Determinants of Functional Limitation and Disability in Older Adults

Mefford AN[1], Castro-Schilo L[2], Widamen K[3], Mungas D[1], & Farias ST[1]

[1]University of California, Davis, Department of Neurology; [2]University of North Carolina at Chapel Hill, Department of Quantitative Psychology;
[3]University of California, Davis, Department of Psychology

INTRODUCTION

Decline in the ability to perform everyday functions and the eventual loss of independence are a major concern for older adults and their families, leading to a lower quality of life as well as greater economic burden[1,2]. As a critical public health concern, a comprehensive understanding of the factors that contribute to functional loss and disability is important in widening the scope of primary, secondary, and tertiary preventative interventions.

The Disablement Process Model is a theoretical framework developed to describe the pathway leading from disease pathology ultimately to disability[3] (Figure 1).

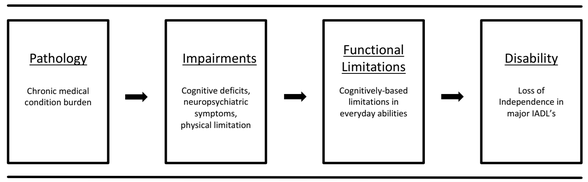

Figure 1. Disablement Process Model (adapted from Verbrugge & Jette, 1994)

Recent work has shown that deficits in global cognition are a strong predictor of IADL disability and specific types of neurocognitive impairment have been shown to most significantly lead to disability, namely deficits in the domains of executive function and episodic memory. However, the range of disability observed in older adults depends only in small part on cognitive impairment; a study by Royall (2007) suggests that deficits in cognition explain only 21% of the variance in older adults' functional status[4].

Several additional factors have thus been identified as likely contributing to functional decline, including physical impairments, neuropsychiatric symptoms, and medical morbidity burden. Previous studies have shown an association between IADL disability and motor impairments related to muscle strength and balance, even in community-based samples without obvious or severe motor dysfunction[5]. Neuropsychiatric symptoms have also been associated with increased functional disability, with depression being the most studied to this point[6]. Finally, greater cumulative medical illness burden has been associated with increased frailty, disability, and mortality[7-9]; however, little is known regarding how these chronic medical conditions interact with other factors in leading to disability.

OBJECTIVES

While most previous studies have examined various determinants of functional impairment in isolation, the present study adds to this literature by taking a more comprehensive approach, examining how multiple potential factors simultaneously exert independent effects on daily function as measured at both the level of everyday functional limitations and IADL disability.

1. Examine the relationship between cognitively-based functional limitation, as measured by the Everyday Cognition (E-Cog) scale, and the cumulative degree of disability in Instrumental Activities of Daily Living (IADL's).
2. Quantify the influence of physical impairments, neuropsychiatric impairment, and cognitive impairment on everyday cognitively-based functional limitation and IADL disability.
3. Examine the influence of cumulative medical morbidity burden on the domains of physical impairment, neuropsychiatric impairment, and cognitive impairment.

METHODS

Setting: This study data was collected as part of a longitudinal research cohort at the University of California, Davis Alzheimer's Disease Center.

Participants: Participants (n = 444) were diagnosed as having normal cognition, mild cognitive impairment (MCI), or dementia, had an informant who could complete informant-based ratings, and had at least one follow-up visit.

Design: Participants received study assessment measures and diagnostic work-ups on an annual basis.

Measurements: Participants completed the Everyday Cognition (ECog) scale, a questionnaire-based instrument designed to measure everyday function across six cognitive domains, as well the Spanish-English Neuropsychological Assessment Scale (SENAS), the Short Physical Performance Battery (SPPB), and the Neuropsychiatric Inventory (NPI). Medical comorbidities were assessed using the Cumulative Illness Rating Scale (CIRS). Measurement of disabilities focused on instrumental ADLs using on a modified version of the Lawton and Brody scales.

Data Analysis: We used the structural equation modeling (SEM) framework to explore associations between different domains of impairment, functional abilities, and disability, while accounting for medical morbidity burden and several demographic variables (age, gender, education). The fit of the model was assessed with the Comparative Fit Index (CFI) and Room Mean Square Error of Approximation (RMSEA).

RESULTS

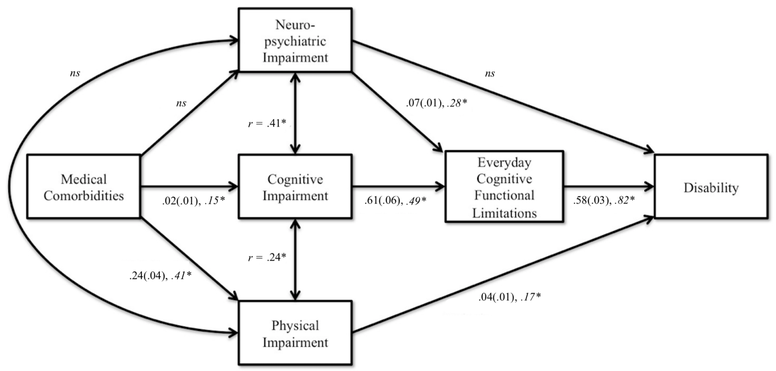

Figure 2. Hypothesized structural equation model. Values along arrows represent unstandardized regression coefficients, (bootstrapped standard errors are in parentheses,) and standardized regression coefficients are shown in italics for the hypothesized model. * $p < .01$, *ns* = non-significant.

CONCLUSIONS

- The present study provides evidence that how well older adults both with and without MCI/dementia function in their daily life and how independent they are depends on many inter-related factors.
- Further, simultaneously accounting for multiple factors allows us to account for more of the variance in functional outcomes.
- The determinants of functional capacities in older adults differ at the everyday functional limitation and IADL disability levels.
- Cognitive impairment and neuropsychiatric symptom burden were independently associated with greater cognitively-based functional limitation on the ECog.
- Everyday functional limitations on the ECog and physical impairment on the SPPB were independently associated with greater IADL disability.
- A higher degree of medical morbidity burden (independent of dementia/MCI) contributed to functional outcomes through its association with greater cognitive impairment and physical impairment.
- These findings have important clinical implications in regards to better understanding why older adults become disabled, specifically by elucidating the complex interactions between various contributing factors, and emphasize the importance of a multi-domain preventative approach.
- Improved interventions aimed at these individual determinants may have an additive benefit in influencing functional outcomes and improving quality of life in our older patient population.

REFERENCES

1. Hope, T., Keene, J., Gedling, K., Fairburn, C. G., & Jacoby, R. (1998). Predictors of institutionalization for people with dementia living at home with a carer. *International J of Geriatric Psychiatry*, 13(10), 682-690.
2. Severson, M.A.S., Smith, G.E., Tangalos, E.G., Petersen, R.C., Kokmen, E., Ivnik, R.J., Atkinson, E.J. and Kurland, L.T. (1994). Patterns and Predictors of Institutionalization in Community-Based Dementia Patients. *J of the American Geriatrics Society*, 42(2), 181-185.
3. Verbrugge, L. M., & Jette, A. M. (1994). The disablement process. *Social Science & Medicine*, 38(1), 1-14.
4. Royall, D. R., Lauterbach, E. C., Kaufer, D., Malloy, P., Coburn, K. L., & Black, K. J. (2007). The cognitive correlates of functional status: a review from the Committee on Research of the American Neuropsychiatric Association. *The Journal of Neuropsychiatry and Clinical Neurosciences*.
5. den Ouden, M. E., Schuurmans, M. J., Arts, I. E., & van der Schouw, Y. T. (2011). Physical performance characteristics related to disability in older persons: a systematic review. *Maturitas*, 69(3), 208-219.
6. Lenze, E.J., Rogers, J.C., Martire, L.M., Mulsant, B.H., Rollman, B.L., Dew, M.A., Schulz, R. and Reynolds, C.F. (2001). The association of late-life depression and anxiety with physical disability: a review of the literature and prospectus for future research. *The American J of Geriatric Psychiatry*, 9(2), 113-135.
7. Fried, L. P., Bandeen-Roche, K., Kasper, J. D., & Guralnik, J. M. (1999). Association of comorbidity with disability in older women: the Women's Health and Aging Study. *J of Clinical Epidemiology*, 52(1), 27-37.
8. Fried, L.P., Tangen, C.M., Walston, J., Newman, A.B., Hirsch, C., Gottdiener, J., Seeman, T., Tracy, R., Kop, W.J., Burke, G. and McBurnie, M.A. (2001). Frailty in older adults evidence for a phenotype. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 56(3), M146-M157.
9. Fried, L. P., Ferrucci, L., Darer, J., Williamson, J. D., & Anderson, G. (2004). Untangling the concepts of disability, frailty, and comorbidity: implications for improved targeting and care. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 59(3), M255-M263.

CONTACT

For more information contact:
Anthony Mefford, UC Davis School of Medicine [amefford@ucdavis.edu]
Sarah T. Farias, Ph.D., UC Davis Dept. of Neurology [farias@ucdavis.edu]