

Improvements and Decline in the Physical Functioning of Israeli Older Adults

Tal Spalter, PhD,* Jenny Brodsky, MA, and Yitschak Shnoor, MA

Myers-JDC-Brookdale Institute, Aging Department, Jerusalem, Israel.

*Address correspondence to Tal Spalter, PhD, Myers-JDC-Brookdale Institute, JDC Hill, 91037 Jerusalem, Israel. E-mail: talspalt@gmail.com

Received January 14, 2013; Accepted July 3, 2013
Decision Editor: Rachel Pruchno, PhD

Purpose of the Study: The current study depicts improvement and decline in functioning among 3 population groups of Israeli older adults: Jews and veteran immigrants, former Soviet Union immigrants, and Arabs. **Methods:** Using longitudinal data from 2005 and 2010 Survey of Health and Retirement (SHARE) in Israel ($n = 982$), we examined 4 functional changes in late life in mobility, movement, activities of daily living (ADL), and instrumental ADL, as a function of sociodemographic, health, and social variables. **Results:** The findings reveal that physical functioning among older adults can decline as well as improve over time. Older age, higher number of diseases and comorbidity, living with others (not the spouse) compared with living alone, receiving informal help and formal help with homemaking, and declined mental health and cognitive status predict deterioration in physical functioning. Also, Arab older adults are at higher risk of deterioration over time compared with Jewish older adults. **Implications:** Findings imply that noncompatible assistance to older adults may “save them the hassle” of doing things by themselves and thus, weakens a potential functional rehabilitation process. There is a need to guide not only professional personnel but also nonprofessional home care workers and family members on how to encourage and retain older adults’ functions as much as possible in order to improve their quality of life. Another implication of investing in rehabilitation is that it might reduce the disability rate among older adults and thus save health expenditures on long-term care at the macrosocial level.

Key Words: Changes in functioning, Rehabilitation, Disablement process model

Theoretical Background and Study Hypotheses

One of the key indicators for examining the quality of life and well-being in old age has to do with older adults’ ability to function in daily life (Guralnik & Ferrucci, 2003). At the individual level, functional limitations and disability reduce older adults’ independence and ability to enjoy an active social life (Avlund, Lund, Holstein, & Due, 2004a). Concomitantly, at the macrosocial level, an aging population is likely to lead to higher rates of disability compared with a younger one. This has various implications, including high public expenditure on health and long-term care and a growing burden of care on the informal system of assistance to older adults in their daily lives (Martin, Schoeni, & Andreski, 2010).

In the study described here, we look at the changes in physical functioning that occur among three groups of Israelis aged 60+ between 2005 and 2010 and examine their health, social, and sociodemographic determinants. We compare over time, four self-reported different measures: mobility—the ability to move from place to place (i.e., climbing stairs); movement—the ability to perform gross or fine motor skills (i.e., raising hands, picking up a small coin from a table); activities of daily living (ADL); and instrumental ADL (IADL). The current study will add to the literature the dynamic aspects of late life changes

in functioning and their detriments, comparing different population groups (i.e., minorities vs majorities). It will then enable us to plan for prevention and intervention programs within the Israeli context, as well as to infer from the results for the sake of other developed countries. Furthermore, examining four different measures of functional limitations and disability allows us to test the stability and coherence of the performance measures over time.

A 2011 report by the World Health Organization (WHO, 2011) noted that disability is part of life and that everyone will, at some stage of his/her life, suffer from an impairment of some kind, especially those who will live into old age. The definitions of functioning and disability depend on the context in which they are examined. For example, they may relate to a person's ability to perform certain tasks or activities without the help of another person (intrinsic disability), whereas in other cases, a person may be asked how he/she manages practically in daily life, that is, with the use of various types of assistance (actual disability; Verbrugge & Jette, 1994). An additional definition, based on national laws and administrative considerations, classifies disabilities in order to evaluate them and provide the appropriate benefits (Gronvik, 2009). Concerning late life, it is important to note that disability derives from the physical, cognitive and mental ability combined with the nature of the tasks and environmental challenges facing older adults. All of these are affected by progress and technological developments, social structure, and the division of resources in society (Martin et al., 2010).

The theoretical pathway From Disease to Disability developed by Nagi (1976) describes four stages from the time a disease develops until it causes daily dependence on another person (if at all) due to inability to function. The stages are known as pathology (disease, injury), impairment (dysfunction/abnormality in specific body's system or organ), functional limitation (limitations in performance of generic actions at the level of the whole organism or person), and, eventually, disability (limitations in performance of socially defined roles and activities within the context of the physical and sociocultural environment—i.e., work, family). Verbrugge and Jette (1994) elaborated on Nagi's scheme and established the disablement process model. They operationalized and restated Nagi's pathway to make it more congruence with sociomedical language. For instance,

they distinguished between disability and functional limitations by explaining why the conceptual niche for ADL/IADL is disability. They argued that these are activities a person does as a member of society and that depend on basic physical capabilities and body actions as mobility, motions, and the ability to hear and see—all, that if missing, are functional limitations.

Verbrugge and Jette (1994) also focused on introducing social, environmental, and psychological factors that hasten or moderate the process of disablement. The researchers justified their efforts with the argument that better understanding of the process and its determinants will have an impact on the implementation of interventions and preventive action and treatment. That is because identification of risk factors, characterization of the decline and level of dependence or disability, and recognition of opportunities and correct timing for interventions can affect the health and the quality of life of older adults.

Although it is widely thought that as people grow older, their functioning largely deteriorates, studies in recent decades have shown that there is also a reverse trend, that is, functioning improves or the decline is deferred (Nikolova, Demers, Beland, & Giroux, 2011). In the current study, we examine the change occurring in four functioning variables in terms of gaining or losing difficulties/limitations. Two of them have to do with functional limitations—mobility and movement—whereas the other two measure disability—ADL and IADL. The first study hypothesis was that alongside with patterns of functional decline, we would also find patterns of improvement.

The literature describes numerous factors that may influence changes in functioning in old age. Recent findings have shown that women are more vulnerable than men regarding disability (Espelt et al., 2010). It has also been found that as age increases, so too does the chance of functional decline both among older adults with disabilities and those with none (Yeom, Fleury, & Keller, 2008). Also, individuals with low incomes and few assets (Nilsson, Avlund, & Lund, 2010a) and the less educated (Freedman, Martin, Schoeni, & Cornman, 2008) are at greater risk of functional decline in old age. Minorities have been found to be at greater risk of functional decline in old age for reasons as less of education and risky health behaviors (i.e., smoking, unhealthy nutrition; Arbeev, Butov, Manton, Sannikov, & Yashin, 2004). In the current study, we examine three population groups that

differ in their background, culture, and language. Jews and veteran immigrants are the privileged majority, former Soviet Union (FSU) immigrants are less privileged, and the Arabs (control group) are underprivileged minority in terms of income, education, and other socioeconomic characteristics (Katz & Lowenstein, 2002). Consequently, the second study hypothesis was that individuals who are female, aged, belong to minority group (Arabs), or in low socioeconomic status (SES) are at greater risk of functional decline in old age.

It has been found that diseases, particularly when they accumulate and are combined with old age (Chou & Leung, 2008), have a detrimental effect on functioning in that stage of life (Freedman, Schoeni, Martin, & Cornman, 2007; Yeom et al., 2008). A poor cognitive state has also been found to be linked to disability (Arbeev et al., 2004), as has a low mental state with symptoms of depression (Nikolova et al., 2011). Hence, the third study hypothesis was that a large number of diseases and an increase in the number of diseases, together with a poor cognitive and mental state, contribute to a functional decline in old age compared with healthier older adults.

Most studies that examine the association between social networks/support and disability in old age show that broad and diverse social network, a high level of social activity, and social support given and received by older people, protect them from functional deterioration (Avlund et al., 2004a, 2004b; Lund, Nilsson, & Avlund, 2010). In contrast, living alone with no social support and receiving instrumental support—especially if it is not adapted or comes in place of activities that the older person should do himself, increases functional deterioration (Nilsson et al., 2010a, 2010b). Accordingly, the fourth study hypothesis was that living alone (control group) versus living with others, low social activity, and an absence of informal assistance contribute to functional decline in old age. With regard to formal assistance, its contribution to a change in physical functioning is expected to be negative because it may weaken older adults' independence (Mendes de Leon, Gold, Glass, Kaplan, & George, 2001).

Methodology

Participants and Procedure

Data were drawn from the Survey of Health, Ageing, and Retirement in Europe originated in 2004 and is still going on (SHARE; Börsch-Supan

et al., 2008). SHARE-Israel is coordinated by Israel Gerontological Data Center (head: Professor H. Litwin) at the Hebrew University of Jerusalem and was carried out by B.I. and Lucille Cohen Institute for Public Opinion Research (Tel-Aviv University, head: Professor N. Lewin-Epstein). The first wave of data collection was conducted between October 2005 and July 2006, and the second wave started in August 2009 and ended in August 2010. The survey is based on a hierarchical stratified cluster sample of 2,598 adults residing in 1,774 households to represent the community-dwelling older population in Israel (the household sample in Israel was the largest among other SHARE countries and arrived to 104% extraction in order to make the sample effective and more representative; Litwin & Sapir, 2008). Within each stratum ($N = 9$), the clustering is hierarchical: participants within households within 150 statistical regions (with an ethnicity group's representation) within strata. The complex sampling design was taken into consideration when running the analyses of the study in order to keep the standard errors and confidence intervals from inflating. We used SPSS (17.0) to create a complex samples analysis plan based on stratum, cluster, and individual weight variables. Each of the measures and analyses were run accordingly to ensure stable estimates.

The target population of eligible interviewees includes all Hebrew-, Arabic-, or Russian-speaking residents born in 1955 or earlier and their spouses/partners of any age at the time of the interview. It does not include individuals living in institutional residential facilities, in prisons, and similar institutions (<http://igdc.huji.ac.il/Share/Share.aspx?page=introH>). Out of the full sample, the first round (2005) examined only those participants and their partners aged 60+ who would be aged 65+ in the second round (2010; $n = 982$). The computer-aided personal interviews were conducted face-to-face. The average age of the participants in the first round was 70.9 ($SE = 0.3$); 58.0% were women; had 10.7 years of schooling ($SE = 0.2$), on average; 80.2% were Israeli-born Jews or had immigrated many years previously; 9.4% had immigrated from the FSU since 1990; and 10.4% were Arab citizens of Israel.

Measures

Four outcome variables were examined in the survey (based on Katz, Ford, Moskowitz, Jackson,

& Jaffe, 1963; Lawton & Brody, 1969; Nagi, 1976; Verbrugge & Jette, 1994)—all were calculated by subtracting the level of difficulty in the second round from the difficulty in the first round.

1. *Changes in mobility difficulty*—In both rounds, the mobility difficulty measure consisted of the aggregate score of five items (ability to walk 100 m, sit for 2 hr, get up from a chair, walk up several floors, and walk up a single floor without rest; α : T1 = 0.77, T2 = 0.79). In the first round, 4.9% of those tested had five mobility difficulties compared with 48.0% who had zero mobility difficulty. (The current study examines continuity and changes of functional ability and not only improvement or deterioration. Consequently, it examines populations that at the start were not limited in their functionality and liable only to deteriorate, as well as those with disabilities that could either improve or deteriorate.)
2. *Changes in movement difficulty*—In both rounds, the movement difficulty measure was the aggregate score of five items (ability to bend down and kneel, lift hands above shoulders, pull and push heavy objects, carry 5 kg, lift a small coin off a table; α : T1 = 0.74, T2 = 0.77). In the first round, 0.9% of those tested had five movement difficulties compared with 51.9% who had zero.
3. *Changes in ADL function*—In both rounds, the ADL measure was the aggregate score of six items (ability to get dressed, cross the room, bathe, eat, get into and out of bed, and use the toilet; α : T1 = 0.87, T2 = 0.91). In the first round, 1.6% of those tested had six ADL difficulties compared with 82.8% who had zero.
4. *Changes in IADL function*—In both rounds, the IADL measure was the aggregate score of five items (ability to prepare a hot meal, purchase groceries, use the telephone, take medication, and manage a budget; α : T1 = 0.70, T2 = 0.82). In the first round, 0.9% of those tested had five IADL difficulties compared with 77.9% who had zero.

The independent variables in the study were taken from the first round. The sociodemographic variables were gender (women = 0, control group), education (number of years of education), income (annual household income, New Israeli Shekels [NIS]), and population group (Jewish with many

years in the country, immigrants from the FSU since 1990, and Arabs, constituting the control group). The health variables included functional status at the first round (as a baseline)—the aggregate score with regard to mobility (mean = 1.25, $SE = 0.06$), movement (mean = 1.05, $SE = 0.05$), ADL (mean = 0.47, $SE = 0.06$), and IADL (mean = 0.42, $SE = 0.04$). They also included number of diseases (the aggregate score of 14 diseases diagnosed by a physician—heart attack, hypertension, cholesterol, stroke, diabetes, chronic pulmonary disease, asthma, arthritis, osteoporosis, cancer, stomach ulcer, Parkinson's, cataracts, hip fracture); change in the number of diseases between the two rounds (the higher the numerical value, the more diseases the respondent had acquired over time); a mental health measure—the aggregate score of 12 items (i.e., in the last month, have you been sad or depressed?) setting out symptoms of depression according to the European Depression scale (Prince et al., 1999)—the higher the score, the greater the mental difficulties; and a measure of cognitive status—the aggregate score, after standardization, of three measures—fluent speech (the number of animals that the interviewee could recall within a minute; skewness = 0.39, kurtosis = 0.16), verbal memory (number of words from a list of 10 that the examinee could remember 5 min after they were read out; skewness = 0.17, kurtosis = -0.30), and mathematical ability (solving four simple daily mathematical problems; skewness = 0.32, kurtosis = -0.70)—the higher the score, the better the cognitive status (Kavé et al., 2012).

The social variables, such as social participation, support, and living arrangements, included a measure of social and recreational activity (the aggregate score of five activities: taking courses, volunteering, participating in a social club, religious activity, political activity; Litwin, 2009); living arrangements (constructed from variables of size of household and family status, divided into four groups: lives alone [control group], lives with spouse, lives with spouse and others, lives with others); receives formal assistance with housework and personal care; and receives informal assistance from a person who do not live in the same household (in the last three measures, 1 = yes, 0 = no).

Data Analysis

We examined the prevalence of each item constitutes the four dependent variables in both rounds, as well as the functional change scores in

each measure (using *t* test for matched samples). Next, we conducted a bivariate analysis (using χ^2 or Pearson correlations) that included the independent and dependent variables. Finally, we conducted a four-step general linear model according to the study hypotheses. The prediction equations for the changes in function included, in the first step, the physical functioning variables in the first round as a baseline, sociodemographic variables in the second step, health variables in the third, and variables reflecting social participation, living arrangements, and support as the fourth and final step. The different steps show what these additional groups of variables add to the explained variation of the dependent variables beyond those that already exist in the model. Due to limited space, we present only the last nested model (which includes the four steps). The parameter estimates are presented in order to ascertain the relative impact of the variables in the equation. All the analyses were conducted using SPSS (Version 17, <http://www-01.ibm.com/software/analytics/spss/>).

Results

Table 1 describes the dependent variables in the study. (Note here that a preliminary examination of the reliability of the responses among the four functionality areas found high reliability among them. In only 3% of the sample was there an improvement in some of the measures and a decline in others, whereas in most cases, there was compatibility in the responses to all four measures of functional difficulty.) The first two columns describe the prevalence of the item in the two rounds for the entire sample (e.g., it can be seen that in the first round, 17.8% of the sample had difficulty walking 100 m, whereas in the second round, this had increased to 25.0% of the entire sample). The next four columns present the change (improvement vs decline) or stability between the two rounds in the physical functioning variables and the aggregate measures at the individual level. For example, apparently for 6.1% of those sampled, there was an improvement in walking 100 m between the first and second round, compared with 14.2% who experienced a decline and 66.1% who remained in good condition (i.e., did not experience this kind of difficulty in either round) and 13.6% who remained in poor condition.

The table reveals that in each item of physical functioning, there was some improvement as well as much decline between the two rounds, and

that in most cases the changes were significant. Evidently, too, there were changes in the aggregate measures of the difficulty: while in the mobility and motoric difficult measures, the percentages of improvement (24.3% and 24.2%, respectively) and decline (32.6% and 32.8%, respectively) were rather high; in the ADL and IADL measures, the percentages of improvement were relatively lower (7.9% and 8.8%, respectively); the percentage for decline was higher in IADL (32.2%) than ADL (15.4%).

Table 2 presents a bivariate analysis of the connection between the change in the four measures of difficulty and the independent study variables. The table reveals that greater age and an increased number of diseases are correlated to functional decline among Israeli older adults. In contrast, high education and income (significantly associated with ADL/IADL only) and low functional status in the first round are correlated to improved functioning between the two rounds. The number of diseases in the first round, surprisingly, is positively correlated to an improvement in movement but, on the other hand, negatively correlated to a decline in IADL. An even more surprising finding is that impaired mental health in the first round is positively correlated to improved mobility and movement. A normative cognitive status is positively correlated to improved IADL/ADL only. It also seems that the measure of social activity is positively correlated to an improvement in IADL and that there is a difference by gender with regard to change in movement and in IADL. Finally, it appears from the table that there is a significant connection between ethnicity, living arrangements, and types of assistance and all four variables of functioning.

The Predictors of a Change in Physical Functioning in Old Age

Table 3 presents the findings of linear regressions with regard to the four variables of changed functioning. The functioning status at the first round (first step) is assessed for the purpose of controlling in all the equations and is indicated by a positive number. This means that the worse the functional status in the first round (more functioning difficulties), the greater the chance of improvement in the second round, and vice versa. This measure constitutes a reference point and has a statistical rather than content-based meaning. Moreover, it leaves room for additional explanations as reflected in the values of the subsequent regression steps.

Table 1. Dependent Variables—Mobility Difficulties, Movement Difficulties, ADL, IADL, *n* = 982 (Percent)

Description of the disability	Frequency ^a		Frequency of change between Round 1 and Round 2			
	Round 1	Round 2	Improvement	No improvement, good status ^b	No improvement, poor status ^b	Decline
Mobility difficulty						
Walk 100 m**	17.8%	25.0%	6.1%	66.1%	13.6%	14.2%
Sit for 2 hr	12.7%	11.2%	9.9%	78.2%	3.6%	8.3%
Get up from chair	25.9%	27.4%	11.9%	56.0%	18.0%	14.1%
Climb several floors without rest*	45.8%	49.6%	15.7%	18.3%	45.8%	20.2%
Climb one floor without rest**	23.3%	33.3%	6.7%	54.8%	20.9%	17.6%
Change in measure**			24.3%	43.1%		32.6%
Motoric difficulty						
Bend down, kneel	30.3%	33.3%	12.4%	47.3%	24.9%	15.4%
Lift both arms above shoulders	10.5%	9.3%	8.4%	81.9%	2.5%	7.2%
Pull or push large object**	29.4%	36.8%	10.4%	45.3%	26.7%	17.6%
Lift and carry 5 kg or more**	32.7%	45.0%	9.3%	35.3%	33.9%	21.5%
Lift a small coin from the table**	2.5%	5.6%	1.4%	92.9%	1.0%	4.7%
Change in measure**			24.2%	43.0%		32.8%
ADL						
Get dressed, including socks and shoes**	13.8%	19.9%	3.9%	74.7%	10.8%	10.6%
Cross the room*	5.3%	8.1%	3.3%	88.4%	2.2%	6.1%
Take bath or shower**	10.6%	17.0%	2.9%	79.0%	8.1%	10.0%
Eat, cut up food**	4.2%	6.7%	2.2%	91.0%	1.9%	4.9%
Get in and out of bed**	7.6%	10.8%	3.6%	85.2%	3.5%	7.7%
Use toilet**	5.6%	9.0%	2.5%	88.1%	3.4%	6.0%
Change in measure**			7.9%	76.7%		15.4%
IADL						
Prepare a hot meal**	11.1%	24.0%	2.4%	71.8%	9.8%	16.0%
Purchase groceries**	15.6%	31.0%	4.3%	61.3%	13.4%	21.0%
Make phone calls**	2.4%	7.9%	1.6%	90.4%	0.9%	7.1%
Take medication**	3.2%	9.7%	1.4%	88.7%	2.0%	7.9%
Manage a budget**	10.1%	20.3%	4.4%	74.0%	7.1%	14.5%
Change in measure**			8.8%	59.0%		32.2%

Notes: ADL = activities of daily living; IADL = instrumental ADL.

^aThe change between the rounds is significant in the *t* test for matched samples.

^bGood/poor status = has difficulty/no difficulty with the variable in question and status is the same in both rounds.

* $p > .05$. ** $p < .01$.

Table 2. Association Between the Independent Variables and the Change in the Two Rounds in the Functionality Measures, Pearson Correlations/ χ^2 , $n = 982$

Study variables	Means (SE)/percent	Range	Change in mobility difficulty	Change in movement difficulty	Change in ADL	Change in IADL
1. Age	70.9 (0.3)	60–93	–0.017*	–0.022**	–0.021*	–0.034**
2. Gender: women	58.0%	0–1	15.2	21.65*	12.71	21.47*
3. Years of education	10.7 (0.2)	0–25	0.016	0.020	0.033**	0.037**
4. Income	26,900.8 (1,261.9)	0–99,477	0.02	0.04	0.16*	0.10**
5. Origin						
Jews/veteran immigrants	80.2%	0–1	64.03**	73.07**	18.9	69.68**
Recent immigrant from FSU	9.4%	0–1	72.89**	57.76**	8.18	54.55**
Arab	10.4%	0–1	26.63**	64.11**	37.06*	29.89**
6. Functional status in first round		0–5/6	0.47**	0.45**	0.31**	0.10*
7. Number of diseases	2.2 (0.8)	0–9	0.09*	0.05	0.01	–0.07*
8. Change in number of diseases	0.44 (0.08)	–6–7	–0.24**	–0.18**	–0.14**	–0.1**
9. Mental health	3.10 (0.11)	0–12	0.08**	0.05*	–0.00	–0.03
10. Cognitive status	–0.2 (0.1)	5.85–7.14	–0.03	0.00	0.06*	0.10**
11. Recreation and social activity	0.60 (0.03)	0–5	0.05	0.02	0.07	0.08*
12. Living arrangements						
Lives alone	27.5%	0–1	14.40	13.46	25.17	23.7*
With spouse only	52%	0–1	40.61**	33.5**	60.28**	37.15**
With spouse and others	9%	0–1	28.20**	17.2	18.45	8.22
With others only	11.5%	0–1	38.76**	37.04*	63.18**	47.41**
13. Assistance with housework	9%	0–1	32.67**	44.71**	125.46**	57.40**
14. Assistance with personal care	5%	0–1	66.33**	33.65**	98.96**	44.89**
15. Informal assistance	30.5%	0–1	30.58*	52.83**	49.43**	66.32**

Notes: ADL = activities of daily living; IADL = instrumental ADL; FSU = former Soviet Union.

* $p < .05$. ** $p < .01$.

Table 3 shows that the sociodemographic variables have a considerable addition to the explained variance in the models—between 8.0% and 12.0%. The table shows that greater age is a predictor of a decline in IADL and that there is no difference between men and women with regard to change in functioning in old age. It also shows that no power of explanation was left for education and income to add to the explained variance of the functional changes beyond the other variables in the nested model. As health is known to be associated with SES (Herd, Goesling, & House, 2007), mediation was tested and found significant in most of the equations. Belonging to the “Jews and veteran immigrants” group is a predictor of an improvement in function, compared with “Arabs,” in movement and in ADL; belonging to the “FSU immigrant group” is a predictor of a positive change in ADL compared with the Arab group (although complex sampling has been taken into account, this finding should be treated with caution as the FSU immigrants group is very little).

The table also shows that the health variables contribute significantly to the explained variance in the equations—9.0%–11.0%. A higher number

of diseases in the first round and additional diseases over time are predictors of a change for the worse in older adults’ functioning in all four equations. Poor mental health is a predictor of a decline in movement and IADL functioning. Good cognitive status is a predictor of change for the better in all the measures but movement.

The social variables also add to the explained variance in the equations—from 0.5% to 12.0%. However, the amount of social activities does not affect the changes in functioning beyond the other variables in the nested model. Living with spouse and others is a predictor of a decline in movement compared with living alone. Living without a spouse but with other people is a predictor of a decline in functioning compared with living alone—with the exception of a change in mobility difficulty. Furthermore, the receipts of formal assistance (with housework, but not with personal care) and informal assistance are predictors of a decline in all the function variables between the two rounds.

A comparison between the four models shows that the mobility model has the highest variance explained (41.5%) followed by movement (40.2%),

Table 3. General Linear Model to Predict Changes in Functioning: Mobility, Movement, ADL, IADL, $n = 982$

Variable	Change in mobility difficulty	Change in movement difficulty	Change in ADL	Change in IADL
First step (R^2)	0.215**	0.184**	0.075**	0.031**
Functional status at first round	0.66**	0.72**	0.63**	0.69**
Sociodemographic				
Second step (ΔR^2)	0.078**	0.102**	0.085**	0.115**
Age	-0.01	-0.01	-0.01	-0.02**
Gender	-0.02	-0.00	-0.11	0.05
Years of education	0.01	0.00	-0.00	0.01
Income	0.01	0.05	0.1	0.05
Population group				
Jews/veteran immigrants	0.29	0.47*	0.59*	0.26
FSU immigrant	0.80	0.51	1.55*	-0.06
Health				
Third step (ΔR^2)	0.104**	0.111**	0.089**	0.109**
Number of diseases	-0.19**	-0.19**	-0.11*	-0.15**
Change in the number of diseases	-0.23**	-0.17**	-0.18**	-0.16**
Mental health measure	-0.00	-0.04*	-0.03	-0.04*
Cognitive status	0.06*	0.05	0.08**	0.09**
Social participation, living arrangements, support				
Fourth step (ΔR^2)	0.018**	0.005*	0.118**	0.079**
Recreation and social activities measure	0.06	0.06	0.06	0.04
Living arrangements				
With spouse	0.10	0.02	-0.20	-0.07
With spouse and others	-0.33	-0.4*	-0.32	-0.11
With others	-0.23	-0.54*	-0.96**	-0.69**
Formal support				
Home assistance	-0.45*	-0.47*	-0.67**	-0.65**
Personal assistance	0.21	0.06	0.08	0.13
Informal support	-0.59**	-0.42**	-0.46**	-0.35*
R^2	0.415**	0.402**	0.367**	0.334**
F	17.09	11.80	6.44	9.77
dF	18	18	18	18

Notes: ADL = activities of daily living; IADL = instrumental ADL; FSU = former Soviet Union. The table presents parameter estimates. Gender: female control group; living arrangements: lives alone control group; population group: Arabs control group. * $p < .05$. ** $p < .01$.

ADL (36.7%), and IADL (33.4%). Functional status at first round contributes more to the variance explained in the mobility and movement models (21.5% and 18.4%, respectively) than to ADL (7.5%) and IADL (3.1%). Sociodemographic variables add between 8% and 10% to the variance explained of all the models but IADL to which they contribute 11.5%. Health variables contribute between 9% and 11.0% to the variance explained in the models and social participation, living arrangements, and support add between 0.5% and 12.0% to the variance explained of the models.

Discussion

Based on the disablement process model, which makes the distinction between functional

limitations and disability, we examined changes in four measures of limitation and disability: mobility difficulties, movement difficulties, and difficulties performing ADL and IADL. As for the first study hypothesis, we found that concomitantly with a decline in functioning in old age, there are also patterns of improvement regarding the four measures and in some of them, considerable percentage improvements. These trends imply that in Israel, as in other developed countries (Nikolova et al., 2011), there is no single, negative pattern of decline in functioning in old age; rather, there are patterns of improvement over time.

For the second hypothesis, as was found in the literature (Nikolova et al., 2011)—the greater the age, the greater the prediction of functional decline. However, except for the change in IADL, this association does not hold beyond other variables in the

nested model. Although the mainstream literature has evidence of the vulnerability of women with regard to functioning in old age (Espelt et al., 2010; Yeom et al., 2008), no differences were found here between the sexes. In accordance with the literature (Tabassum, Verropoulou, Tsimbos, Gjonca, & Breeze, 2009), the first models have found that low SES, reflected in the education and income variables, has a negative impact on the changes in different types of functioning. However, this impact disappears when health variables, which mediate the association, are entered into the model.

It was also found that belonging to a minority group is a predictor of functional decline in old age, as described in the literature (Freedman et al., 2008). The three groups that were examined known to be different in their socioeconomic characteristics and health parameters as self-rated health, morbidity, and health behaviors, with veteran Jews reporting better results than the other two populations. Moreover, although FSU immigrants use the health services in a similar way to the Jews majority and are not segregated from them in their living areas, Arabs live mostly in rural areas and tend to use the health care services less adequately (i.e., visiting a family physician instead of specialists; Baron-Epel, Garty, & Green, 2006; Baron-Epel, Kaplan, & Moran, 2010). Also, results from interactions between ethnicity and socioeconomic variables (not presented here) show that educated Arabs are a very selective group predicting functional improvement in ADL and IADL compared with educated Jews and with uneducated Arabs. These disparities may explain the finding above, although not in regard to IADL and mobility changes. It might be that the ways Arabs live (very big family houses with several floors but without elevators and very little public transportation inside their villages) enforce them to be mobile, although the fact that they live within their families save them the challenge of functioning in other life domains.

According to the disablement process model, disability is defined as physical limitations that exist in an environmental context, which in the absence of available help and resources create a dependence on others and deterioration over time (Verbrugge & Jette, 1994). The findings of the current study demonstrate that social structure, and particularly the inequality deriving from it, with regard to the division of resources in society, has an effect on the patterns of change in functioning among the Israeli older population. Negative

changes in function may occur due to reasons that are not necessarily direct consequences of belonging to disadvantages groups, but to the absence of power and social status. Consequently, for these groups, a change in status and social perceptions about them could slow down their functional deterioration.

The third study hypothesis was largely corroborated. Consistently with the literature, it was found that a large number of diseases in the first round and an increase in the number of diseases over time predict a change for the worse in all four measures. Also in keeping with the literature, poor mental and cognitive status predict a change for the worse in old age (Arbeev et al., 2004; Freedman et al., 2007; Nikolova et al., 2011). Of interest here is that an increase in the number of diseases and especially comorbidity is an indisputable risk factor for a decline into functional limitation and disability per the process model.

As for the fourth study hypothesis, it appears that the extent of recreational activity has a beneficial effect on the first models of change in some of the measures of functioning in old age. However, no more than other variables when its effect was assessed in the nested model. It was also found that living with others than the spouse (supposedly caregivers or the extended family) is a predictor of a decline in functioning compared with living alone. Receiving formal assistance with housework and informal assistance from a person from outside the household are also strong predictors of decline in all the measures. These findings show that among those receiving formal or informal assistance (which is probably instrumental), it is likely to weaken their ability to improve functionally. This is in contrast to older adults who live alone, who are probably “required” to continue to function and thus maintain their functional ability.

This finding does not lead to the conclusion that it is detrimental to help older adults who live alone. Moreover, it has been well documented that formal and informal assistance enable older adults with functional difficulties to age in place rather than being institutionalized (Barrett, Hale, & Gauld, 2012). However, the literature describes extensively how active assistance—if not compatible (i.e., render the older person dependent on support, discourage own capacities)—may be detrimental to rehabilitation and to physical functioning (Avlund et al., 2004a, 2004b; Nilsson et al., 2010b). If we consider all study results, we may assume that this is the case here, too. It may be

that instead of rehabilitating and restoring older adults' abilities with the assistance of formal or informal helpers, these helpers conduct the daily activities for the older person and "save him the hassle" of performing them. If that so, thus unintentionally, these helpers may cause harm to the rehabilitating person and make him/her lose confidence in his/hers ability to perform the activities. This might prevent the possible and essential process of rehabilitation.

Evidently, planning of training based on rehabilitation knowledge and skills and imparting knowledge about the ability to function in old age are a growing issue of concern to governments and societies. Such training will be adjusted for the personnel qualified to provide formal care and for informal caregivers, who will be given recognition as caregivers for older adults. Providing appropriate daily rehabilitation care, even if it is not through a professional rehabilitation framework, will allow older adults to maintain their abilities and may even prevent a rapid functional decline. Given the increasing life expectancy, older adults can have a better quality of life through such rehabilitative assistance.

A comparison between the four models (Table 3) shows that the sociodemographic variables add the highest percentages to the variance explained of IADL (11.5%, Step 2). That might be due to the fact that managing finances and medications is related to levels of education and income, as well as to cultural differences, age, and sex. The sociodemographic variables contribute less to the explained variance of mobility and movement changes which their variances are better explained by health variables (Step 3), as can be expected by their definitions. The social independent variables (Step 4) contribute more to the explained variance of ADL/IADL models. This comparison strengthens the distinctions made by Verbrugge and Jette (1994) regarding functional limitations (mobility, movement) and disability (ADL/IADL), which is more socially associated.

Although this matter has not been examined here, an indirect implication of rehabilitation of functional abilities is that it might reduce the disability rate among older adults in Israel. The estimated number of Israelis aged 65+ disabled in ADL is expected to increase and reach 342,000 in 2030 (compared with 176,000 in 2009). Taking into account the aging of the population, and the present utilization of geriatric rehabilitation services according to age, the projected number of

hospitalizations in geriatric rehabilitation wards in 2030 will reach 23,565 (compared with 12,837 in 2010), accounting for a total cost of 639 million shekel (approximately 2.5 billion U.S. dollars; Brodsky, Shnoor, & Be'er, 2010). Although there are no data on the current expenditures in ambulatory rehabilitation services, it is known that the vast majority of rehabilitation services are provided in inpatient wards. The Ministry of Health has been encouraging the health providers to increase ambulatory rehabilitation services in the community. The current research supports this direction by implying that there should be an expansion of rehabilitative opportunities for older adults to prevent further functional deterioration. It is expected that the expansion of rehabilitation services will save public expenditures of institutional long-term care, as it was found in other countries (Manton, Lamb, & Gu, 2007).

The current study has few limitations. First, not including the timing of onset of difficulties prevent us from understanding how many years people are suffering from disability and functional limitations, a measure that may influence differently on their coping and adjustment to the advantages of aging, as well as on prevention and intervention programs and on the costs for societies. Second limitation refers to not including work status (working vs retired/never worked). This variable has social, physical, and cognitive influences along the life course and on older adults' independence and quality of life. Third, the current study was limited to two points in time. It is therefore not possible, at this stage, to reach any conclusions about trends of improvement or decline in disability and functioning. However, the study findings clearly show that such patterns exist. Consequently, it is worthwhile—even desirable—to plan interventions and policy aimed at rehabilitation of functional ability in old age in order to improve the quality of life of older adults and the population as a whole.

Acknowledgments

This article was presented in the Gerontological American Society (GSA) conference, San Diego, California—65th Annual Scientific Meeting: Charting new Frontiers in Aging, November 14–18, 2012.

References

- Arbeev, K. G., Butov, A. A., Manton, K. G., Sannikov, I. A., & Yashin, A. I. (2004). Disability trends in gender and race groups of early retirement ages in the USA. *Social and Preventive Medicine*, 49, 142–151. doi:10.1007/s00038-004-3041-y
- Avlund, K., Lund, R., Holstein, B. E., & Due, P. (2004a). Social relations as determinant of onset of disability in aging. *Archives of Gerontology and Geriatrics*, 38, 85–99. doi:10.1016/j.archger.2003.08.003

- Avlund, K., Lund, R., Holstein, B. E., Due, P., Sakari-Rantala, R., & Heikkinen, R. L. (2004b). The impact of structural and functional characteristics of social relations as determinants of functional decline. *Journal of Gerontology: Social Sciences*, 59, S44–S51. doi:10.1093/geronb/59.1.S44
- Baron-Epel, O., Garty, N., & Green, M. S. (2006). Inequalities in use of health services among Jews and Arabs in Israel. *Health Research and Educational Trust*, 1008–1019. doi:10.1111/j.1475-6773.2006.00645.x
- Baron-Epel, O., Kaplan, G., & Moran, M. (2010). Perceived discrimination and health-related quality of life among Arabs and Jews in Israel: A population based survey. *BMC Public Health*, 10, 282. doi:1471-2458/10/282
- Barrett, P., Hale, B., & Gauld, R. (2012). Social inclusion through ageing-in-place with care? *Ageing & Society*, 32, 361–378. doi:10.1017/S0144686X11000341
- Börsch-Supan, A., Brügiavini, A., Jürges, H., Kapteyn, A., Mackenbach, J., Siegrist, J., et al. (Eds.). (2008). *First results from the Survey of Health, Ageing and Retirement in Europe (2004–2007): Starting the longitudinal dimension*. Mannheim, Germany: Mannheim Research Institute for the Economics of Aging.
- Brodsky, J., Shnoor, Y., & Be'er, S. (2010). *The elderly in Israel: The 2009 Statistical Abstract*. Jerusalem, Israel: ESHel, Myers-JDC-Brookdale Institute, Mashav (Hebrew).
- Chou, K. L., & Leung, J. C. B. (2008). Disability trends in Hong Kong community-dwelling Chinese older adults - 1996, 2000, and 2004. *Journal of Aging and Health*, 20, 385–404. doi:10.1177/0898264308315852
- Espelt, A., Font-Ribera, L., Rodríguez-Sanz, M., Artazcoz, L., Ferrando, J., Plaza, A., et al. (2010). Disability among older people in a southern European city in 2006: Trends in gender and socioeconomic inequalities. *Journal of Womens Health*, 19, 927–933. doi:10.1089/jwh.2009.1608
- Freedman, V. A., Martin, L. G., Schoeni, R. F., & Cornman, J. C. (2008). Declines in late-life disability: The role of early- and mid-life factors. *Social Science & Medicine*, 66, 1588–1602. doi:10.1016/j.socscimed.2007.11.037
- Freedman, V. A., Schoeni, R. F., Martin, L. G., & Cornman, J. C. (2007). Chronic conditions and the decline in late-life disability. *Demography*, 44, 459–477. doi:10.1353/dem.2007.0026
- Gronvik, L. (2009). Defining disability: Effects of disability concepts on research outcomes. *International Journal of Social Research Methodology*, 12, 1–18. doi:10.1080/13645570701621977
- Guralnik, J. M., & Ferrucci, L. (2003). Assessing the building blocks of function utilizing measures of functional limitation. *American Journal of Preventive Medicine*, 25, 112–121. doi:10.1016/S0749-3797(03)00174-0
- Herd, P., Goessling B., & House, J. S. (2007). Socioeconomic position and health: The differential effects of education versus income on the onset versus progression of health problems. *Journal of Health and Social Behavior*, 48, 223–238. doi:10.1177/002214650704800302
- Katz, R., & Lowenstein, A. (2002). Family adaptation to chronic illness in a society in transition: The rural Arab community in Israel. *Families in Society*, 83, 64–72.
- Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., & Jaffe, M. W. (1963). Studies of illness in the aged: The index of ADL: A standardized measure of biological and psychosocial function. *Journal of the American Medical Association*, 185, 914–919. doi:10.1001/jama.1963.03060120024016
- Kavé, G., Shrira, A., Palgi, Y., Spalter, T., Ben-Ezra, M., & Shmotkin, D. (2012). Formal education level versus self-rated literacy as predictors of cognitive aging. *Journal of Gerontology: Psychological Sciences*, 67, P697–P704. doi:10.1093/geronb/gbs031
- Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist*, 9, 179–186. doi:10.1093/geront/9.3_Part_1.179
- Litwin, H. (2009). Social networks and well-being: A comparison of older people in Mediterranean and non-Mediterranean countries. *Journal of Gerontology: Social Sciences*, 65, S599–S608. doi:10.1093/geronb/gbp104
- Litwin, H., & Sapir, E. (2008). Methodology: Structure and content of SHARE-Israel surveys. *Bitachon Sociali*, 76, 25–42 (Hebrew).
- Lund, R., Nilsson, C. J., & Avlund, K. (2010). Can the higher risk of disability onset among older people who live alone be alleviated by strong social relations? A longitudinal study of non-disabled men and women. *Age and Ageing*, 39, 319–326. doi:10.1093/ageing/afq020
- Manton, K. G., Lamb, V. L., & Gu, X. L. (2007). Medicare cost effects of recent US disability trends in the elderly: Future implications. *Journal of Aging and Health*, 19, 359–381. doi:10.1177/0898264307300186
- Martin, L. G., Schoeni, R. F., & Andreski, P. M. (2010). Trends in health of older adults in the United States: Past, present, future. *Demography*, 47, S17–S40. doi:10.1353/dem.2010.0003
- Mendes de Leon, C. F., Gold, D. T., Glass, T. A., Kaplan, L., & George, L. K. (2001). Disability as function of social networks and support in elderly African Americans and whites: The Duke EPESE 1986–1992. *Journal of Gerontology: Social Sciences*, 56, S179–S190.
- Nagi, S. Z. (1976). Epidemiology of disability among adults in United States. *Milbank Memorial Fund Quarterly-Health and Society*, 54, 439–467. doi:10.2307/3349677
- Nikolova, R., Demers, L., Beland, F., & Giroux, F. (2011). Transitions in the functional status of disabled community-living older adults over a 3-year follow-up period. *Archives of Gerontology and Geriatrics*, 52, 12–17. doi:10.1016/j.archger.2009.11.003
- Nilsson, C. J., Avlund, K., & Lund, R. (2010a). Social inequality in onset of mobility disability among older danes: The mediation effect of social relations. *Journal of Aging and Health*, 22, 522–541. doi:10.1177/0898264309359684
- Nilsson, C. J., Avlund, K., & Lund, R. (2010b). Mobility disability in midlife: A longitudinal study of the role of anticipated instrumental support and social class. *Archives of Gerontology and Geriatrics*, 51, 152–158. doi:10.1016/j.archger.2009.09.043
- Prince, M. J., Reischies, F., Beekman, A. T. F., Fuhrer, R., Jonker, C., Kivela, S.-L., et al. (1999). Development of the Euro-D Scale – A European Union Initiative to compare symptoms of depression in 14 European centres. *British Journal of Psychiatry*, 174, 330–338. doi:10.1192/bjp.174.4.330
- Tabassum, F., Verropoulou, G., Tsimbos, C., Gjonca, E., & Breeze, E. (2009). Socio-economic inequalities in physical functioning: A comparative study of English and Greek elderly men. *Ageing & Society*, 29, 1123–1140. doi:10.1017/S0144686X09008812
- Verbrugge, L. M., & Jette, A. M. (1994). The disablement process. *Social Science & Medicine*, 38, 1–14. doi:10.1016/0277-9536(94)90294-1
- World Health Organization (WHO). (2011). *World report on disability, summary* (pp. 1–24). Geneva, Switzerland: WHO.
- Yeom, H. A., Fleury, J., & Keller, C. (2008). Risk factors for mobility limitation in community-dwelling older adults: A social ecological perspective. *Geriatric Nursing*, 29, 133–140. doi:10.1016/j.gerinurse.2007.07.002