FUNCTIONAL CONSEQUENCES OF JOINT IMPAIRMENT AT AGE 79

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ABSTRACT. A study of functional ability—in relation to joint impairment and disability—in 79-year-olds was performed on representative subsamples by interview (n=134) and physical examination of joints (n=89) as well as interview and functional tests regarding activities of daily living (ADL) (n=84). Joint complaints of the lower extremities were more frequent than complaints of the upper extremities. Restricted knee motion had the highest correlation to disability of entering public transports. Previous sedentary workers were more disabled in ADL functions than those with a previous strenuous physical work. Correlation was found between low physical activity in the leisure time and impaired ADL functions. Low physical activity in the group with no definable disease was also correlated with greater social assistance. The reasons for commitment to institutional care were usually complex and, generally, not caused by joint impairment. Although disability had increased within the sample since age 70, at age 79 sixty per cent of the probands could still manage household tasks and personal care, and 69% did not require walking aids. The 79-year-olds thus display a high degree of musculoskeletal ability.

Key words: Ageing, population study, joint function, disability

A reduction of mobility, muscle strength and coordination with increasing age can be expected to cause reduced functions of activities of daily living (ADL). On the other hand, it has been shown that a considerable proportion of the 70-year-olds still have rather good functional capacity (4), and that also, at age 79, advanced handicaps are relatively uncommon (17–19).

The present report describes the functional consequences of joint impairment at age 79 and is one in a series of presentations of results derived from the gerontological and geriatric longitudinal study of a representative group of 70-year-olds in Göteborg (7, 8). The symptoms and signs of rheumatic disorders at age 79 have been described separately (7), and that report also included a prevalence study of age related changes in joint range of motion (ROM).

Beside the purpose of discovering possible associations between joint impairment and altered ADL functions (and thus providing data useful for future planning or adaption of housing and environment for handicapped and/or elderly people), the aims of this investigation were to study the prevalence of locomotor disability and to check some previously developed functional tests in screening of disability caused by joint impairment.

SUBJECTS AND METHODS

The present data were obtained when the survivors of the original sample of 70-year-olds investigated in 1971/72 were reexamined at a second follow-up at the age of 79.

Thus, in 1980/81, 621 probands were invited for a general physical examination which also included a home visit by a registered nurse, an ECG recording, a radiographic investigation of the chest, and blood sample analysis. Five hundred and thirty-seven probands (209 men and 328 women) took part, with a non-response of 13.5%. The method of sampling, as well as the design and performance of the general study, has been described by Rinder et al. (24).

The method of systematic selection of a proband subsample (n=134) for a more detailed investigation of joint motion and joint impairment was reported previously (7). One hundred and twenty-nine probands were interviewed (non-response 3.7%) and 89 of these took part in the physical examination of vertebral spine and peripheral joints.

The subsample was representative of the total sample regarding marital status, absence of signs of definable disease (15) and frequency of back and joint complaints. The frequency of cardiovascular disorders (arrhythmia, chest pain, congestive heart failure, treated hypertension, calf pain), neurological disease (central or peripheral paresis, transitory ischemic brain attack, rigidity, coarse tremor, treated Mb Parkinson) and complaints or restricted range of motion (ROM) in back or peripheral joints is shown in Figs. 1 and 2.

Definitions established by WHO (13) were used in the present study. Thus, an impairment reflects disturbances at the organ level, a disability at the personal level while a handicap is an expression for the social consequence of disability. The examination methods used for the studies of
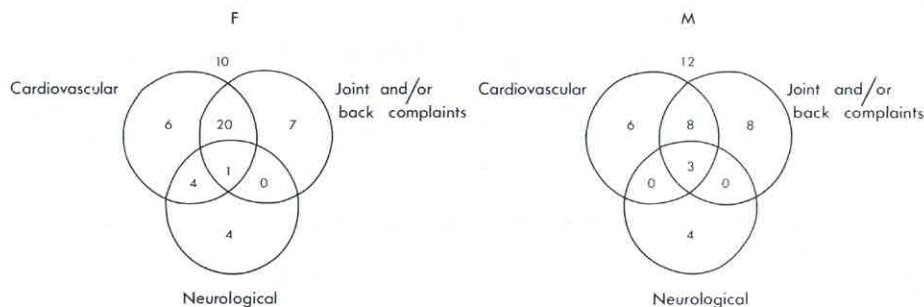
Fig. 1. Number of probands with cardiovascular, and/or neurological signs and symptoms and/or joint and/or back pains. Females (F) n=52, males (M) n=37.

joint impairments have recently been described (7). The methods used to describe disability and handicap were based primarily on previously reported procedures (4, 18, 29). Eighty-four 79-year-old probands in the present examination of joints were also studied by Lundgren-Lindquist et al. (17, 18, 19) which allows certain comparisons. Also, a great many data concerning e.g. manifestations of ageing, state of health, life style and social living conditions were available among the data from the longitudinal study of 70-year-olds.

From an interview at age 70, the subjects' responses concerning professional work (26) and past and present leisure time physical activity were rated on a four point scale (27): 1) physically inactive (mostly sitting down), 2) moderate (walks, cycling, etc., at least 4 hours per week), 3) regular physical activity (running, swimming, playing tennis, skiing) at least 3 hours per week or 4) hard training and competitive sports several times a week. At age 79, covering the age period 75–79, the 4th alternative was omitted.

The disabilities considered in the present study are primarily personal care, locomotor, body disposition and dexterity disabilities.

The following ADL functions were registered for correlations to joint impairments:

Interview items

Ability to go to the bath-room
Ability to dress/undress

Ability to eat
Ability to wash feet
Ability to cut toe nails
Ability to perform household chores
Ability to get up from a chair
Ability to climb stairs
Ability to enter public vehicles
Use and type of walking aids
Habits of walking outdoors summer and winter

Functional tests (4, 17, 18, 19)

Lifting hands above head/behind neck
Grasping an ear-lobe from behind the head
Finger-tips on the opposite big toe in sitting position
"Water pouring" test in standing position
Lifting a glass to a shelf, 180 cm
Lifting one kilogram package onto a shelf, 180 cm
"Panel test" (ability to handle a coin, an electric plug and a light bulb, to dial a telephone number and to use a key to unlock a lock)
"Clothes-peg test" (coordination test)
Hand strength as measured by vigorimeter
Walking test (30 m, comfortable and maximum speed)
Climbing step ≥40 cm, with and without using a handrail
Getting up from a low chair (38 cm height)

Some interview data reflecting proband attitudes to, e.g., physical activity such as going out for a walk, were
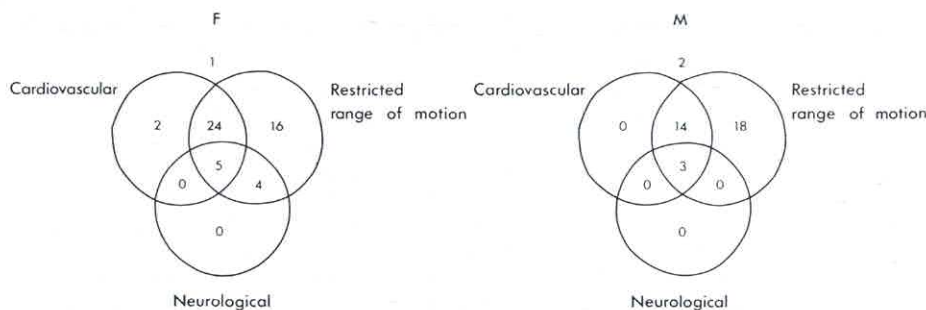

Fig. 2. Number of probands with cardiovascular and/or neurological signs and symptoms and/or restricted range of motion (ROM) in back and/or peripheral joints. Females (F) n=52, males (M) n=37.

A

Upper
extremity

| 10 | 12 | 25 |

Lower
extremity

42

B

Upper
extremity

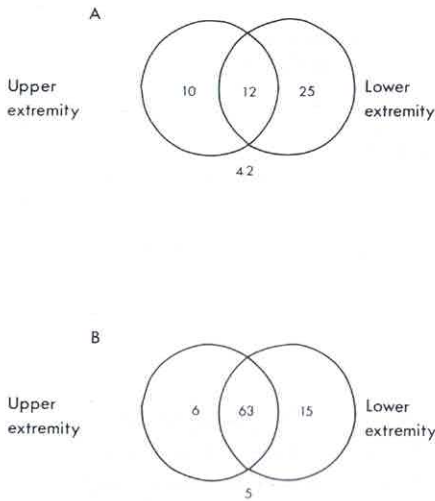| 6 | 63 | 15 |

Lower
extremity

5

Fig. 3. Number of probands with (A) current joint complaints and (B) restricted range of motion in the upper extremity including cervical spine and/or in the lower extremity including thoracolumbar spine, *n*=89.

collected at the home visit by a registered nurse and correlated to joint impairments. From the treatment of the data on disability manifestations, joint impairments were grouped into (I) cervical spine and upper extremity (u.e.) and (II) thoracic and/or lumbar spine and lower extremity (l.e.) (Fig. 3).

Statistics

Student's *t*-test and the χ^2-test were used together with two non-parametric tests—the Pitman test (9) and the Fisher two-tailed test (22).

RESULTS

Fifty-one per cent of the females and 19% of the males lived alone while 63% of the males but only 25% of the females lived with a spouse. Institutional care, defined as need of care for at least 3 months, was required for 9% of the subjects including 5% who lived in sheltered housing ("service house" or home for the elderly). Twenty-five per cent of the subjects did not have access to an elevator despite living upstairs. Handicap was reflected by certain factors, such as the proportion of subjects licensed for handicap transport service (females 47%, males 18%) or for need of personal care (females 9%, males 13%) or domestic assistance (females 38%, males 23%).

Current joint complaints were reported by 35% of the individuals and back problems by 29%—including 13% with combined complaints from back and

peripheral joints. Dizziness was experienced by one third of the subjects and reduced vision (visual acuity ≤0.4) was found in 27%. One fifth of the probands had no signs or symptoms of any definable disease (15).

The prevalence of certain ADL-disabilities according to interview criteria and reduced capacity in the performance of functional tests is shown in Table I. Table II gives the results of questions regarding hindrances experienced in walking out-of-doors. The risk of being accosted was the most frequent hindrance for both males and females; this fear was more frequent in females than in males.

Slightly less than 25% of the subjects reported complaints in one or both of the upper extremities and approximately 40% reported complaints in one

Table I. *Frequency of ADL and locomotor disabilities at age 79*

	F (%)	M (%)	Total (%)
A. Interview (at the home call)	*n*=77	*n*=57	*n*=134
Need of assistance in			
Housekeeping	38	23	31
Dressing/undressing	9	13	11
Going to bathroom	7	13	9
Eating	1	7	4
Making beds	14	21	17
Need of handicap transport service (incl. taxi)	47	18	35
B. Interview (at the out-patient department)	*n*=46	*n*=38	*n*=84
Difficulty/inability of			
Washing feet	9	8	9
Cutting toe-nails	22	24	23
Difficulty/inability of			
Getting up from chair	9	11	10
Getting out of bed	7	11	8
Climbing stairs	22	26	24
Entering public transports	31	19	26
Entering public transports because of high footsteps	18	11	15
Entering public transports because of narrow doors, etc.	9	3	6
Use of walking aids	30	32	31
C. Functional tests (at the out-patient department)	*n*=46	*n*=38	*n*=84
Difficulty/failure in			
"Ear-lobe test"	9	5	7
"Big-toe test"	9	9	9
"Hands-above-head-test"	11	8	10
Difficulty/failure in			
Test on getting up step, ≥40 cm height			
Without handrail	70	29	51
With handrail	24	9	17

Table II. *Attitudes towards risks in going outdoors*

	Summertime			Wintertime		
	F n=77 (%)	M n=57 (cm)	Tot n=134 (%)	F n=77 (%)	M n=57 (%)	Tot n=134 (%)
Probands seldom or never getting outdoors because of assumed risk of						
Being accosted	40	21	32	46	25	37
Falling in the street	10	4	8	31	12	23
Falling in the staircase	5	2	4	10	2	6

or both of the lower extremities. Fifty per cent of the subjects reported one or more complaints from either the upper or the lower extremities whereas 13% had complaints from upper as well as lower extremities (Fig. 3). Among individuals reporting complaints from one or more joints of the upper extremities, restricted ROM was found predominantly in the wrists or shoulders (Table III) whereas, in subjects with complaints from the lower extremities, hip motion was limited in 84% of the subjects and ROM of thoracolumbar spine in nearby 75%.

Among subjects with restriction in ROM (Fig. 3), 1/2–2/3 reported that they did not experience any symptoms (Table IV a and b). Table V shows the relationship between restricted ROM versus that of ADL activities. Correlations were found between difficulties in climbing stairs or getting up from a chair or the bed, as well as need for walking aids versus impaired ROM in the lower extremity (l.e.) and, furthermore, between the tested ability of grasping opposite ear-lobe and restricted ROM in the upper extremity (u.e.).

When probands reporting both joint complaints and restricted ROM within the same extremity group were compared to those who had neither symptoms nor restricted ROM in the same extremity group, significant differences were found concerning ability of entering public transport vehicles (u.e., $p<0.05$), ability of climbing stairs (l.e., $p<0.05$), need for walking aids (l.e., $p<0.05$) and performing the "big toe" test (u.e., $p<0.001$). On the other hand, no significant differences were found between the two groups regarding the ability of managing personal care and domestic tasks in ADL.

The ability of entering public transports was dependent on joint function in the upper, as well as in the lower, extremities. When mobility of shoulders, hips and knees were compared, knee motion had the strongest correlation to the ability of entering transport vehicles. There was also a strong co-variance between motion impairment of hips and knee joints. Regarding complaints, hip complaints dominated knee problems as the primary disability associated with entering public transports.

Body weight and body mass index (BMI) were correlated to complaints of knee joints ($p<0.01$), predominantly in females ($p<0.001$). Restricted ROM of the knees showed no such correlation, while instable knee joints were correlated to BMI ($p<0.05$).

Lean subjects reported shoulder problems and had restricted range of shoulder motion to a greater extent ($p<0.05$) than nonlean individuals. This was reflected in a significantly higher need of assistance in ADL functions such as dressing/undressing, eat-

Table III. *Frequency of restricted range of motion (ROM) in probands reporting joint complaints, N=89*

	Restricted ROM	
	n	%
I. Probands reporting complaints from upper extremity/cervical spine, n=22		
Shoulder	11	50
Wrist	15	68
Hand/finger	18	46
Cervical spine	8	36
II. Probands reporting complaints from lower extremity/throacic/lumbar spine, n=37		
Hip	31	84
Knee	7	19
Foot/toe	21	57
Thoracic/lumbar spine	27	73

Table IV a. Frequency of complaints from (I) upper extremity and (II) lower extremity in probands with restricted range of motion (ROM)

	No. of probands with restricted ROM	Frequency of complaints in probands with restricted ROM	
		n	%
I. Shoulder			
Active	34	11	32
Passive	33	11	33
Wrist	45	15	33
Fingers	23	10	44
Cervical spine	36	8	23
II. Hip	56	31	55
Knee	15	7	47
Foot/toe	39	21	54
Thoracic spine	46	18	40
Lumbar spine	50	22	44

Table IV b. Frequency of complaints of joint pain in probands with restricted range of motion (ROM)

Complaints from	n	%
I. Probands with restricted ROM in upper extremity/ cervical spine, n=69		
Shoulder	13	19
Elbow	2	3
Wrist	4	6
Fingers	7	10
Cervical spine	6	9
Upper extremity/cervical spine	19	28
II. Probands with restricted ROM in lower extremity/thoracic/lumbar spine, n=78		
Hip	12	15
Knee	18	23
Ankle	4	5
Toe	0	–
Thoracic/lumbar spine	21	27
Lower extremity/thoracic/lumbar spine	36	46

ing and going to the bathroom (p<0.001). Consequently, we also found a tendency of more frequent use of social services in these subjects.

Individuals with symptoms of general disease, RA or previous injuries to joints or bone structures had a significantly diminished ability of reaching the opposite ear-lobe or the opposite big toe with the hand than those without (p<0.01). The test of ability to reach the opposite big toe was further correlated to subjects whose joint problems were caused by osteoarthritis of the hip joint (p<0.001). There was a highly significant correlation between probable rheumatoid arthritis (defined by ≥3 criteria according to ARA (25)) and failure of the upper extremity tests (p<0.01–0.001). As might be expected, this implied a higher frequency of ADL dependency for personal care and household chores (p<0.01).

The subjects were divided into 3 groups with re-

Table V. Correlations (r=correlation coefficient) between restricted range of motion (ROM) of joints and functional disability in 79-year-old men and women (n=89)

	Use of walking aids	Getting up from a chair	Climbing stairs	Difficulty in entering public transports	Ear-lobe test	Hands above head test	Difficulty with clothes-peg test	Big-toe test
Restricted ROM of								
Cervical spine	–	–	–	–	–	–	–	–
Wrist	–	–	–	0.35**	0.34**	0.38**	0.19	–
Slight impairment	–	–	–	0.12	0.18	0.16	0.14	–
Moderate or severe restriction	–	–	–	–	–	–	–	–
Finger joints	–	–	–	0.08	0.33**	0.28	0.27	–
Moderate restriction	–	–	–	–	–	–	–	–
Severe restriction	–	–	–	0.12	0.18	0.15	0.14	–
Shoulders	–	–	–	0.05	0.41*	0.37*	0.09	–
Active	–	–	–	–	–	–	–	–
Passive	–	–	–	0.30*	0.36**	0.40**	0.29*	–
Lumbar spine	0.15	0.20	0.22	0.30*	0.40**	0.43***	0.29*	0.27*
Thoracic spine	0.31*	0.07	0.20	0.07	–	–	–	0.31*
Hip	0.27*	0.26*	0.43***	0.32*	–	–	–	0.26
Knee	0.20	0.44**	0.36**	0.49***	–	–	–	0.25

p>0.05 =NS, p<0.05 =*, p<0.01 =**, p<0.001 =***.

spect to physical strain during their professional work (26). Thus, when two groups, one with previous sedentary work and the other with previous strenuous manual work, were compared, it was found that the latter had restriction of ROM of thoracolumbar spine and finger joints to a greater extent than the former ($p<0.05$); this was not reflected in the variables tested on disability factors, however. Formerly sedentary workers had, at age 79, a greater need for assistance with dressing/undressing and going to the bath-room than the rest of the sample ($p<0.05$)—no such significant correlations were found concerning the heavy workload group.

When probands were divided into 3 groups (27) regarding leisure time activities before age 70—physically inactive, group 1 (18%), moderately active, group 2 (72%) and more physically active, group 3 (8%)—and compared on impairment and disability variables at age 79, a statistically significant difference was found between group 1 and groups 2 and 3 concerning restricted spinal motion ($p<0.05$). The active groups also showed a reduced need of assistance in ADL ($p<0.05$). Many disabilities, especially reduced ADL functions and difficulties in walking or climbing stairs, were related to a sedentary life in the preceding 4 years (p-values<0.001–0.01). This also concerned probands free from disease and joint disorders at age 79. They displayed a high correlation between low physical activity and diminished ability to dress/undress ($p<0.001$), make beds ($p<0.001$) and go to the bathroom ($p<0.001$).

DISCUSSION

In accordance with previously reported studies of joint impairments in 79-year-olds (7), the present results further indicate that a restriction in ROM compared to what is considered "normal" in younger individuals (1, 6) is common in elderly subjects who do not show any evidence of joint disorders or have joint complaints. Our conclusion is that the manifestations of ageing often imply such a restriction, and that this should be taken into account when "normality" of joint motion (clinical reference values) in the elderly is considered. Reference values for joint motion are often given without adjustment for age (1, 6), although a few studies have contributed to our knowledge of ROM in elderly subjects (12, 28, 32). Furthermore, as also reported by Jette & Branch (1983) (14), considerable impairment and

restriction in ROM can exist in the elderly without causing obvious disability.

Previous morbidity statistics suggests joint impairment and disability to be the most frequent health problems (10, 11, 16). Our comparison between the upper and the lower extremity groups of joints showed that complaints were more often directed towards the lower extremity group. This would indicate a higher frequency of locomotor disabilities such as reduced walking capacity, but 80% of the 79-year-olds were still able to climb stairs and walk over 1 000 m.

One of the aims of this study was to look for possible relations between functional disturbances that are easy to measure and practically important disabilities. The "ear-lobe test" was shown to reflect the ability of combing or washing hair, and the ability to perform the "big toe test" seems to be related to the ability of washing feet or putting on stockings and shoes. Thus, a negative outcome on these tests would imply a diminished active life. The step-test, reflecting the ability to use public transportation, would obviously be meaningful to perform more often considering its important implications.

Impaired joint motion was not found to be a major cause of loneliness or sparse contact with children or friends. Besides direct motor disturbances, the prevalence of general disease, dizziness or other neurological symptoms and decreased sensory functions—such as visual or auditory impairment—could influence the living situation. The frequency of cardiovascular disorders in combination with joint impairment made certain conclusions regarding the definite cause of disability impossible. The use of prescribed drugs might also contribute to restrictions of moving about, i.e. use of diuretics or side effects of sedative drugs; only 5% of the females and 23% of the males were totally without current medication. Furthermore, within the locomotor system, it was previously reported that the reduction of muscle strength associated with ageing had an earlier onset and was more pronounced in the lower extremities than in the upper ones, which might explain the reduced ability of e.g. climbing stairs (4, 5, 23). The force of the quadriceps muscle is of significant importance for the ability to enter a bus or a train (4). Regarding joints, we found that restricted ROM was of greater importance to the occurrence of a disability than the proband's complaints on joint problems—this was shown for shoulder involvement in the "ear-lobe test", knee involvement in the "big-toe

test" and hip and/or knee impairment when trying to enter a bus.

Strenuous manual work in earlier life was not negatively related to the ADL functions at age 79. Such a correlation might traditionally have been expected as a consequence of "worn-out joints", but, to the contrary, the sedentary workers were more disabled than those with a previous strenuous occupation. However, this might also be due to selection of individuals to specific jobs, and thus reflect personal capacity and interests at younger ages. Furthermore, it might illustrate selection of survivors up to age 79. No significant differences of mortality rate in the ages 70–75 or 75–79 were found between the heavy and the sedentary worker groups.

Those who reported a low physical activity at age 79 usually had been rather inactive throughout most of their adult life. Two thirds of individuals reporting sedentary life styles had displayed the same style throughout their lives. This seems to indicate that their higher prevalence of disability was not an obvious cause for their sedentary life at age 79. The same rather constant activity traditions were reported by the physically active; 90% of these also reported a similar life style throughout their adult life.

The results show that the practical consequences of the studied disability parameters often had different practical implications for females and males. In daily life, females experienced a greater need for domestic help and transport service; this was also reflected in their greater difficulty in entering public transports. This could partly be explained by a higher prevalence of peripheral joint disorders in females than in males (7), but social factors could be of some importance, especially the need of domestic help (30). Thus, more than half of the females of the subsample were living alone compared to one fifth of the males. Furthermore, nearly 2/3 of the males were married and would probably expect their wives to perform household chores and assist on personal care, whether they were able to do these things themselves or not. Females experienced more fear of going outdoors alone, partly due to the risk of falling down, but to a great extent, due to fear of being submitted to violence. The climate plays a role, too, as the number of probands unwilling to walk outdoors due to the risk of falling was 3 times higher during the winter season than during summer. Of joint motion impairments, restricted hip ROM was found in all male probands with a negative attitude towards going outdoors during winter.

Previous reports from the longitudinal study of 70-year-olds have shown that institutional care, defined as need of care for at least 3 months, was required for 3% at age 70 and 5% at age 75 (21). Although at age 79 this percentage had increased to 8.5% (20), no significant correlation was found between joint impairment and institutional care; the reasons for commitment to care or sheltered housing were generally complex and based on a combination of social, psychiatric and somatic factors. The present results indicate, however, that the prevalence of disabilities and handicaps increases markedly towards the age of 80 compared to the age interval 70–75 as previously observed in the same subjects (31).

On the other hand, at least 80% of the 79-year-olds were capable of performing basic personal care functions, over 50% could manage their own housekeeping and more than two thirds never used a walking aid despite the fact that restricted ROM of separate joints was found in one fifth to two thirds of all subjects. This implies that the elderly are able to cope with a minor diminishment in ROM. Furthermore, one fifth of the probands displaying restricted ROM of either upper or lower extremity compensated for the impairment, to a certain extent, by using the opposite joint group, e.g. by using a handrail for entering a bus or getting up from a chair. A general conclusion is that disability directly due to joint impairment is not very frequent even at the age of 79.

REFERENCES

1. American Academy of Orthopaedic Surgeons: Joint motion. Method of measuring and recording. Reprinted by The British Orthopaedic Association. E. S. Livingstone, Edinburgh and London, 1966.
2. Aniansson, A., Grimby, G. & Rundgren, Å.: Isometric and isokinetic quadriceps muscle strength in 70-year-old men and women. Scand J Rehab Med *12:* 161–168, 1980.
3. Aniansson, A. & Gustafsson, E.: Physical training in elderly men with special reference to quadriceps muscle strength and morphology. Clin Physiol *1:* 87–98, 1981.

4. Aniansson, A., Rundgren, Å. & Sperling, L.: Evaluation of functional capacity in activities of daily living in 70-year-old men and women. Scand J Rehab Med *12* (4): 145–154, 1980.

5. Asmussen, E. & Heebøll-Nielsen, K.: Isometric strength of adult men and women. *In* Communications from the Testing and Observation Institute of the Danish National Association for Infantile Paralysis, 11, 1961.

6. Beetham, W. P., Polley, F. R., Slocumb, C. H. & Weaver, W. F.: Physical Examination of the Joints. W. B. Saunders Company, Philadelphia and London, 1965.

7. Bergström, G., Bjelle, A., Sorensen, L. B., Sundh, V. & Svanborg, A.: Prevalence of symptoms and signs of joint impairment at age 79. Göteborg, 1985, to be published.

8. Bergström, G., Bjelle, A., Sorensen, L. B., Sundh, V. & Svanborg, A.: Prevalence of rheumatoid arthritis, osteoarthritis, chondrocalcinosis and gouty arthritis at age 79. Göteborg, 1985, to be published.

9. Cox, D. R. & Hinkley, D. V.: Theoretical Statistics. Chapman and Hall, London, 1974.

10. Euro Reports and Studies 65: Preventing disability in the elderly, Report in a WHO Working Group, Copenhagen, 1982.

11. Harris, A. I.: Handicapped and Impaired in Great Britain. Part I. H. M. Stationery Office, London, 1971.

12. Harris, M. L.: Flexibility. Phys Ther *49:* 591–601, 1969.

13. International Classification of Impairments, Disabilities and Handicaps. WHO, Genève, 1980.

14. Jette, A. M. & Branch, L. G.: Musculoskeletal impairment among the non-institutionalized aged. Int Rehab Med *6:* 157–161, 1984.

15. Landahl, S., Jagenburg, R. & Svanborg, A.: Blood components in a 70-year-old population. Clin Chim Acta *112:* 301–314, 1981.

16. Lawrence, J. S. (Ed.): Rheumatism in Populations. W. Heinemann Medical Books, London, 1977.

17. Lundgren-Lindquist, B., Grimby, G. & Landahl, S.: Functional studies in 79-year-olds. I. Performance in hygiene activities. Scand J Rehab Med *15:* 109–115, 1983.

18. Lundgren-Lindquist, B. & Sperling, L.: Functional studies in 79-year-olds. II. Upper extremity function. Scand J Rehab Med *15:* 117–123, 1983.

19. Lundgren-Lindquist, B., Aniansson, A. & Rundgren, Å.: Functional studies in 79-year-olds. III. Walking performance and climbing capacity. Scand J Rehab Med *15:* 125–131, 1983.

20. Mellström, D. & Rundgren, Å.: Institutional care at the age of 79 in an urban population. Aktuel Gerontol, 1983.

21. Mellström, D., Rundgren, Å. & Svanborg, A.: Handikappad med avancerat vårdbehov vid 70 och 75 års ålder. Läkartidningen *77:* 3769–3771, 1980.

29. Odén, A. & Wedel, H.: Arguments for Fisher's permutation test. Ann Statist *3:* 518–520, 1975.

23. Potvin, A. R., Syndulko, K., Tourtellotte, W. W., Lemmon, J. A. & Potvin, J. H.: Human neurologic function and the aging process. Am Ger Soc *28:* 1–9, 1980.

24. Rinder, L., Roupe, S., Steen, B. & Svanborg, A.: Seventy-year-old people in Gothenburg. A population study in an industrialized Swedish city. I. General presentation of the study. Acta Med Scand *198:* 397–407, 1975.

25. Ropes, M. W., Bennett, G. A., Cobb, S., Jacox, S. & Jessar, R. A.: Diagnostic criteria for rheumatoid arthritis. 1958 revision. Ann Rheum Dis *18:* 49–53, 1959.

26. Roupe, S. & Svanborg, A.: Previous job and health at the age of 70. Scand J Soc Med *9:* 26–31, 1981.

27. Saltin, B. & Grimby, G.: Physical analysis of middle-aged and old former athletes. Circulation *38:* 1104–1115, 1968.

28. Spangfort, E.: Ortopedisk hälsoundersökning av 69-åringar i Stockholm. *In* A 74—Hälsoundersökning av 69-åringar i Stockholms kommun, 1974 (Orthopaedic health examination of 69-year-olds). Socialstyrelsen redovisar 1977: 13, pp. 149–216. (In Swedish.)

29. Sperling, L.: Evaluation of upper extremity function in 70-year-old men and women. Scand J Rehab Med *12:* 139–144, 1980.

30. Svanborg, A.: Seventy-year-old people in Gothenburg. A population study in an industrialized Swedish city. II. General presentation of social and medical conditions. Acta Med Scand, Suppl. *611:* 5–37, 1977.

31. Svanborg, A., Djurfeldt, H. & Steen, B. (ed.).: Frisk eller sjuk på äldre dar. Delegationen för Social Forskning, DSF-rapport 1980: 4, 1980.

32. Walker, J. M., Sue, D., Miles-Elkousy, N., Ford, G. & Trevelyan, H.: Active mobility of the extremities in older subjects. Phys Ther *64:* 919–923, 1984.

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