

# International Encyclopedia of Rehabilitation

Copyright © 2010 by the Center for International Rehabilitation Research Information and Exchange (CIRRIE).

All rights reserved. No part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system without the prior written permission of the publisher, except as permitted under the United States Copyright Act of 1976.

Center for International Rehabilitation Research Information and Exchange (CIRRIE)

515 Kimball Tower

University at Buffalo, The State University of New York

Buffalo, NY 14214

E-mail: [ub-cirrie@buffalo.edu](mailto:ub-cirrie@buffalo.edu)

Web: <http://cirrie.buffalo.edu>

*This publication of the Center for International Rehabilitation Research Information and Exchange is supported by funds received from the National Institute on Disability and Rehabilitation Research of the U.S. Department of Education under grant number H133A050008. The opinions contained in this publication are those of the authors and do not necessarily reflect those of CIRRIE or the Department of Education.*

# **Mobility Limitations**

**Vanessa Yong, PhD**

**Advanced Research Institute for the Sciences and Humanities  
Nihon University, 12-5 Goban-cho, Chiyoda-ku, Tokyo 102-8251  
Email: [vanessa.yong@nihon-u.ac.jp](mailto:vanessa.yong@nihon-u.ac.jp)**

## **Introduction**

Mobility limitations and disability are currently viewed largely from a person-environment perspective where the disabled outcome is often seen as a result of the dynamic interplay between the individuals' capabilities and the demands of the environments in which they negotiate (Altman, 2001; Brandt and Pope, 1997; Verbrugge and Jette, 1994). This "social model" of disability places emphasis on the importance of environmental impacts such as the physical environment, the services available and accessible to people with disabilities, attitudes, and legislation on a person's movement capability, and departs from the earlier "medical model" where disability is considered to be chiefly an individual attribute that is associated primarily with health problems or impairments caused by health conditions, whether congenital or acquired later in life, or by accidental injuries. The current understanding of disability and the disablement process takes into account both environment and individual factors, and how these interact together to affect the level of activity limitations and participation in a social world.

Seen in this light, disability is a multidimensional concept which includes impairments, activity limitations, and participation restriction. Recognizing that the complexity of the concept of disability has to be understood within a social and environmental contextual framework, the World Health Organization (WHO) introduced in 2001 the International Classification of Functioning, Disability and Health (ICF) which covers the components of body functions (the physiological and psychological functions of body systems), body structures (the anatomical parts of the body), activity (the execution of a task or action), participation (involvement in a life situation), and environmental factors (the physical, social, and attitudinal environment in which people live and conduct their lives). These components are further structured into more specific domains and categories.

Based on the ICF, under the "activity" component, a mobility limitation can be defined as difficulty with walking and moving around (ICF codes d450-d469) and changing or maintaining body position (ICF codes d410-d429). Additionally, the mobility chapter of the ICF also includes difficulty with carrying, moving and handling objects (ICF codes d430-d449), and moving around using transportation (ICF codes d470-d489) (World Health Organization, 2001). It should, however, be noted that because specific definitions and measurements of mobility limitations and disability usually vary from study to study, caution must be taken particularly when comparing results such as prevalence estimates across studies and surveys which may differ widely as a result. For instance, assistive

devices such as walking canes, wheelchairs, and other devices to facilitate movement are often used by people with mobility limitations, and some studies may identify people with mobility limitations based on their use of assistive devices while others may be assessed with or without the use of such devices (Rasch, Altman, and Madans, 2006). Furthermore, the range of functional levels for all classes of actions and activities should also be considered.

Mobility problems are most common among older adults, although people of any age can experience difficulties in mobility (Iezzoni, McCarthy, Davis, and Siebens, 2001). In addition to the large body of literature on mobility limitations among older adults, there are also a number of studies on mobility limitations among the intellectually and developmentally disabled and the visually impaired (Cleaver, Hunter, and Ouellette-Kuntz, 2008; Salive, Guralnik, Glynn, and Christen, 1994).

## **Measurements and Assessment Tools of Mobility Limitations**

A number of assessment tools have been developed to measure mobility in research, clinical, and rehabilitation settings (Bussmann and Stam, 1998). The different assessment tools can be broadly divided into two types: performance-based measures and self-reported measures.

Performance-based measures include clinical assessments of levels and different aspects of mobility ability. To obtain objective measurements, trained personnel use instruments that range from simple scales of timed tests and examination of gait, balance, and posture to portable ambulatory activity monitors and complex laboratory-bound equipment that measure physical forces, movements, and even physiological markers (e.g. heart rate and oxygen uptake). Performance-based measures are useful for obtaining mobility ability outcomes on basic function level as well as for simple activities, but are usually limited to a small number of subjects who are examined.

Self-reported measures typically include survey questionnaires and regular diary entries (usually made by the subjects themselves). Survey questionnaires are commonly used for large-scale, population-based national studies and questions on mobility limitations such as difficulties in walking one-quarter mile or climbing one flight of stairs are typically asked. Also included in surveys are questions on the ability to perform complex and role-fulfillment activities of daily living such as bathing, dressing, feeding, housekeeping, and working. For diary entries, subjects keep diaries and make entries related to their mobility ability at pre-determined time intervals. Compared to performance-based measures, self-reported measures have an element of subjectivity, although they have the advantage of obtaining information on a wider range of activities.

As noted above, each measurement type and assessment tool has its strengths and weaknesses and depending on the specific measure and tool used, the outcomes obtained are likely to be different. The choice of measures to use depends in large part on several

factors – the particular setting under consideration, the research questions, the clinical problem, the specific aspects of mobility to measure, methodological quality (i.e. reliability and validity), and availability and costs involved.

## **Prevalence of Mobility Limitations**

Comparative studies across countries on the prevalence of mobility limitations are usually limited because of differences in measures used, in part because of different assessment tools for mobility. An exception is the World Health Survey (WHS) undertaken by the World Health Organization in 70 countries where the measurement for mobility is standardized. Two questions on mobility were asked in the survey questionnaires to respondents aged 18 years and over: 1. Overall in the last 30 days, how much difficulty did you have with moving around? 2. In the last 30 days, how much difficulty did you have in vigorous activities, such as running 3km (or equivalent) or cycling? Response categories were none, mild, moderate, severe, and extreme/cannot do. In general, about 77 percent and 63 percent reported no difficulties with moving around and vigorous activities, respectively. The prevalence of mobility limitations is higher in developing countries than in developed countries. For instance, 47 percent reported having some difficulties with moving around in India compared to 26 percent in Denmark. The severity of mobility limitations is also higher in developing countries. For more details on the WHS, see <http://www.who.int/healthinfo/survey/whsresults/en/index.html>.

In the United States (not included in the WHS), data from the National Health Interview Survey (NHIS), a nationally representative survey of non-institutionalized civilian residents, showed that over the period 2001 to 2005, the most common difficulty is related to movement, with 21.7 percent of the population aged 18 and older reporting difficulties with basic physical actions such as walking, bending, reaching overhead, or using their fingers to grasp something (Altman and Bernstein, 2008). The U.S. Census Bureau reported that in 2005, of Americans aged 15 and older, 11.9 percent had difficulty with ambulatory activities of the lower body, 9.8 percent had difficulty walking a quarter of a mile, and 9.4 percent had difficulty climbing a flight of stairs (Brault, 2008). Importantly, because of differences in measurements and definitions as noted, international comparability of prevalence estimates of disability is difficult and complex; thus, the results from NHI, the U.S. Census Bureau, and the WHS cannot be compared directly. Currently, groups such as the Washington Group on Disability Statistics, together with the United Nations Statistical Division, are working on facilitating cross-national comparison of data on disability.

## **Risk Factors for Mobility Limitations**

Various risk factors have been found to be associated with mobility limitations. These can be classified into individual, social, environmental, and organizational factors (Yeom, Fleury, and Keller, 2008).

Individual risk factors include age, sex, marital status, socioeconomic status, lifestyle and health behaviors, and diseases and conditions. Numerous studies have documented a

positive correlation between age and mobility limitations, i.e., as age increases, the likelihood of having difficulties with walking and movement increases (Guralnik et al., 1993; Melzer and Parahyba, 2004; Shumway-Cook, Ciol, Yorkston, Hoffman, and Chan, 2005). These studies provide some evidence that mobility limitations are, in part, related to the normal aging process, where muscle mass and bone density losses as well as joints erosions in later life may result in a decline in mobility function. In particular, at higher ages of 70 years and over, there is a very strong association between age and mobility limitations. Nevertheless, a body of literature also exists that supports the notion that mobility decline is not part of the normal aging process but represents some underlying pathological process.

Compared with men, women tend to have higher prevalence of mobility impairments and are more likely to be disabled in later life (Ahacic, Parker, and Thorslund, 2000; Guralnik et al., 1993; Melzer and Parahyba, 2004; Shumway-Cook et al., 2005). This sex difference in mobility limitations is partly a function of age and life expectancy: because women live longer, they also have a higher likelihood of more years of life with mobility limitations than men. In addition, gender inequality and basic physiological differences between the sexes (e.g. leg extension power and walking speed) are also contributing factors (Rantanen and Avela, 1997). The gender gap has, however, narrowed over time in some countries. For example, a study in Sweden found that from 1968 to 1992, Swedish women's physical mobility improved more than men's (Ahacic et al., 2000). The improved mobility was associated with changes in the social class structure, increased employment among women, and changes in health behaviors in smoking and physical activity (Ahacic, Parker, and Thorslund, 2003; Rantanen and Avela, 1997).

Marital status also influences the likelihood of mobility limitations. In a study of mobility limitations among the Medicare population in the United States, Shumway-Cook and colleagues (2005) reported that being unmarried is associated with a higher probability of being classified at higher levels of mobility limitation. A study on five European countries (Finland, The Netherlands, Germany, Hungary and Italy) similarly found that older unmarried people are more likely to report greater difficulties in moving around (Mollenkopf et al., 2004).

Socioeconomic status (SES), measured by income and educational levels, is associated with mobility limitations after taking into account other demographic characteristics. Research has found that individuals earning lower annual incomes and having less than a high school education are more likely to have functional difficulties with walking and movements compared with those of higher SES (Guralnik et al., 1993; Shumway-Cook et al., 2005). Some causal mechanisms in the relationship between SES and health status are health behaviors, knowledge and utilization of health care, and access to quality care (Smith, 2004).

Lifestyle and health behaviors are important risk factors for mobility limitations. Various studies have found that a sedentary lifestyle, smoking, drinking alcohol, poor nutritional

status, and obesity are significantly associated with mobility limitations, after adjusting for other demographic factors. Studies have shown that those who regularly engage in physical activities are less likely to risk mobility limitations and disability in later life (LaCroix, Guralnik, Berkman, Wallace, and Satterfield, 1993). Østbye and colleagues (2002) reported that not only do non-smokers have a higher probability of maintaining lower body mobility than smokers, they are also more likely to recover from impaired mobility. Non-consumption of alcohol was found to be significantly associated with maintaining mobility (LaCroix et al., 1993). Compared with those who have a balanced nutritional status, people who suffer from malnutrition are more likely to have problems with mobility (Wissing & Unosson, 1999). Finally, being obese is a strong predictor of mobility difficulties. Several studies found that individuals who are obese have lower body mobility and are more likely to have difficulties with activities of daily living (Jenkins, 2004; LaCroix et al., 1993). It should be noted that the relationship between obesity and mobility limitations is bi-directional, i.e. obesity can also result from having mobility limitations.

Diseases and conditions can also influence the ability to walk and move around. Older adults with heart diseases, stroke, high blood pressure, diabetes, and dyspnea have a greater likelihood of mobility limitations (Guralnik et al., 1993; Oldridge and Stump, 2004). Those with knee pain and foot problems are also more likely to report difficulties with ascending and descending stairs, stepping, and stability (Lamb et al., 2000; Menz and Lord, 2001). In addition, tiredness with daily activities, fatigue, and having metabolic syndrome predict mobility decline (Avlund, Rantanen, and Schroll, 2006; Blazer, Hybels, and Fillenbaum, 2006).

Social risk factors for mobility limitations include weak social networks, low levels of social participation, and high dependency on caregivers. It has been found that extensive social networks and relations with others such as friends and family members are associated with a lower probability of mobility limitations. Active social participation in activities outside the home appears to have a positive effect on maintaining mobility (Avlund, Lund, Holstein, and Due, 2004). It should, however, be noted that it is possible that having mobility limitations may reduce social participation in the first place. Further research is needed to address the selectivity effect on the relationship between social participation and mobility limitations. A high dependency on caregivers who “over-protect” has been found to be a risk factor that contributes to increased mobility limitations (Cimarolli, Reinhardt, and Horowitz, 2006; Thompson, Galbraith, Thomas, Swan, and Vrungos, 2002).

Environmental factors are also important for determining the extent of mobility limitations. Environment barriers to mobility include poor housing and outdoor accessibility (e.g. presence of numerous steps, lack of ramps and handrails, and lack of lifts) that make physical movements from one place to another difficult (Iwarsson and Wilson, 2006). Geographical location has also been found to be associated with mobility limitations. Although older adults living in rural areas have lower levels of mobility limitations, they are more likely to develop mobility difficulties in later life compared with those living in

urban areas (Melzer and Parahyba, 2004; Mollenkopf et al., 2004). Finally, physical conditions such as traffic safety, air pollution, season of the year, and neighborhood characteristics may also influence mobility levels (King et al., 2006).

Last but not least, organizational factors, particularly policy-related ones, such as urban planning and transportation regulations, can have an impact on the level of mobility difficulties that individuals may experience. In particular, for people with no or few resources to overcome personal or environmental limitations, policies for barrier-free access to buildings and public transportation can significantly improve their mobility ability (Mollenkopf et al., 2004).

## **Consequences of Mobility Limitations**

Because of the close association with disability and increase in dependency, mobility limitations can often restrict activity and social participation, bring about isolation, anxiety and depression, and contribute to an overall poorer quality of life (Netuveli, Wiggins, Hildon, Montgomery, and Blane, 2006; Rubenstein, Powers, and MacLean, 2001). Unsupportive environments can further diminish active participation in usual social and work activities and in maintaining a household.

Studies have found that limitations with mobility are a strong predictor of subsequent disabilities and the need for assistance (Hirvensalo, Rantanen, and Heikkinen, 2000; Jette, Assmann, Rooks, Harris, and Crawford, 1998; Johnson and Wolinsky, 1993; Lawrence and Jette, 1996; Stuck et al., 1999). Older persons who lose independent mobility are also less likely to remain living in the community and more likely to be institutionalized (von Bonsdorff, Rantanen, Laukkanen, Suutama, and Heikkinen, 2006). Other studies have found that impaired mobility among older adults is associated with a higher risk of mortality (Hirvensalo, et al., 2000; Lyyra, Leskinen, and Heikkinen, 2005). In light of these associations, maintaining mobility over time is a key concern and important goal especially for older persons who are more likely to experience functional decline and disability.

Although people with mobility difficulties and disabilities are more likely to experience poorer health and suffer from more conditions compared to their nondisabled counterparts, resulting in increased need for health services and higher medical costs, accessibility to primary, specialty, and preventive health care is often difficult and limited. Common barriers include physical access to doctor's offices and office/medical equipment and facilities, establishing trusting relationships with physicians, and payment for durable medical equipment, medications, lack of insurance coverage for specific services, and rehabilitation (O'Day, Dautel, and Scheer, 2002). Quality of care as well as patient and health care worker safety, e.g. difficulties encountered or injuries sustained when an untrained health care worker transfers patients with disabilities to examination tables that are too high or insufficiently padded, may be compromised as a result (Kirschner, Breslin, and Iezzoni, 2007). Furthermore, variations in provider capacity to offer accessible

healthcare to people with disabilities may also limit access to certain vital health services. For instance, a study found that among providers, dentists and mental health/substance abuse providers are significantly less likely to report that they provide accessible services to people with disabilities (Bachman, Vedrani, Drainoni, Tobias, and Andrew, 2007). Because of these barriers and difficulties, the sense of stigmatization could be heightened among people with mobility limitations and disabilities (Iezzoni, 2003). Recognizing this, in 2006, the United Nations Convention on the Rights of Persons with Disabilities was adopted by the United Nations General Assembly to address the equalization of opportunities for people with disabilities in all aspects of life, including the right to equitable and accessible health care.

## **Rehabilitation Interventions**

Research has found that mobility is dynamic in nature and most mobility limitations are not permanent, especially at younger ages. Gill and colleagues (2006) reported that even among older adults, mobility is characterized by frequent transitions between states of independence and disability within relatively short periods of time. Thus, rehabilitation interventions and care are particularly beneficial to people with mobility limitations in order to increase their likelihood of recovery. Some widely-used rehabilitative interventions for people with mobility limitations include physiotherapy and occupational therapy. These therapies, conducted by trained professionals, often address components such as strength, flexibility, balance, and exercise training. Functional tasks such as transferring from bed to chair, sitting to standing, walking and wheeling are also practiced in therapy sessions. In addition, therapy also targets improving independence in personal activities of living (e.g. bathing, dressing, toileting, and feeding).

Changes to the environment such as removal of structural barriers and adaptation of transportation systems can also be considered as part of a rehabilitation intervention strategy for people with mobility limitations. Mobility devices are also used to increase the mobility levels of people with mobility limitations. These devices include, but are not limited to, crutches, walking frames, rollators, and manual and powered wheelchairs. It has been estimated that in the United States, more than 6.8 million Americans use mobility devices in their daily lives (Kaye, Kang, and LaPlante, 2000). There has been evidence that mobility devices improve users' activity and participation and increase mobility (Salminen, Brandt, Samuelsson, Toytari, and Malmivaara, 2009). With the goal of creating equal opportunities for people with disabilities, the World Health Organization has recommended assistive devices as important tools for achieving this end (World Health Organization, 2006).

## **Acknowledgements**

The constructive comments provided by the reviewer of this article are gratefully acknowledged.



## References

- Ahacic A, Parker MG, Thorslund M. 2000. Mobility limitations in the Swedish population from 1968 to 1992: age, gender and social class differences. *Aging* 12(3):190-198.
- Ahacic A, Parker MG, Thorslund M. 2003. Mobility limitations 1974-1991: Period changes explaining improvement in the population. *Social Science and Medicine* 57(12):2411-2422.
- Altman B. 2001. Disability definitions, models, classification schemes, and applications. In GL Albrecht, KD Seelman, M Bury, Editorss. *Handbook of disability studies*. Thousand Oaks (CA): Sage Publications. p. 97-122.
- Altman B, Bernstein A. 2008. *Disability and Health in the United States, 2001-2005*. National Center for Health Statistics.
- Avlund K, Lund R, Holstein B, Due P. 2004. Social relations as determinant of onset of disability in aging. *Archives of Gerontology and Geriatrics* 38(1):85-99.
- Avlund K, Rantanen T, Schroll M. 2006. Tiredness and subsequent disability in older adults: The role of walking limitations. *Journals of Gerontology Series A: Biological and Medical Sciences* 61(11):1201.
- Bachman S, Vedrani M, Drainoni M, Tobias C, Andrew J. 2007. Variations in provider capacity to offer accessible health care for people with disabilities. *Journal of Social Work in Disability and Rehabilitation* 6(3):47-63.
- Blazer D, Hybels C, Fillenbaum G. 2006. Metabolic syndrome predicts mobility decline in a community-based sample of older adults. *Journal of the American Geriatrics Society* 54(3):502-506.
- Brandt E, Pope A. 1997. *Enabling America: Assessing the role of rehabilitation science and engineering*. Washington, D.C: National Academies Press.
- Brault M. 2008. *Americans with disabilities: 2005*. Washington, DC: U.S. Census Bureau.
- Bussmann J, Stam H. 1998. Techniques for measurement and assessment of mobility in rehabilitation: A theoretical approach. *Clinical Rehabilitation* 12(6):455-464.
- Cimarolli V, Reinhardt J, Horowitz A. 2006. Perceived overprotection: Support gone bad? *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 61(1):S18.

- Cleaver S, Hunter D, Ouellette-Kuntz H. 2008. Physical mobility limitations in adults with intellectual disabilities: A systematic review. *Journal of Intellectual Disability Research* 53(2):93-105.
- Gill TM, Allore HG, Hardy SE, Guo Z. 2006. The dynamic nature of mobility disability in older persons. *Journal of the American Geriatrics Society* 54(2):248-254.
- Guralnik J, LaCroix A, Abbott R, Berkman L, Satterfield S, Evans D, et al. 1993. Maintaining Mobility in Late Life. I. Demographic Characteristics and Chronic Conditions. *American Journal of Epidemiology* 137(8):845-857.
- Hirvensalo M, Rantanen T, Heikkinen E. 2000. Mobility difficulties and physical activity as predictors of mortality and loss of independence in the community-living older population. *Journal of the American Geriatrics Society* 48(5):493-498.
- Iezzoni L. 2003. When walking fails: Mobility problems of adults with chronic conditions: Univ of California Press.
- Iezzoni L, McCarthy E, Davis R, Siebens H. 2001. Mobility difficulties are not only a problem of old age. *Journal of General Internal Medicine* 16(4):235-243.
- Iwarsson S, Wilson G. 2006. Environmental barriers, functional limitations, and housing satisfaction among older people in Sweden: A longitudinal perspective on housing accessibility. *Technology and Disability* 18(2):57-66.
- Jenkins K. 2004. Obesity's effects on the onset of functional impairment among older adults. *The Gerontologist* 44(2):206.
- Jette AM, Assmann SF, Rooks D, Harris BA, Crawford S. 1998. Interrelationships among disablement concepts. *Journals of Gerontology Series A: Biological and Medical Sciences* 53(5):395-404.
- Johnson R, Wolinsky F. 1993. The structure of health status among older adults: Disease, disability, functional limitation, and perceived health. *Journal of Health and Social Behavior* 105-121.
- Kaye H, Kang T, LaPlante M. 2000. Mobility device use in the United States. *Disability Statistics Report* 14.
- King A, Toobert D, Ahn D, Resnicow K, Coday M, Riebe D., et al. 2006. Perceived environments as physical activity correlates and moderators of intervention in five studies. *American Journal of Health Promotion* 21(1):24-35.

- Kirschner K, Breslin M, Iezzoni L. 2007. Structural impairments that limit access to health care for patients with disabilities. *Journal of American Medical Association* 297(10):1121-1125.
- LaCroix A, Guralnik J, Berkman L, Wallace R, Satterfield S. 1993. Maintaining mobility in late life. II. Smoking, Alcohol Consumption, Physical Activity, and Body Mass Index. *American Journal of Epidemiology* 137(8):858-869.
- Lamb S, Guralnik J, Buchner D, Ferrucci L, Hochberg M, Simonsick E, et al. 2000. Factors that modify the association between knee pain and mobility limitation in older women: The Women's Health and Aging Study. *Annals of the Rheumatic Diseases* 59(5):331.
- Lawrence RH, Jette AM. 1996. Disentangling the disablement process. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 51(4):173-182.
- Melzer D, Parahyba M. 2004. Socio-demographic correlates of mobility disability in older Brazilians: Results of the first national survey. *Age and Ageing* 33(3):253-259.
- Menz H, Lord S. 2001. The contribution of foot problems to mobility impairment and falls in community-dwelling older people. *Journal of the American Geriatrics Society* 49(12):1651-1656.
- Mollenkopf H, Marcellini F, Ruoppila I, Szeman Z, Tacken M, Wahl H. 2004. Social and behavioural science perspectives on out-of-home mobility in later life: findings from the European project MOBILATE. *European Journal of Ageing* 1(1):45-53.
- O'Day B, Dautel P, Scheer J. 2002. Barriers to healthcare for people with mobility impairments. *Managed Care Quarterly* 10(3):41-51.
- Oldridge N, Stump T. 2004. Heart disease, comorbidity, and activity limitation in community-dwelling elderly. *European Journal of Cardiovascular Prevention and Rehabilitation* 11(5):427.
- Ostbye T, Taylor Jr, D, Krause K, Van Scoyoc L. 2002. The role of smoking and other modifiable lifestyle risk factors in maintaining and restoring lower body mobility in middle-aged and older Americans: Results from the HRS and AHEAD. *Journal of the American Geriatrics Society* 50(4):691-699.
- Rantanen T, Avela J. 1997. Leg extension power and walking speed in very old people living independently. *The Journals of Gerontology: Series A* 52(4):M225.

- Rasch E, Altman B, Madans J. 2006. The impact of assistive device use on disability measurement in international views on disability Mmeasures, moving toward comparative measurement. *Research in Social Science and Disability* 4:247-262.
- Salive M, Guralnik J, Glynn R, Christen W. 1994. Association of visual impairment with mobility and physical function. *Journal of the American Geriatrics Society* 42(3):287-292.
- Salminen A, Brandt A, Samuelsson K, Toytari O, Malmivaara A. 2009. Mobility devices to promote activity and participation: a systematic review. *Journal of rehabilitation medicine: Official Journal of the UEMS European Board of Physical and Rehabilitation Medicine* 41(9):697.
- Shumway-Cook A, Ciol MA, Yorkston KM, Hoffman JM, Chan L. 2005. Mobility limitations in the Medicare population: Prevalence and sociodemographic and clinical correlates. *Journal of the American Geriatrics Society* 53(7):1217-1221.
- Smith J. 2004. Unraveling the SES-Health connection. *Population and Development Review* 108-132.
- Stuck AE, Walthert JM, Nikolaus T, Büla CJ, Hohmann C, Beck JC. 1999. Risk factors for functional status decline in community-living elderly people: A systematic literature review. *Social Science and Medicine* 48(4):445-469.
- Thompson S, Galbraith M, Thomas C, Swan J, Vrungos S. 2002. Caregivers of stroke patient family members: Behavioral and attitudinal indicators of overprotective care. *Psychology and Health* 17(3):297-312.
- Verbrugge LM, Jette AM. 1994. The disablement process. *Social Science and Medicine* 38(1):1-14.
- Wissing U, Unosson M. 1999. The relationship between nutritional status and physical activity, ulcer history and ulcer-related problems in patients with leg and foot ulcers. *Scandinavian journal of caring sciences* 13(2):123-128.
- World Health Organization. 2001. *International Classification of Functioning, Disability and Health (ICF)*. Geneva, Switzerland: World Health Organization.
- World Health Organization. 2006. *Disability and Rehabilitations WHO action plan 2006-2011*. Geneva: Disability and Rehabilitation (DAR) Team.
- Yeom H, Fleury,J, Keller C. 2008. Risk factors for mobility limitation in community-dwelling older adults: A social ecological perspective. *Geriatric Nursing* 29(2):133-140.