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GENDER COMPARISONS OF FUNCTION-RELATED DEPENDENCE PAIN AND INSECURITY IN GERIATRIC REHABILITATION

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Objective: **To evaluate possible gender differences regarding the effect of intervention in geriatric rehabilitation, expressed in terms of change in function-related dependence, pain and insecurity.**
Design: **Comparative study.**
Participants: **A total of 110 women and 44 men undergoing geriatric rehabilitation.**
Methods: **Performance-based assessments with use of the General Motor Function assessment scale. Non-parametric statistics were mainly used.**
Results: **The women showed higher degrees of function-related dependence, pain and insecurity on admission than the men. Both women and men displayed significant improvement in all 3 variables during the rehabilitation period. However, the positive changes regarding pain and insecurity were according to the analyses of systematic group changes, at a low degree among the men, probably because of the low levels on admission. Gender comparisons of proportions with positive intervention outcome indicated that a significantly larger proportion of the women showed a positive treatment effect after intervention, with a difference in recovery of 19% in dependence, 23% in pain and 33% in insecurity ($p < 0.05$).**
Conclusions: **Gender differences in disability, with higher degrees of function-related dependence, pain and insecurity among women on admission for geriatric rehabilitation, can be diminished during the rehabilitation period. These promising results may have relevance for the public health of the elderly population.**

Key words: geriatric, rehabilitation, gender, motor function.

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INTRODUCTION

Since, on average, women live longer than men and have higher rates of chronically disabling conditions, they also constitute a greater proportion of the growing elderly population and of older patients in healthcare (1). It has been estimated that older women should expect 3–5 years of disability at the end of life, implying severe dependency in activities of daily living (ADL), whereas men can expect fewer restrictions in ADL during a shorter period of time before dying (1, 2). The underlying factors that contribute to a longer duration of life with disability among women, are likely to include a higher prevalence of non-fatal chronic conditions, body-composition factors and unfavourable health behaviours (3). Since behaviours are modifiable, there should be a potential for reduction in disability. Although recovery from disability has a dynamic influence on gender differences in mobility disability among older people, and therefore needs to be studied to improve the understanding of such differences (3), previous gender comparisons concerning recovery of older people undergoing rehabilitation have been sparse.

Since adequate motor functioning is an essential prerequisite for independence in ADL and for good health among older adults, assessment and treatment of functional incapacity are fundamental in geriatric rehabilitation. Besides independence, several aspects of motor functioning, such as performance-triggered pain and insecurity, have been shown to have a significant influence on disablement processes in older people of both genders. Activity reductions caused by negative experiences, such as function-related pain, and insecurity due to fear of failure, may, in a specific disablement process, lead to secondary effects on other bodily functions and thereby cause impairments, for example, in cardiopulmonary function and muscle strength. This risk is particularly pronounced among frail and elderly people with chronic disorders. Furthermore, previous studies have shown that both musculoskeletal pain (4, 5) and fear of falling (6) (which in this article is defined as a form of function-related insecurity) are prevalent among older persons in poor health. Research has also confirmed that among older people, pain is associated with functional incapacity and difficulties in performing ADL (7, 8) and that fear of falling is associated with functional incapacity and decreased quality of life (QOL) (6, 9). Furthermore, in several studies it has been found that a larger proportion of women than men state that they are afraid of falling (10–13). Recent research by Leveille et al. (14, 15) has indicated, moreover, that musculoskeletal pain is more common and persistent among older women with disability than among older men with comparable conditions, and that pain in this group constitutes a risk factor for falls and appears to predict the progression of disability.

The aim of this study was to evaluate possible gender differences regarding the effect of intervention, expressed in

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terms of change in function-related dependence, pain and insecurity, among people undergoing rehabilitation provided by hospital-based geriatric teamwork.

METHODS

Setting and subjects

This study, which was approved by the Ethics Committee of the Medical Faculty. Uppsala University, was conducted at a Geriatric University Hospital Clinic in central Sweden, where the rehabilitation was based on 3 different levels of care: (i) institutional rehabilitation, for patients with the most extensive care needs; (ii) home rehabilitation, for those who were independent enough to assimilate care in their own homes: and (iii) rehabilitation for a limited period in day-care for patients who were in a more stable state and who were able to come to the hospital 2 or 3 days a week. In all 3 forms of care the intervention was based on problem-oriented multidisciplinary teamwork, involving medical, nursing, functional, psychological and social factors.

The data examined in this study consisted of performance-based assessments with the General Motor Function (GMF) assessment scale, carried out by physiotherapists during a 3-month period, as part of their daily practice. The criterion for inclusion of patients was a diagnosed need for geriatric rehabilitation, with exclusion of patients with Parkinson's disease with obvious on-off symptoms. Selection of patients who were cognitively and communicatively able to participate in the test procedure was based on clinical judgements. The GMF assessments were conducted pre- and post-intervention, as part of the physiotherapists routine examinations of all patients referred to them for rehabilitation during this period, including in-patients and patients receiving rehabilitation at home and in day-care. All GMF assessments available at the time of the retrospective scrutiny of the medical records were included. This led to inclusion of data from records of 154 patients, of whom 101 were undergoing rehabilitation in institutional care, 30 in home care and 23 in day-care.

The primary diagnosis of each patient, necessitating the rehabilitation, was assigned to 1 of 3 groups: neurological, orthopaedic and other diagnoses. In the neurological group stroke was the most common diagnosis and in the orthopaedic group femoral fracture predominated; the other diagnoses were mainly heart, vascular or lung diseases. Demographic data for the included patients are shown in Table I.

General Motor Function assessments

The GMF assessment scale (16) provides a performance-based assessment instrument, targeting incapacity in different motor functions that are considered to have an impact on the ability for ADL. and including multiple aspects of such functioning. In contrast to most other instruments for assessment of motor functioning, the GMF includes a combination of mobility and upper limb functions, and 3 subscales covering different aspects of functioning, namely performance-related dependence (on help), pain and insecurity. The GMF includes 21 motor functions, of which 11 are mobility functions (from turning over in bed to climbing stairs and transferring outdoors) and 10 are upper limb functions including both arm movements and grip functions, all of which are judged to be prerequisites for the performance of basic ADLs, which are not gender-related (see Appendix). Three aspects of mobility functions — dependence, (on help), pain and insecurity are assessed and upper limb functions are evaluated regarding dependence (on help) and pain (see Appendix). All assessments were made by asking the subjects to carry out the 21 motor functions, one by one. During each task the assessor observed the degree of dependence and asked the patients a "yes-or-no" question about pain and in the case of mobility functions, also about insecurity caused by the execution of the task in question.

Pain and insecurity are thus always assessed on a 2-point (dichotomized) scale, whereas degrees of dependence are assessed on 2- or 3-point scales, in which each variable can be dichotomized (dependent/independent). The scoring of the scale is constructed as sum-scores of the 3 subscales measuring dependence, pain and insecurity. The scores for each subscale are summarized separately. Attainment of the maximum score for dependence, i.e. 34, pain, i.e. 21 and insecurity, i.e. 11, implies that the patient is dependent in all 21 assessed moior functions and that she/he experiences pain when executing all these functions and insecurity when executing all mobility functions (see Appendix). The sum of dichotomous dependence scores has a maximum of 21.

More detailed descriptions of the GMF, including its conceptual basis and testing of its clinical and psychometrical properties, which has been carried out with satisfactory results, are reported elsewhere (16).

Statistical analysis

The Student's t-test was applied to examine possible age differences between men and women in the study group. Since the GMF instrument should be regarded as an ordinal measurement, non-parametric statistics were manly used in analyses of the GMF results. The Mann-Whitney U test was applied for gender comparisons of the distribution of the GMF scores before geriatric rehabilitation.

A non-parametric rank-invariant method, which is valid for all types of ordered data without assumptions regarding the distribution, was further used in analyses of systematic changes in GMF scores after intervention, compared with pre-intervention. This approach allows the systematic component of observed differences between paired ordered categorical assessments to be separated from the random variability and then measured. The basis for this separation is a 2-way bivariate ranking procedure in which the paired assessments are replaced by ranks (17, 18). The level of systematic part of the change on the group level is defined by the parameter of systematic shift in position, which is summarized by the statistic relative position (RP). The RP can hence be utilized to indicate a shift in position of responses on the GMF between the 2 assessment occasions. RP lies in the interval -1 to 1. Values of RP close to zero imply negligible change over time (18), whereas decreased GMF scores, which means decreased levels of dependence, pain and insecurity at the post-intervention assessment, are indicated by a negative RP. The 95% confidence intervals (CI) for the RP were obtained by bootstrap calculations (19).

The presence of a systematic disagreement between 2 paired data sets can be illustrated by plotting the cumulative relative frequencies for the marginal distributions of the paired assessments against each other. The curve thus obtained is known as a Relative Operating Characteristic (ROC) curve. A ROC curve that coincides with the main diagonal indicates equal marginal distributions and no systematic change whereas a ROC curve corresponding with decreased GMF levels will deviate from the main diagonal in the higher-left direction (18). Such ROC curve illustrations can hence be used to illustrate any level of systematic change in GMF scores, attributed to the group of women and men, respectively.

Table I. *Distribution of the participants' ages, main diagnoses and form of geriatric rehabilitation, by gender*

	Age (years)		Diagnosis (%)			Form of geriatric care (%)		
	n	Mean (SD)	Ort	Neu	Qth	Inst	Home	Day
Women	110	80.6 (7.6)	45	32	23	66	20	14
Men	44	79.3 (8.9)	36	41	23	64	18	18
All	154	80.2 (8.0)	42	35	23	66	19	15

Ort = orthopaedic; Neu = neurological; Oth = other diagnoses; Inst = institutional care; Home = home care; Day = day care.

Table II. *Distribution of Genera! Motor Function assessment scores among women (n = 110) and men (n = 44) before (pre) and after (post) geriatric rehabilitation*

	Dependence Md (Ql,Q3) Range	D. Dependence Md (Ql,Q3) Range	Pain Md (Q1,Q3) Range	Insecurity Md (Q1,Q3) Range
Women				
Pre	7.5 (2.8, 12)	5.9 (2, 10)	5.6 (0, 10)	3.7 (0, 7)
	0–26	0–18	0–21	0–11
Post	3.3 (0, 4)	2.8 (0, 3.8)	2.8 (0, 5)	1.3 (0, 2)
	0–23	0–16	0–17	0–11
Men				
Pre	5.4 (0.3, 7)	4.0 (1, 7)	2.0 (0, 2.8)	1.1 (0, 1.8)
	0–22	0–16	0–11	0–8
Post	3.8 (0, 4.8)	2.0 (0, 6)	1.0 (0, 1)	0.7 (0, 1)
	0–19	0–16	0–11	0–5

All medians (Md) are interpolated. D. = dichotomized scores.

To test a possible gender difference in positive treatment effect, comparisons of the proportions of women and men with reduced GMF scores after intervention were carried out by calculations of 95% CI with normal distribution approximation (20) for the difference.

RESULTS

No significant gender-related differences in age were shown by the use of the *t*-test ($p = 0.347$). The similarity in mean ages of the genders was confirmed by the 95% CI of the difference in mean ages of −1.47 to 1.42 (Table I).

An overview of the GMF results obtained before and after geriatric intervention is given in Table II. Gender comparisons of GMF results before intervention yielded statistically significant differences before intervention, concerning dependence ($p = 0.045$), pain ($p = 0.001$) and insecurity ($p = 0.001$), with women receiving a higher score in all 3 variables. The dichotomized dependence scores, however, showed no significant difference ($p = 0.106$) between women and men.

Analyses of changes in GMF scores after intervention compared with the pre-intervention values revealed systematic shifts ($p < 0.05$), expressed as negative RP, with a decrease in all 3 variables-dependence, pain, and insecurity – in both genders (Table III). When comparing the 95% CIs of RP, all but 1; namely the CI for insecurity, were to some extent overlapping. It is to be noted; however, that these overlapping CIs do not necessarily show a lack of difference in recovery between women and men, although the absence of such overlap indicates that the most obvious gender difference in recovery is to be found in insecurity.

This pattern of improvements were further confirmed by ROC curves (Fig. 1) which showed deviations from the main diagonal in the upper-left direction for all variables and both genders. However, the reductions in dependence, pain and insecurity were more marked in women than men, as indicated by more pronounced upper-left deviations of all 3 curves; but the most obvious gender difference was seen in change in insecurity.

The 95% CI of the difference between percentages proportions of women and men with reduced GMF scores after intervention indicated that a significantly larger proportion of the women showed a positive treatment effect in function-related dependence, pain and insecurity (Table IV). Though no such difference was shown regarding the dichotomized dependence scores.

DISCUSSION

The results of this study indicate that although women undergoing geriatric rehabilitation show higher degrees of function-related dependence, pain and insecurity on admission, compared with men in the same situation, they also benefit more from the rehabilitation, and show a higher degree of recovery from these problems. Both women and men displayed significant improvement in all 3 variables during the rehabilitation period. However, the positive changes regarding pain and insecurity were at a very low degree among the men, probably because of the low levels on admission. Gender comparisons of proportions with a positive intervention outcome revealed that the women showed higher proportions with positive outcome results in all 3 variables, with a significant proportional difference in recovery of 19% in dependence. 23% in pain and 33% in insecurity ($p < 0.05$). These are promising results, implying that in older women it may be possible to influence and treat the generally higher degrees of functional incapacity related to ADL disability, so that the gender gap in this respect can be diminished. This is also in agreement with the conclusions drawn by Leville et al. (14) in their studies aimed at elucidating what older disabled women report as their main symptoms causing disability. These authors stated that many of the most commonly identified symptoms in older persons are treatable and that greater attention should be paid to symptoms

Table III. *Systematic group changes in General Motor Function (GMF) scores, expressed as Relative Position (RP), with 95% confidence intervals (CI) for RP, for women (n = 110) and men (n = 44). Statistically significant values in bold type*

	GMF subscales Dependence	D. Dependence	Pain	Insecurity
Women				
RP	**−0.44**	**−0.42**	**−0.33**	**−0.43**
CI	−0.54 to −0.36	−0.52 to −0.33	−0.43 to −0.23	−0.54 to −0.33
Men				
RP	**−0.23**	**−0.24**	**−0.15**	**−0.08**
CI	−0.40 to −0.08	−0.41 to −0.09	−0.29 to −0.03	−0.21 to −0.06

D. = Dichotomized scores. CI is calculated by bootstrap statistics.

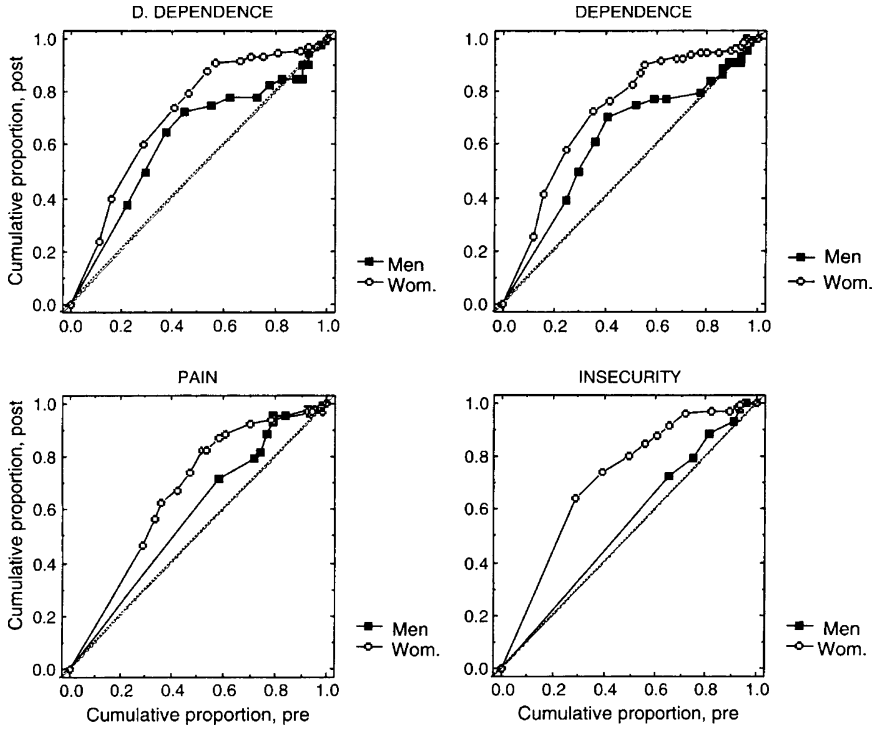

Fig. 1. Relative operating characteristics curves of the systematic group changes in dependence, pain and insecurity, according to General Motor Function scores, from pre- to post-intervention, among women (Wom) and men undergoing geriatric rehabilitation. D. = Dichotomized scores.

that interfere with their daily activities, since modification of these may reduce the overall burden of disability (22).

When comparing the current results with research in related fields, 2 different methodological aspects should be taken into consideration, namely functional incapacity vs ADL disability, on the one hand, and interviews vs performance-based testing, on the other. Since data from previous gender-comparative studies concerning functional recovery most commonly are based on structured interviews concerning ADL, conducted with the older persons themselves and/or their next-of-kin, these do not refer to the same concept as in performance-based testing of functional incapacity, as in the case of the current study. The importance of discrimination between ADL disability as a dimension of social role disability and functional incapacity as referring to a task-oriented action performed by an individual, has been emphasized previously (21). The concept functional incapacity has additionally been shown to be a key component and a main driving force in the disablement process, which therefore needs to be elucidated in rehabilitation, and assessed separated from disability, such as difficulties in performance of ADL (22).

Researchers have also acknowledged that there are discrepancies between interviewer-administered and performance-based assessments, arguing that these methods evaluate different constructs of physical functioning, i.e. perception vs (in)capacity (23). It has been shown that interviews and performance-based assessments can give different results and that assessments of functional incapacity of older patients should preferably be based on performance testing (24). One study of older (75 years and over) patients of both genders indicated that if patients are independent in ADL tasks, the results from self-report and performance-based assessments are similar, whereas patients with ADL disability tend to both under- and over-score their self-reported ability in ADL compared with their performance score (25). Moreover, in a study of gender differences in the comparison of self-reported disability in community dwelling older people (71 years and over), it was found that women reported more disability and functional incapacity than men, and that women had poorer performance scores for every task. Compared with similar performance items, self-reports of function were accurate in the majority of participants of both genders. Among those who inaccurately reported function, more men than women under-reported disability and more women than men over-reported disability (26). However, in another study of a sample of community-dwelling older women, performance-based assessments more often identified incapacity in physical functioning than did self-report measures (23). Hence, it may be important to use performance-based assessments in gender comparisons of functional (in)capacity in older people. The current results further indicate that when assessing intervention effects in function-related dependence fairly detailed, non-dichotomized assessments may be required for the detection of possible gender differences.

Hitherto, gender comparisons of disability among older people have commonly been made in relation to prevalence of

Table IV. *Percentage proportions of women (n = 110) and men (n = 44) with reduced General Motor Function assessment (GMF) scores after intervention, including gender difference between these proportions and 95% confidence intervals for the differences. Statistically significant values in bold type*

	Proportions with reduced GMF scores after intervention (%)			
	Dependence	D. Dependence	Pain	Insecurity
Women	73.6	65.5	57.8	58.2
Men	54.6	52.3	34.1	25.0
Gender diff.	**19.1**	13.2	**23.2**	**33.2**
Difference CI	**2.2 to 36.0**	−4.1 **to** 30.4	**6.4 to 40.0**	**17.4 to 49.0**

D. = Dichotomized scores; CI = confidence interval.

and risk factors for disease in older community dwellers. In contrast to the results of the current study, these previous results have not generally indicated that women show a higher degree of recovery in response to rehabilitation compared with men. Several community-based studies of self-reported physical function among older persons have shown that women are less likely to recover from disability compared with men (27, 28). In line with these results, a recent study on recovery of older 1 (57+) patients from injuries to the extremities, in which interviews were conducted for the assessment of basic ADLs, indicated that female patients recovered less well than male patients (29). However, in a study on geriatric rehabilitation outcome, following hip fracture surgery, using the Functional Independence Measure (F1M™) scale, no gender differences in this outcome were found (30). In that study the pre-fracture F1M™ scores were determined by recall at an interview with the patient or with the patient's next of kin. On admission and at the end of the rehabilitation these scores were determined by a staff meeting of the geriatric ward. The only study found in which, in line with the current results, adult females were shown to be significantly more improved in functional status than men after rehabilitation addressed the effect of gender on early recovery from cardiac surgery (31). In that study, comprising men and women aged 36–83 years, the functional status was assessed by pre- and post-operative interviews. The discrepancies in methodology and target populations in the above studies may, at least partly, explain some of these contradictory results.

The present study has some limitations that should be taken into consideration. It might, for example, have been an advantage if several measurement methods and not only the GMF had been used. With the use of GMF, which is an instrument aiming at identifying specific problem areas, namely function-related dependence on help, pain and insecurity; it was not possible to detect higher levels of functioning, which in this study could have concealed even more successful recovery than was demonstrated. As a rule, however, the category of patients studied here cannot tolerate frequent assessments. Furthermore, the unbalanced proportion of women and men in the present sample is not ideal, but it does reflect the gender proportions in the population studied.

A strength of this study is the use of performance-based assessments, which, as mentioned above, are commonly judged to be the most valid when evaluating functional incapacity. Moreover, the task-specific nature of the GMF assessment of pain and insecurity, which is unique for this instrument, involves concretization of these subjective variables and prevents unspecific subjective results. The importance of such specification when assessing fear of falling has been emphasized previously by Tinetti et al. (32). Additionally, the use of all 3 subscales of the GMF encourages the patient verbally to express emotional factors associated with the performance of a task. This verbalization has been suggested as important for the motivation to be physically active. It has been proposed that factors which reduce the incentive for activity, for example pain and insecurity, are among the most important to consider when evaluating motivation for activity among older people with frail health (33, 34). Moreover, previous research has indicated that older patients might be less willing to report pain (7, 35) and that, among patients who are afraid of falling, lack of communication regarding falls is associated with activity limitation (10). Hence the assessment procedure of the GMF may serve as a facilitator in the rehabilitation process for older people, since it may identify problem areas that, particularly in older females, need to be expressed, noticed and treated.

Patients of both genders who are undergoing geriatric rehabilitation are typically suffering from multiple diseases and functional failures, a high incidence of secondary complications and non-specific presentations of symptoms (36). Many of the most commonly identified symptoms among older persons, such as functional incapacity, pain and insecurity are hence not related to particular conditions or diagnoses, but may well be treatable and are therefore important to identify. Since recovery from disabling symptoms, as examined in this study, is crucial for the activity level among older persons, and since even a modest increase in the proportion of women who are physically active could potentially lead to significant savings in both healthcare costs and societal burden (37), confirmation of the present results, including follow-up studies examining the events after the period of rehabilitation, should be desirable.

In conclusion, the results of this study indicate that gender differences in disability, with higher degrees of function-related dependence, pain and insecurity among women than among men on admission for geriatric rehabilitation, can be diminished during the rehabilitation period. Since women represent a larger

proportion, both of the older population and in healthcare, interventions targeting these aspects of disability may have a positive impact on public health.

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APPENDIX

Overview of the General Motor Function items and scoring.

Function	Dependence	Pain	Insecurity
Turn around when lying in bed	0–2	0–1	0–1
Sit up from recumbent position	0–2	0–1	0–1
Lie down from a sitting position	0–2	0–1	0–1
Transfer from bed to chair	0–2	0–1	0–1
Touch left big toe	0–1	0–1	0–1
Touch right big toe	0–1	0–1	0–1
Stand up from a sitting position	0–2	0–1	0–1
Stand more than 10 seconds	0–2	0–1	0–1
Transfer indoors 10 metres	0–2	0–1	0–1
Climb stairs up/down 7 steps	0–2	0–1	0–1
Transfer outdoors 25 metres	0–2	0–1	0–1
Move left hand to mouth	0–1	0–1	–
Move right hand to mouth	0–1	0–1	–
Move left hand to head	0–1	0–1	–
Move right hand to head	0–1	0–1	–
Move left hand on back	0–1	0–1	–
Move right hand on back	0–1	0–1	–
Greeting grip with left hand	0–2	0–1	–
Greeting grip with right hand	0–2	0–1	–
Pinch grip with left hand	0–2	0–1	–
Pinch grip with right hand	0–2	0–1	–
Total range	0–34	0–21	0–11