Expanding the Disablement Process Model Among Older Mexican Americans

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**Background.** Very few studies have examined how disability develops among older Mexican Americans. To determine how disability develops, we explored the Disablement Process model, which posits that impairment, measured by muscle strength, leads to functional limitations, which lead to disability, which ultimately is associated with health-related quality of life (HRQOL).

**Methods.** A structural equation model approach was used (AMOS 4) with data collected on 622 Mexican Americans aged 71 or older residing in the Southwest.

**Results.** Our results show preliminary support for the Disablement Process model. Impairment is significantly associated with functional limitation ($\beta = .36, z = 7.2$), which is significantly associated with disability ($\beta = -.53, z = 16.1$). Finally, disability is significantly related to both physical and mental components of HRQOL ($\beta = -.69, z = 23.4; \beta = -.26, z = 6.5$, respectively).

**Conclusions.** Muscle strength as a measure of impairment and the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36) score as a measure of HRQOL are important factors in understanding disability in older Mexican Americans.

Very few studies have examined how disability develops among older Mexican Americans (1–5). For a population that experiences relatively low mortality despite low socioeconomic status, termed the Hispanic Paradox (6,7), it is crucial to examine how factors that influence mortality, such as disability, develop. Moreover, disability is a very real public health issue. Approximately 20% of older adults in the United States have some type of chronic disability, and almost one third have mobility limitations (8). Medical care for a disabled older adult costs, on average, three times more than care for a nondisabled senior (9). As the percentage and numbers of older Mexican Americans rapidly increases, the impact of their rising rates of disability on health care is unknown.

Disability research among older adults has, until recently, focused primarily on either non-Hispanic Whites or non-Hispanic Blacks (e.g., 3–5). It is not clear how the disablement process works in older Mexican-American adults. However, research suggests that greater disability and health disadvantages exist among Mexican Americans relative to older Whites (e.g., 2,5,10). Also, previous research indicates that older Mexican Americans have a higher prevalence of certain health conditions (e.g., diabetes and obesity) that have been associated with disability (4,10).

Moreover, studies that have focused on disability among older Mexican Americans have typically estimated incident or prevalent disability rather than the process of becoming disabled or the outcomes from that process (10). Theoretically, the progression toward disability could be affected, perhaps even delayed or halted, by multiple biological, psychological, and social factors (1,2,11). However, to determine whether the process of becoming disabled can be influenced, it is important to first examine how disability develops. Therefore, the goal of this study is to investigate how disability develops in older Mexican Americans. We build on the Disablement Process model that we partially tested in a previous study (2). The Disablement Process model posits that impairments (which are abnormalities at the physiological, anatomical, or mental level) lead to functional limitations (limitations in basic physical and mental actions), which then lead to disability (difficulty doing everyday activities, problems with activities of daily living [ADLs] or instrumental ADLs [IADLs]).

In this study, we will examine this model more thoroughly than has been done in previous research in two ways: by including not only components of the main pathway to disability, but also a potential outcome from the process—health-related quality of life (HRQOL); and by the additional use of performance-based measures for the impairment component of the Disablement Process model. Impairment is an early part of the model and is meant to represent physiological, anatomical, or mental abnormalities (11). We focus on impairment through measuring muscle strength with a Nicholas Manual Muscle Tester. Previous research on the connection between muscle strength and disability indicates that upper and lower extremity muscle strength is strongly related to disability through their effects on mobility (12). However, there has been no direct test of the role of muscle strength in the Disablement Process model, nor have the effects of muscle strength on disability been examined among older Mexican Americans.

Therefore, our goal in this research is to begin to evaluate the Disablement Process model by hypothesizing that: (a) impairment (measured by muscle strength) will be positively...
associated with functional limitations (measured by lower body mobility); (b) functional limitations will be negatively associated with disability; and (c) disability will be negatively associated with HRQOL.

**METHODS**

**Data Collection Procedures**

The sample for the current study is a subsample from the Hispanic Established Populations for Epidemiologic Study of the Elderly (EPESE). The Hispanic EPESE is a population-based study of 3050 noninstitutionalized Mexican-American individuals aged 65 or older at baseline (1993–94) from five southwestern states (Texas, California, New Mexico, Colorado, and Arizona). Four waves of data have been collected (1993–94, 1995–96, 1998–99, and 2000–01) [for details of sampling frame, please see reference (13)].

After Wave 3 data were collected, we created a list of respondents who were alive at the end of Wave 3 (n = 1979) and who reported having Medicare coverage at either Wave 1 or Wave 2 (n = 1598). From this group of respondents, 800 were randomly selected to be the sample for a substudy focusing on the link between acculturation, disability, and HRQOL. Of the 800 respondents selected, 622 subjects completed the interviews. The remaining 179 respondents included those who refused to participate and those who completed proxy interviews. We did not include proxy interviews due to the physical nature of some of the measurements in the substudy. The respondents in the substudy were interviewed due to the physical nature of some of the measures in the substudy. The respondents in the substudy were completed proxy interviews. We did not include proxy interviews. Of the 800 respondents selected, 622 subjects completed the interviews. The remaining 179 respondents included those who refused to participate and those who completed proxy interviews. We did not include proxy interviews due to the physical nature of some of the measure-

**Outcomes**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean (SD) or %</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mental health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>55.10 (8.51)</td>
<td>615</td>
</tr>
<tr>
<td><strong>Physical health</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>41.34 (12.61)</td>
<td>615</td>
</tr>
</tbody>
</table>

**Notes:** *Higher scores indicate better functioning.

1Hierarchical variable where 0 = no activities of daily living (ADL) or instrumental ADL (IADL) disability, 1 = any IADL limitation or mobility-related ADL limitation, and 2 = any basic ADL limitation.

**SF-36** was designed to be a generic health-status measure, and it addresses function in eight domains of health—physical function, role physical (physical health), bodily pain, general health, vitality, social function, role emotional (emotional health), and mental health. The range is from 0 to 100 on each dimension; higher scores indicate better HRQOL.

Disability is assessed by ADL and IADL limitations. Respondents were asked if they needed help doing seven ADL tasks taken from a modified version of the Katz Activities of Daily Living scale, which include walking across a small room, bathing, grooming, dressing, eating, transferring from bed to chair, and toileting (15). If respondents indicated that they needed help or were unable to do a task, then they were scored as having an ADL disability. For the IADL items, respondents were asked if they were able to do 10 activities, based on the Older American Resources and Services Instrument (OARS) Instrumental Activities of Daily Living scale (16) and the Rosow–Breslau scale (17). These activities were using a telephone, driving, shopping, preparing meals, performing light housework, taking medications, handling money, doing heavy housework, walking up and down stairs, and walking half a mile. If respondents applied in the negative, they were coded as having an IADL disability.

The final disability variable is hierarchical with three levels. Scoring 0 indicates no ADL or IADL limitation; 1 indicates any IADL limitation (i.e., needing help with instrumental activities such as shopping, taking medication, or using transportation) or a mobility-related ADL limitation (i.e., needing help walking across a room), and 2 indicates a basic ADL limitation (i.e., needing help bathing or toileting).

Functional limitation is addressed through lower body limitations, which include assessment of balance and gait by using items from the Performance Oriented Mobility Assessment (18). These items include assessments of standing balance, walking speed, and repeated chair stands. First, standing balance includes side-by-side, semitandem, and full-tandem standing. Respondents who were able to hold the first stand for 10 seconds progressed to the next stand and so on until the stands were completed. The standing balance variable was coded from 0 to 4, with 0 reflecting no standing balance completed and 4 indicating full-tandem standing for the full 10 seconds. Second, walking across a small room (8-foot walk) was timed twice to the nearest second, with the faster of the two walks used for scoring purposes. Scores were divided into quartiles from the sample ranging from 0 to 4, with 0 again reflecting walk not completed and 1–4 indicating quartiles of the walk scores with upper scores being faster times. Finally, scores for the repeated chair stands were estimated to the nearest tenth of a second among those who were capable of standing one time from a sitting position with arms folded across their chest. These scores were also divided into quartiles, with 0 reflecting no chair stands completed and 1–4 reflecting quartiles with higher scores reflecting better times. The total score is created from a combination of these measures with a range of 0–12, where higher scores indicate better functioning (19).
Impairment is measured through upper and lower body extremity strength using a Nicholas Manual Muscle Tester (NMMT), which is a handheld device for objectively quantifying muscle strength. The peak strength (in kilograms) required to break an isometric contraction is measured as the examiner applies force against the subject. The NMMT is designed to be used with larger muscle groups of the upper and lower extremities. A load cell in the device provides digital output ranging from 0.0 to 199.9 kg (equivalent to approximately 440 lb). The unit is placed between the examiner’s hand and the limb being tested [for details on the reliability and validity of the NMMT, see reference (20)]. There were five positions tested: hip flexion, hip abduction, knee extension, and two positions for shoulder abduction. Higher scores indicate greater muscle strength. The testing positions and reliability of the procedure have been tested in older adults. Intraclass correlation coefficient values for the five positions ranged from 0.76 to 0.98 (20).

Finally, we included four variables that could influence the disablement process: age, sex, financial strain, and household structure. Financial strain is a question that assesses how much difficulty respondents have in meeting monthly payments on bills; 1 indicates a great deal; 2 indicates some; 3 indicates a little; and 4 indicates none. Finally, household structure is measured through household size, with a range of 1–5 persons. (A few households had >5 people, but we included these with the 5-person households.)

**Statistical Analyses**

To examine the Disablement Process model (shown in Figure 1), we used structural equation models estimated with AMOS 4.01 (Small Waters Corporation, Chicago, IL). Structural equation models allow path analysis as depicted in the Disablement Process model in Figure 1. Although the Disablement Process model shows multiple pathways influencing disability, the main pathway that we are focusing on in this research is the pathway from impairment to functional limitation to disability, and ultimately to HRQOL (a “global outcome”). This type of model has been used previously (1) and is appropriate for the examination of the patterns of inter-relationships among components of the disablement process (2). Also, structural equation models are useful for estimating factors, or latent constructs.

Figure 2 shows the model that we estimated. We examine impairment through five measures of muscle strength. Structural equation models estimate both measurement components and relationships between variables. Thus, Figure 2 (the estimates will be discussed below in the Results section) shows that we are estimating: (a) the associations of our control variables with impairment, functional limitations, and disability; (b) the associations between impairment and functional limitations and between functional limitations and disability; and (c) the association between disability and HRQOL.

**RESULTS**

Table 1 includes the descriptive statistics for the sample. The average age of respondents in the sample is approximately 78 years, and the majority are female. The average household size is slightly above 2, and the mean financial strain falls between “some” problems meeting monthly payments on bills and “a little.” Focusing on the disablement process variables, we found that the sample appears to be relatively nondisabled, with most of the sample falling into the non-ADL or non-IADL disabled or IADL disabled and/or mobility ADL disabled only. Also, the sample averages around 7 on the performance-based lower body assessment (12 is the highest score), indicating a medium level of functioning.

Table 2 and Figure 2 show the results from the evaluation of the Disablement Process model. First, as expected, the main pathway is supported by the structural equation model. Impairment, as measured by the five measures of muscle strength...
strength, is strongly associated with functional limitations. Those respondents with greater muscle strength have higher lower body functioning ($\beta = .29$), whereas those with better lower body functioning have less disability ($\beta = -.53$). In addition, disability is strongly related to HRQOL. Respondents with more disability have lower mental health and physical health scores on the SF-36 ($\beta = -.26$; $\beta = -.69$, respectively).

Focusing briefly on the control variables, we found that household structure had no significant associations with any components of the Disablement Process model. However, age, sex, and financial strain were related to certain components. Being older was associated with decreased muscle strength, decreased lower body functioning, and increased disability. Being female was related to decreased muscle strength and increased disability, which was expected, but female sex was counterintuitively associated with increased lower body functioning. When we conducted an exploratory analysis to examine why this was the case, the results suggested that, when accounting for muscle strength in the model, being female was no longer associated with disability and was associated with better lower body functioning (results not shown). Finally, having less financial strain was associated with better muscle strength, better lower body functioning, and less disability.

**DISCUSSION**

With increasing numbers of aging minorities, especially a quickly growing group such as older Mexican Americans, two lines of investigation that are important to the delivery of services for older adults are the understanding how disability develops and how disability influences other health outcomes like HRQOL. Our goal in this research was to address the Disablement Process model with the inclusion of HRQOL as an outcome and through the inclusion of muscle strength to measure impairment. The model that we tested was supported by the data [the model fit was reasonable, with the Normed Fit Index and Comparative Fit Index $> .95$ and the Root Mean Square Error of Approximation $< .10$; e.g., see references (21) and (22)], indicating preliminary support for our hypotheses. The Disablement Process model, which has received support for non-Hispanic White samples, also appears to hold true for older Mexican Americans. Furthermore, muscle strength plays a similarly important role in the disablement process of both non-Hispanic Whites and older Mexican Americans. Including the measurement of muscle strength as part of the Disablement Process model is a contribution to disability research. Investigation into the effects of muscle strength on disability and into the process of becoming disabled among older adults has been lacking in population research. With more information on how muscle strength affects disability in late life, exercise and strength-training interventions can be designed to help older adults retain their functional independence. It is also possible that a threshold for strength could be developed to target older individuals who are at greatest risk of becoming disabled (23).

**Figure 2.** Financial strain = difficulty meeting monthly payments on bills: 1) a great deal, 2) some, 3) a little, or 4) none. Household structure = number living in the household (up to 5 persons). Impairment = score on combined hip abduction, hip flexion, knee extension, and two shoulder-abduction scores (higher scores indicate higher functioning). Functional limitation = summary score on performance-based lower body function measures (higher scores indicate better functioning). Disability: 0) none, 1) either limitation in mobility activity of daily living (ADL) or any instrumental ADL. For mental and physical SF-36, higher scores indicate higher quality of life.
the disablement process to quality-of-life outcomes, such as HRQOL. Authors of the original article conceptualizing the disablement process argued that research into the disablement process should not stop at disability as the final outcome (11). Solely investigating the main pathway to disability is insufficient. It is critical to examine what the path to disability influences, including institutionalization, mortality, and quality-of-life issues. We attempted in this research to incorporate one outcome related to quality of life in the Disablement Process model. The results of our investigation suggest that disability is related strongly to HRQOL and that the hypothesized model that conceptualizes the disablement process with HRQOL as an outcome is preliminarily supported by the data. Thus, more has been done in this research to fully conceptualize the Disablement Process model than has been done previously.

Although there are important contributions of this investigation to research on disability, there are two primary limitations that should be discussed. First, the generalizability of this research to older Mexican Americans is limited. Although the subsample was randomly selected from 10-year survivors of the original Hispanic EPESE cohort, it is not representative of Mexican Americans aged 70 years or older. Second, the Disablement Process model is intended to be examined as a process, and these analyses are based on cross-sectional data, which are useful in establishing relationships between variables. Support for the model is somewhat limited until more data points can be used, although, on the basis of previous research (2), we do not expect the relationships to change.

Conclusion

Muscle strength is an important addition to expanding the investigation of the Disablement Process model in older Mexican Americans. Moreover, examining HRQOL in relation to the process of becoming disabled is one way of expanding the model of the disablement process to investigate the influences of disability on other aspects of life among older adults. As the proportion of minority older adults increases in the United States, research that focuses on how to keep minority elderly persons functionally independent will be of increasing importance.

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References

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Table 2. Coefficients From the Structural Equation Model of the Disablement Process (N = 622)

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Estimate</th>
<th>z Value</th>
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<tbody>
<tr>
<td>Age → impairment</td>
<td>−0.18</td>
<td>4.9</td>
</tr>
<tr>
<td>Sex → impairment</td>
<td>−0.53</td>
<td>13.8</td>
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<tr>
<td>Financial strain → impairment</td>
<td>0.08</td>
<td>2.1</td>
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<tr>
<td>Household structure → impairment</td>
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<td>0.2</td>
</tr>
<tr>
<td>Age → functional limitation</td>
<td>−0.18</td>
<td>4.6</td>
</tr>
<tr>
<td>Sex → functional limitation</td>
<td>0.09</td>
<td>2.1</td>
</tr>
<tr>
<td>Financial strain → functional limitation</td>
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<td>2.1</td>
</tr>
<tr>
<td>Household structure → functional limitation</td>
<td>−0.02</td>
<td>0.4</td>
</tr>
<tr>
<td>Age → disability</td>
<td>0.14</td>
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<tr>
<td>Sex → disability</td>
<td>0.12</td>
<td>3.6</td>
</tr>
<tr>
<td>Financial strain → disability</td>
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<td>2.5</td>
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<tr>
<td>Household structure → disability</td>
<td>0.02</td>
<td>0.8</td>
</tr>
<tr>
<td>Impairment → functional limitation</td>
<td>0.36</td>
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</tr>
<tr>
<td>Functional limitation → disability</td>
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<td>16.1</td>
</tr>
<tr>
<td>Disability → physical component of SF-36*</td>
<td>−0.69</td>
<td>23.4</td>
</tr>
<tr>
<td>Disability → mental component of SF-36</td>
<td>−0.26</td>
<td>6.5</td>
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Model fit

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<tr>
<td>Normed fit index</td>
<td>.99</td>
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<tr>
<td>Comparative fit index</td>
<td>.99</td>
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<tr>
<td>Root mean square error of approximation</td>
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</table>

Note: *SF-36 = Medical Outcomes Study 36-Item Short-Form Health Survey.


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