's different kinds, there's like that one and the ones she has and like those and there's other like rough ones some white ones like those >F The round ones like Velcro. >M generic ones (laughs)

6.15 >M And then we used to have some other ones blue ones that didn't work at all. You had a hard time putting them in because they were real thick and these you can press and they stay there for a little while they give you time and those you just had to press and stuff it in your ear and it would expand right away and you'd have it half way and you know you'd find yourself losing time so you just wouldn't care and throw them away, get a new package.

6.16 >M When it's a long time in your ear it gets annoying. It gets claustrophobic sometimes. It gets hot or something. >M or your ears start itching and you want to stick your pinky in there, >M Ya get a Q tip or something.

6.17 >M I have a question though do you think it's safe to wear those things all day because moisture starts to collect in there and you've had them in all day... >M Ya, all that wax that builds up in there. >M Ya, wax.

6.18 >F I can't work without them anymore because I even forget to take them off. But I'd rather wear that and feel whatever than hear all the noise inside.
Table 7. Hearing protection preferences.

7.0 >F I've tried the different types of earplugs and they do have a big difference like these. I wear these, these are softer and pero I feel like they don't hurt as much so the type of earplug you're wearing has to do a lot with it.

7.1 >F That's why I like the string because I don't put them in too deep and they won't fall. Los otros que son single, oy no, I think you have to put them all the way in so it stays.

7.2 >L Oh, those are molded. >F Ya these are good. Try these ones Joe. >M those hurt. >F really?
> M Those are the ones that hurt. >F I think it depends on the size of your ear. >M It's like a plunger or something "pop".

7.3 >M I'd rather use those because when you have the single ones and it's like for lunch break or something you take them off and you seem to misplace them and you get another package. And then you get your supervisor "Heh, we don't have that many. Try and conserve them.

7.4 >F Ya, that's why I like these because of the string. >M It's easier to keep track of them.

7.5 >M I don't like those because if you work all of a sudden you pick up your hand "pow" it pops. Like those. You don't even know it's there and you turn around it pops right out and that's what he's talking about..it hurts.

7.6 >F I've tried them all even those kind. These I liked the way I felt with them better..

Table 8. It's up to you

8.0 >F It's up to you. It's up to you if you want to wear them.

8.1 >F They don't make it mandatory. It's up to you if you want to take care of your ears. I do, I don't want to become a deaf person. (group laughs)

8.2 >M Just thinking of your own health. The only reason I wear them is because I don't want to lose my hearing. It's not because anyone here has told me. You know how we have education for certain things, I haven't seen anything on hearing. The most they've educated us is on attendance and stuff like that but I've never heard anyone say anything about your hearing.

8.3 >M Nobody can make you wear them it's all up to you. >F It's up to the individual. >M If you want to lose your hearing it's all up to you. If you want to protect your ears that's the way you go about it. Nobody can make you do nothing it's just if you want to or not.
Table 9. Awareness of high noise in the plant.

9.0 >M I see that especially a lot (in a) smaller (factory), sounds hits off walls.

9.1 >F Well I think that inside the plant it is very loud, the noise is very loud so eventually somebody who doesn't wear the plugs, they're going to get hurt in the future, they're going to have problems eventually. I'm not sure about it but the noise is very loud.

9.2 >L Ya, whereas the traditional line you heard more or less your own ( M only one ) machine the same sound. Ya, same sound (all at once).
>M Now it's like you're putting a symphony together.
>M And most people in their operation they didn't need to use those and now they have to use them because the machines are so close to them and it's louder.

9.3 >M That's right because you're inside the plant you know, there's no windows here. As long as you're in there, there's noise in there. Even if you're not wearing the plugs you've got to yell sometimes.
>F Even when you're talking to the third person down you're yelling.

9.4 >F ... you're going to be in the noise. Everybody's together. The space is our problem right now so everybody's bunched up.

9.5 >F No. It's a team of 36 people together with different machines, operations and like they say they're in one section and it's not that noisy, so now they're going to be closer to me where I'm noisy see so they didn't have to wear it but now they'll have to wear it because of another person not 'cause of their operation.
>M In other words they weren't used to that noise before and now that we're together it's their noise plus this noise. >F You hear all different levels.

Table 10. Awareness of consequences.

10.1 >M It's the lack of education here is what ruins it... Or operations that have to be mandatory, like her in zipper, it's a mandatory thing, and you knew the consequences of not wearing them, be aware of all this, I think they wouldn't take it as light, we wouldn't take it as light as we are taking it now.

10.2 >M ..what safe is. I've found it to be that you could announce it on the intercom, posters. You just put everything to the side. I'm talking the majority of the people. When you see the consequence then we realize that that's a touchy issue. I see that here.

10.3 >F See that's what I meant by educating the people because some people are going to say "I don't need it". There's people like that. And if you explain to them what it's going to be hurting them they'll understand and they'll say "Pues ya, it's for my own health".

10.4 >M Ya they don't really seem to get a grip on things until something happens to somebody they know or somebody close to them and they say "ah man it was right, they weren't lying to me, it was true it could happen and it did happen" But at the moment they just didn't care about it until it something happened to somebody they know or somebody close to them. But if they teach them or educate them beforehand maybe they can stop and do something about it.
Table 11. You get used to the noise

11.1 >M Well it's gonna be there just. >L You know it's going to be there.
>F The noise is going to be there but. Years back we didn't wear those plugs and they really help us because ah...we were used to the noise pero now we start working without them it's like we can't stand it, I can't stand the noise any more. So I need to have them.

11.2 >F You get used to the noise around you.

11.3 >M Especially now that everybody has to hear the different machines on the teams and they're not used to a certain sound with their machine and so everybody's getting on everybody's nerves.

11.4 >F Tell them that they're all going to be together now, they're all going to have to get used to their own sounds.

11.5 >M In other words they weren't used to that noise before and now that we're together it's their noise plus this noise.

Table 12. Plant management promotes hearing protection use

12.1 >L How did you get used to them? Do you know?
>F I couldn't stand the noise of my machine so you know I had to get used to it. They told us that we had to wear it because the machine was going to giving us some problems to our ears. I got used to it. I took about a month 3 or 4 months. Now I can't live without them.

12.2 >M Actually at times they enforce it, no not really enforce it, but just kind of like told us it would be good for us to wear the protection cause we had some inspectors or visitors coming.

12.3 >F We only have 2 years that we started our safety program where we could enforce it and I think that 2 years, up to today, we have...>L there's been a lot of change then? >F Ya, they've been enforcing it.

12.4 >M But they do enforce it, they do tell you wear them but it's all up to you.
>L Does that help?
>M Well it does. If somebody keeps on telling you you should wear it. And if you just get sick and tired of them telling you, you just make em happy and put em in your ear. But some people say well who are you to tell me what to do. But it all depends on whose the person.

12.5 >F Well I have five years with (the company) and when I was hired they said I have to wear them, and it depends on the supervisor. There are supervisors that are going to enforce it more than others and the one I had enforced it. So I got used to it right away. She was always checking and since I have my hair over my ears all the time, she would even come and go like that you know. She's not here any more

12.6 >M When I started my operation didn't require it. But now since they moved me, it requires that I wear it. So you're going to have to change with your operation ..or lose your hearing, one of the two.
Table 13. Plant management doesn’t promote hearing protection use

13.1 >F You mean if they encourage you? Nobody does.
>M They don’t tell you.
>M Not the supervisor, nobody tells you to wear them.

13.2 >M If the nurse said it was mandatory to wear it they’d probably give everybody one but they don’t, you’ve got to go in there.

13.3 >F They don’t make it mandatory, It’s up to you if you want to take care of your ears. I do, I don’t want to become a deaf person. (group laughs)

13.4 >F With the safety belts they tell you, here they don’t tell you about the earplugs.
>M It’s true they even have commercials about seat belts (laughs).

Table 14. Work team as modality for programs

14.0 >M How about a team meeting or something >L A team meeting, like the team that you already work with? >M Yes.

14.1 >M Get the group to wear them and they can see what happens they can tell.
>L Make one group all wear them and then they can talk about what it was like?
>F The people that are wearing them now, for example like her, or the people that wear them, could talk to other people that don’t wear them.
>F You mean you want us to . . >L give a speech.

14.2 >F I think through the teams we could get information, show us how it’s going to be. >L Does that work in general if workers lead a meeting here? >F Very often. (laughs) >M They don’t call them meetings, they call them discussions.

14.3 >F I think that now that we’re working as a team and that we’re all together actually, one thing that it will help definitely is to educate, you know education for the people so they can understand why we should be wearing those things. That’s definitely one thing that it will help.
>M Lots of people don’t realize the damage.
>F Because they don’t realize and education helps.

14.4 >M Usually when they assemble a team, when they first start they take two weeks off, they’re just going to meeting and meetings and talking about that, maybe you can include it in there. Tell them that they’re all going to be together now, they’re all going to have to get used to their own sounds.
Table 15. Hearing protection is not available.

15.0 >M Well, first of all it's not available to you right there so you could just go and can get it, you have to ask the managers and they'll go and get it for you but sometimes they won't even listen to you or they'll forget it. >L So it's not as available.

15.1 >F I always go to the nursery and she always has some so I go get them from her. >L So you just go yourself. >F But I like it, I like it a lot. At first I didn't I couldn't get adjusted to it I got used to it.

15.2 >M If the nurse said it was mandatory to wear it they'd probably give everybody one but they don't, you've got to go in there.

15.3 >F I use the same ones. >M Sometimes you can't because there aren't enough (to use a new pair). >L Oh

15.4 >F When I see the box I get enough (laughs) you know but sometimes you can't.

15.5 >M But after a while they come and confiscate them back (laughs). You'll see them come and confiscate them (laughs).

15.6 >F People are after a certain type, like me, when I see green ones, I'll just get them.

15.7 >M I notice the orange ones go fast. >L Oh, the ones on the string. >M Those go fast almost like a fashion statement or something.

15.8 >M Those go quick and those other ones too. But if they don't have a string they stay a little longer.

15.9 >L Where do you go to get them? >M They're usually at the supervisor's desk or the nurses office. Each section has it's own little box. It all depends if you use those or not.

15.10 >F The nurse's office. You can go and get them there too.

15.11 >F They have them here at the front desk at the reception. She has a box there too for visitors to come in.

15.12 >L And if you have to try different kinds to find what's good, where would you go then to try that? >F Nurse station (several at once). >M Well the nurse is the one that has them.

15.13 >M You go to the teams that are nearby. >F There's different ones out there, there's boxes. >M You just have to look for the ones that you prefer. >M The ones that match your clothes better, no.
Table 16. Hearing tests for all.

16.1 >F Well, I think that everybody should have a hearing test, especially now with the teams, whether it was required to wear ear plugs or not.

16.2 >M That's right (hearing test for all) because you're inside the plant you know, there's no windows here. As long as you're in there, there's noise in there. Even if you're not wearing the plugs you've got to yell sometimes.
>F Even when you're talking to the third person down you're yelling.

16.3 >F The hearing tests to everybody whether it's required..well now it's going to be required I think in the teams because you're going to be in the noise. Everybody's together. The space is our problem right now so everybody' s bunched up.
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