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ASSESSING DISABILITY IN OLDER ADULTS: THE EFFECTS OF ASKING QUESTIONS WITH AND WITHOUT HEALTH ATTRIBUTION

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Objective: **To determine the effects of using questions with and without health attribution on scores derived from a self-report disability instrument.**

Methods: **We administered the disability component of the Late Life Function and Disability Instrument to 75 community-dwelling older adults. Then, we administered the same 16 questions with attribution to specific health conditions. We used a series of analytic methods including weighted Kappa coefficient, Bowker's Test of Symmetry and Rasch analysis to assess the effects of attribution formats.**

Results: **A higher prevalence of disability was reported in the *non-health* attributed compared with the *health* attributed questions ($t = 5.76$; $p < 0.001$, 95% CI 3.8–7.8). Item analyses indicated that participants were significantly more likely to report disability on the non-health attributed version on 4 of the 16 questions.**

Conclusion: **For community-dwelling older adults, the use of a non-health attribution format may be preferable in instruments designed to assess prevalence of disability from contributing factors other than just health.**

Key words: disability, self-report, Late-Life FDI, attribution, Rasch analysis, older adults.

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INTRODUCTION

Disability refers to restrictions in an individual's physical or mental performance in socially expected roles or behaviours (1). The concept of "disability", as used in the Late Life Function and Disability Instrument (LLFDI), comes from the tradition of the Nagi disablement framework. Under the Nagi model, disability includes activities of daily living (ADL) and complex social roles such as a person's occupation (1). This paradigm of "disability" has many similarities with the emerging concept of "participation" as defined by the International Classification of Functioning, Disability, and Health (ICF) (2, 3). Participation is defined as the person's involvement in life situations, such as domestic life, interpersonal interactions and relationships, major life areas, and community, social and civil life (3).

Although numerous self-report disability measures are available, the phrasing of questions that measure disability concepts has been anything but uniform (4–6). One way in which disability instruments differ is whether or not questions are phrased with or without specific attribution to health. For example, a question *without health attribution* is phrased, "How limited are you in performing a task?" Alternatively, a question *with health attribution* can be expressed, "How much does your health limit you in performing a task?" (5). We believe that the disability process results from interactions between individuals and environments, which, in turn, consist of complicated arrays of social and cultural components. Self-report surveys for community-dwelling older adults with attribution to "health conditions" may focus too narrowly on the individual's contribution to disability, rather than the environment or other factors (7). It is not clear whether these different question formats will yield different results, as changes in attribution may potentially alter estimates of the degree of disability (4, 8).

Surprisingly, very little work on the effects of attribution on the wording of questions in disability assessments has been reported. For example, one recent article investigated whether questions with specific attribution to an affected area (acute upper limb problem) yielded different results than when compared with questions with attribution to global health (9). Contrary to expectations of the investigators, persons reported *more* disability when questions were worded "to what extent has your arm, shoulder or hand problem interfered with …" (specific attribution to an affected area) than those questions phrased "to what extent has your physical health or emotional problems interfered with …" (attribution to global health). In this case, more specific attribution appeared to highlight limitations related to the acute upper extremity condition in otherwise healthy middle-aged persons.

In the present study, we compare attribution to global health vs no specific attribution. The no-attribution format allows persons to consider factors other than health, such as the environment, as potential factors related to disability. We know of no comparable study that has examined the potential effects of global health attribution vs no attribution on disability questions in a community-dwelling sample of older adults. Thus, the principal aim of this study was to determine the magnitude and direction of effect when one asks self-reported disability questions with global health attribution and without

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attribution. We ask the question, "does global health-related or no-attribution identify greater disability?" A secondary aim of this study was to determine whether *certain disability questions* were more affected by different forms of attribution than others.

METHODS

Participants/sampling procedure

We administered 16 disability questions in 2 distinct formats (health attribution and non-health attribution) to 75 community-dwelling participants. These data were collected as part of a larger study to determine the initial scaling properties and validity of a new disability and function instrument for community-dwelling older adults (Late Life Function and Disability Instrument; LLFDI) (10, 11). The 75 individuals were randomly selected from the larger standardization sample ($n = 150$). We selected these participants to be part of this sub-study on a random basis to attempt to retain representative demographic characteristics within the subsample and analogous distributions of frailty with the larger sample. Recruitment sources consisted of community service programs on ageing, senior centres, senior housing units, assisted living facilities, and ethnic community organizations in urban, suburban and rural communities throughout Massachusetts. Full details of the LLFDI standardization sample are reported elsewhere (10). The Institutional Review Board at Boston University approved all study procedures.

Instruments

The LLFDI contains items that represent *functional limitations* and *disability* (see Fig. 1). Validity and test-retest reliability of the LLFDI were examined using factor analysis and Rasch analytic techniques and have been reported previously (10, 11). The Function component of the LLFDI evaluates self-reported difficulty in performing 32 physical activities comprised of 3 dimensions: (i) upper extremity; (ii) basic lower extremity; and (iii) advanced lower extremity (11). The Disability component evaluates self-reported limitations and frequency of performing 16 major life tasks (10). Analyses of the limitation dimension of the LLFDI revealed that life roles consisted of an instrumental and a management role domain. We believe that disability may be due to *personal* (health, physical, or mental energy) and/or *environmental* (accessibility, transportation, or socio-economic) factors. We framed the LLFDI questions in a *non-health attribution* fashion in order for participants to consider factors other than health in their decision about their own level of disability. In this paper, we consider only the limitation dimension of the Disability component of the LLFDI. Limitation questions are phrased "to what extent do you feel limited in doing a particular task?" with response options of "not at all," "a little," "somewhat," "a lot" and "completely." See Table I for a list of the 16 disability items and their sub-domains. In addition to the original LLFDI questions, the 75 participants repeated the 16 LLFDI Disability questions, but with the items worded differently from the original form. These additional 16 questions were written in a health attribution format and were phrased "to what extent *do health conditions* limit you from doing a particular task?" As described in the LLFDI Manual (12), the summary scores are linearly transformed from the original logit metric to a more conventional 0–100 scale. Scores approximating 100 indicate little to no disability, and scores approaching 0 indicate high levels of disability.

To further describe the characteristics of the sample, we also report data from the 10-item Physical Functioning (PF-10) and 5-item Mental Health (MH-5) subscales of the SF-36 Health Survey (13). All data were collected by interview in the subjects' home.

Data analysis

We conducted a series of analytical methods to examine the effects of health attribution questions on LLFDI Disability summary scores and on individual items. We evaluated differences between the health attribution and non-health attribution formats on *summary scores* by paired *t*-tests and correspondence of the 2 formats by Pearson's product-moment correlation. At the *item* level, we conducted 3 separate procedures. Since there is not any accepted method to examine differences in paired items (health attribution/non-health attribution items), we used multiple methods to identify items that consistently differed across the 3 analytical techniques.

First, paired-item agreement was estimated by a weighted Kappa coefficient (K_w). This coefficient allows for the incorporation of degrees of correspondence in determining the magnitude of difference between items (14). K_w greater than 0.75 indicates excellent agreement and K_w less than 0.40 indicates poor agreement (15). For the purposes of identifying items with unacceptable agreement, we chose the cut-point of $K_w < 0.40$.

Secondly, we evaluated statistical differences of paired-item agreement with the Bowker's Test of Symmetry (16). For this test, the null hypothesis is that the probabilities in the square table satisfy symmetry or that $p_{ij} = p_{ji}$ for all pairs of table cells. This test is identical to the McNemar's test used for 2×2 table, but appropriate for 5×5 contingency tables. Alpha levels of <0.05 indicated lack of paired item symmetry.

Finally, we performed a Rasch rating scale analysis to estimate item locations (calibrations) along the constructed disability scale (17). The Rasch model provided us with a convenient means of examining hypothesized differences in the consistency of item parameters across attribution and non-attribution modes of disability questions. Specifically, the Rasch model transforms ordinal level Likert response data into

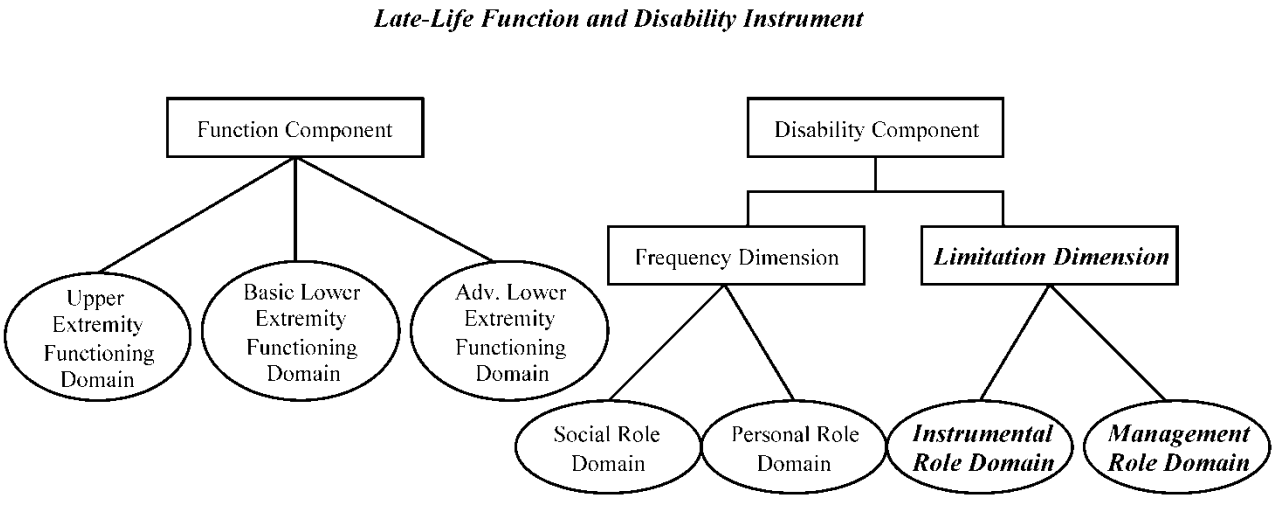

Fig. 1. Illustration of the Late Life Function and Disability Instrument's components.

Table I. *Items listing for Limitation Dimension of the Disability Component*

Instrumental Role Domain
Take part in active recreation
Travel out of town
Work at volunteer job
Provide care to others
Take part in exercise program
Take care of inside of home
Visit friends and family
Go with other to public place
Take part in organized social act
Take care of local errands
Provide meals for self and others
Take care of personal care needs
Management Role Domain
Invite people into your home
Keep in touch with others
Take care of household business
Take care of own health

interval level estimates of predicted item difficulties (18). These item difficulty calibrations are expressed in log-odd units (logits) that are positioned along an interval scale (19). Under the Rasch model, item estimates are assumed to be invariant across similar item pairs if persons are responding in a similar manner to paired questions. If item pairs are measuring the same degree of disability for each condition (health attribution and non-health attribution), then the same item estimates (within a reasonable margin of error) should be obtained for both conditions. We conducted this analysis by a Rasch model computer program WINSTEPS (20) that provides an estimated item calibration value along the scale, and a standard error for each calibration estimate. Then, we performed a series of *Z* tests on respective calibrations of item pairs to identify those items that had item calibrations that were significantly different between health attribution and non-health attribution conditions. We used an α value of <0.01 to avoid a high rate of Type 1 error due to the small sample size and subsequent large item calibration standard errors.

RESULTS

Subjects

Table II summarizes the demographic characteristics of the subjects. The subjects included community-dwelling elderly persons with varying levels of physical frailty as defined by PF-10 scores (13). Twelve percent of the participants were non-frail, 35% were slightly frail, 35% moderately frail and 14% very frail. They were predominantly white, well-educated women and their mean age was 76.6 years (SD 9.0). The physical functioning and mental health was comparable to the older population in the US as reflected by PF-10 and MH-5 values on the SF-36 (21).

Summary scores

On the 0–100 scale, scores approaching 100 indicate little to no disability. The mean summary scores of the non-health attribution format was 66.62 (SD 12.49) compared with the mean of the global health attribution version (71.29; SD: 15.61). The difference in transformed summary scores between both versions was 5.8/100-point scale ($t = 5.76$; $p < 0.001$, 95% CI 3.8–7.8),

Table II. *Participant characteristics (*n = *75)*

Age: mean years (SD)	76.6 (9.0)
Gender: *n* (%)	
Male	16 (21.3)
Female	59 (78.7)
Race/ethnicity: *n* (%)	
White	65 (86.7)
Black	5 (6.7)
Hispanic	4 (5.3)
Asian/Pacific Islander	1 (1.3)
Education: *n* (%)	
High school or less	27 (36.0)
Bachelor degree	34 (45.3)
Graduate degree	14 (18.7)
Living situation: *n* (%)	
Alone	37 (49.3)
With spouse only	27 (36.0)
With family	7 (9.3)
With non-family	4 (5.3)
Living area: *n* (%)	
Urban/suburban	58 (77.3)
Rural	17 (22.7)
Physical functioning[1]: mean score (SD)	58.1 (31.7)
Mental health[2]: mean score (SD)	74.7 (18.7)

[1] Based on the 10 physical functioning items (PF-10) of the SF-36.
[2] Based on the 5 mental health items (MH-5) of the SF-36.

indicating that persons reported more disability with the non-health attribution format than with the global health attribution format. Nonetheless, the non-health attribution and global health attribution summary scores were highly correlated ($r = 0.83$; $p < 0.0001$).

Paired-item agreement

Table III presents the non-health attribution and health attribution item agreements. Overall, for 14 of the 16 items, participants reported more disability on the non-health attribution questions compared with those with health attribution. This can be found by examining the column that reports the percentage of subjects in which disability scores are greater for the non-health attribution format than health attribution. Four items reached a K_w level of <0.40, indicating substantial disagreement. One item "*take care of own health*" had a very low K_w due to a statistical artefact caused by limited variability in that item (22). Four items with $K_w < 0.40$, "*travel out of town*", "*visit friends and family*", "*go with others to public places*", and "*keep in touch with others*" had significantly different distributions (Bowker's test, $p < 0.05$). These items are all related to social contact, and three require mobility out of home that can be affected by the physical environment or social factors. Five items had statistically different paired-item calibrations based on the Rasch analyses (Table IV). Four illustrates the paired-item calibrations with their respective *Z* tests for items with significant differences. These items were identical to the four items recognized by the Bowker's test, but also included the item "*take care of inside of home*". Overall, four items, "*travel out of town*", "*visit friends and family*", "*go with others to public*

Table III. *Comparisons of the non-health attribution and health attribution items*

	Statistical tests			% of agreement and disagreement		
Items	Weighted Kappa[1]	Bowker's test[2] *p*-value	Differences in paired item calibrations[3]	% with perfect agreement[4]	% non-health attribution > health attribution[5]	% non-health attribution < health attribution[5]
Take part in active recreation	0.60	0.285	0.14	63	20	17
Travel out of town	0.35*	0.006*	1.01**	42	49	9
Work at volunteer job	0.61	0.113	0.33	56	28	16
Provide care to others	0.67	0.892	0.15	59	25	16
Take part in exercise program	0.56	0.743	0.21	57	27	16
Take care of inside of home	0.53	0.090	0.48*	55	37	8
Visit friends and family	0.38*	0.031*	0.80**	51	40	9
Invite people into your home	0.49	0.252	0.42	64	27	9
Go with other to public place	0.45	0.036*	0.64*	65	27	8
Take part in organized social act	0.43	0.202	0.50	69	23	8
Keep in touch with others	0.35*	0.021*	0.96**	64	30	5
Take care of local errands	0.74	0.912	0.22	83	10	7
Provide meals for self and others	0.58	0.251	0.40	75	19	6
Take care of household business	0.55	0.501	0.18	79	16	5
Take care of personal care needs	0.67	1.00	0.00	84	8	8
Take care of own health	−0.03*	0.655	0.36	92	4	4

[1] Coefficient Kappa incorporating weight for varying gravity of disagreement; * identify items with poor agreement.
[2] *p* value of paired sample, *p*-value of <0.05 indicates lack of symmetry.
[3] Difference between respective calibrations of items pairs with items significantly different * $p < 0.01$, ** $p < 0.001$.
[4] % of subjects with perfect agreement.
[5] % of subjects showing more (>) or less (<) disability when answering the non-health attribution questions compared with the health attribution questions.

Table IV. *Item calibrations for items with significant differences in paired item calibrations*

Items	Non-health attribution items	Health attribution items	*Z*
Travel out of town	1.13	0.12	5.26**
Take care of inside the home	0.73	0.25	2.51*
Visit friends and family	0.67	−0.13	3.88**
Go with other to public place	0.19	−0.45	2.91*
Keep in touch with others	−0.18	−1.14	3.43**

* $p < 0.01$, ** $p < 0.001$.

places", and "*keep in touch with others*" demonstrated differences across at least two of the three analytic methods.

DISCUSSION

Disability is an important construct in understanding health and well being (1). In a recent review paper, Dijkers et al. (23) propose that persons may not participate in social life for reasons *other* than health conditions. In concordance with this view, our analyses suggest that disability items written with health attribution alone may underestimate self-reported estimates of disability in community-dwelling older adults. We discovered a 5.8% average increase in cumulative disability when persons reported disability without attribution to health alone, indicating that environmental (physical and social) and other factors outside the person's health appear to have an important influence on degree of self-reported disability in community-dwelling older adults.

Although several researchers have advocated including environmental factors in the "concept of disability" (23–26), just how environmental factors are to be integrated into the analysis of disability is still a matter of controversy. One approach is to ask the respondents to report on their daily functioning and to rely on statistical norms or on explicit comparisons with non-disabled control groups to isolate the effects of social and environmental factors (23, 24). We propose that factors underlying social participation are not the simple addition of various factors but rather a "relational" concept in which different interactions between the disablement process and external factors contribute (25). Thus, to understand the reasons a person becomes restricted in social or role expectations, a consideration of an individual's functioning *in relation* to relevant aspects of the person's environment appears to be critical (25, 26).

We must note, however, that the effects of framing questions in a health attribution format are not evenly distributed across all disability items. The impact of health attribution appeared to affect most reliably only 4 of the 16 Disability items, namely "*travel out of town*", "*visit friends and family*", "*go with others to public places*", and "*keep in touch with others*". Three of these items are part of the LLFDI set of Instrumental Role items, requiring travel outside of the home. A fourth item, "*keep in touch with others*", is part of the Management Role. Keeping in touch with others may require certain environmental supports, such as ready access to telephone, internet, or perhaps

transportation to travel out of home to visit others. With larger samples, we might find that other items emerge that can be reliably identified as different between formats, as 14 of the 16 items showed some level of increased disability with non-health attribution than with health attribution alone.

In a recent investigation in a younger population with musculoskeletal disorders in the shoulder, Marx et al. (9) found a small order effect in comparing questions with attribution to the upper extremity vs global health attribution. When specific attribution questions were asked prior to global health attribution questions, the specific attribution questions yielded greater levels of disability. Even when the order was counterbalanced in a subsequent study, the same pattern emerged, although the effect was smaller. In this study, we did not counterbalance the order of the questions, as all of the non-health attribution questions were administered prior to the global health attribution questions. The order in which the participants answered the questions might have affected the magnitude of this discrepancy, but we believe it is unlikely that changing the order of administration would completely reverse the pattern of the results since the percentage of disagreement observed for these 4 items was very large and always in favour of more disability associated with the non-health attribution version.

Our findings may be noteworthy in light of the recent recognition of the importance of the environment (physical, social and attitudinal) on the ICF concept of participation and attitudinal environment (3). The LLFDI's disability concept shares common properties with constructs measuring aspects of life roles in instruments (27–31) based on recent models such as the World Health Organization's model of health (3) or the Disability Creation Process (DCP) (28). It is common for these instruments to frame questions about life roles without specific attribution to health conditions. If a long-term goal of health care and community services is to support independence and full participation in older persons, it appears that environmental aspects are an important factor (32).

In conclusion, the results of this study reveal that the specific wording of questions in a disability assessment can be an important consideration in the measurement of disability, especially for those domains that involve the sociocultural and physical environments. For most items, distinctions between health attribution and non-health attribution formats appear to be less critical. We believe that environment is a fundamental theme of disability assessment, and have chosen to include it as a potential factor contributing to the measurement of disability in the LLFDI. If one's interest is in the measurement of disability from both a personal and social perspective, we recommend measuring disability from a non-health attribution perspective.

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