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Clinical Study

Functional Exercise and Physical Fitness Post Stroke: The Importance of Exercise Maintenance for Motor Control and Physical Fitness after Stroke

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It is argued that all stroke patients, indifferent of disability, have the same possibility to improve with training. The aim of the study was to follow and register functional improvements in two groups with different functional capacities at baseline for a period of 36 months. Stroke patients were recruited and divided into groups related to their functional status at baseline. During the acute rehabilitation, both groups received functional task-oriented training, followed by regular self- or therapeutic driven training the first year after stroke and varied exercise patterns the following 24 months. The participants were tested on admission, and at three, six, twelve, and thirty-six months after the onset of stroke. Both groups improved functional activity up to six months which then stabilized up to twelve months to decline somewhat at thirty-six months after stroke. Change scores indicate a greater potential for rehabilitation in the MAS $\leq$35 in relation to group MAS >35 although the functional capacity was higher in the latter. This indicates the importance of maintaining exercise and training for all persons after stroke.

1. Introduction

Stroke care has undergone major changes in the last 15–20 years in the western world. New treatments, diagnostic tools, and the implementation of stroke units with multidisciplinary rehabilitation are now the golden standard in the acute treatment of stroke and have improved the possibilities for survival and to resume life in the home [1–6]. A major part of the efficacy of the stroke unit is the focus on early mobilization and rehabilitation with task-oriented training which implies the importance of exercise to achieve optimal function. Task-oriented exercise are shown to be most effective to attain optimal motor function and independence in activities in the acute rehabilitation [7, 8]. The importance of exercise and training after stroke has also been documented [9–11]. Studies have shown that persons with stroke, given the opportunity to exercise in the year after stroke, maintain their functional status after the initial rehabilitation and improve function [9–12]. Regular exercises were sustained both with an organised and a voluntary follow-up regimen during the first 12 months after stroke. In the longitudinal randomised controlled trial, both groups received functional task-oriented training tailored according to their specific needs during the acute period of rehabilitation. At discharge from the acute hospital, patients were randomised into different groups. Patients allocated to an organised exercise group were scheduled to have four periods of physiotherapy during the first year after their stroke, with a minimum amount of 80 hours exercise. The exercises were in this group focused on intensive functional endurance, strength, and balance exercises. The patients belonging to the voluntary exercise group were not sent for follow-up treatment on a regular basis but were tested regularly to the same extent as the organised group [10–12]. The result one year after stroke showed that amount and intensity of exercise was high in both groups, with therapeutically steered training in the organised exercise group and self-initiated training in the voluntary exercise group. Frequency of training per week in the

organised group was 2.1 times per week and in the voluntary group 2.2 times per week. The patients improved to the same degree in Instrumental Activities of Daily Living and 6-Minute Walk Test, Berg Balance Scale, Timed-Up-and-Go, and grip strength, and without increasing muscle tone. The results also showed that improvements in walking capacity and balance were especially important for increased activities in Instrumental Activities of Daily Living and participation in society. This is in sharp contrast to no physical activity, exercise, or training after stroke where decline of function show is a progressing pattern in motor function and activities of daily living [13]. A reduction of physical fitness and strength has also been reported for persons with stroke in other studies [14–18].

Furthermore, it is argued that all stroke patients, indifferent of disability, have the same possibility to improve with training [19]. On the other hand, no study has had a sole focus on this difference in a stroke population. It is established that the effect of training will be greater in persons with little or poor ability versus the more trained person [20]. However, among persons with stroke, this seems to be reverse, and rehabilitation clinics indicate a slower progress for persons with more severe stroke at onset [21].

These results underline the importance of physical activity, exercise, and training for all persons with stroke, with focus on both capacities in body functions and activities. However, subgroups with minor, moderate, and severe deficits after stroke might possibly have different goals and needs when it comes to type of exercise after stroke. A person with minor stroke might be able to return to the almost the same physical level as before the stroke and may be able to use the different possibilities for physical activities that exist outside the health services. Persons with moderate and major strokes, on the other hand, may have need for adapted physical activities and exercises in order to maintain optimal function. These services are more limited and perhaps not so easily accessed.

The principal aim of the study was to investigate how motor function, balance, mobility, walking capacity, and activity patterns may differ between two groups with different functional capacities at baseline. Another aim was to follow functional improvements during and postrehabilitation in the groups during and after interventions in a 36-month period.

It was hypothesized that there would be a significant difference between the groups in functions but that both groups would improve in all functional activities, inline with current theories. However, it is expected that the functional gains during the rehabilitation and poststroke period would be lower in persons with a major disability at baseline than in those with a moderate to minor disability. Furthermore, it was hypothesized that the first group would be slightly slower in their progress of improvement than the latter.

2. Method

2.1. Subjects. The participants were 75 persons with stroke divided into two groups, according to motor function after stroke. The participants were recruited for an intervention study and a randomized controlled trial, described in other articles [10–12]. Patients with stroke were consecutively screened for inclusion. Inclusion criteria were first time ever stroke with neurological signs and voluntary participation. The information about the intervention study was given in writing and verbally. An informed consent was obtained by methods approved by the Regional Committee of Medical Research Ethics of Norway. The material in this new study has been reanalyzed; groups have been rearranged according to better or poorer motor function as measured with Motor Assessment Scale [22]. Scores ranging from 0 to 35 were considered as having a major functional disability and are hence called MAS group <35 ($n = 37$; after 36 month $n = 27$), and persons with scores from 36 to 48, which indicates a moderate-to-minor disability, are called MAS group >35 ($n = 38$; after 36 months $n = 33$). The division of Motor Assessment Score <35> is significantly correlated to BI <60> ($P = 0.001$, $r = 0.7$) [23]. The score, <60, in Barthel Index has been used as cut score for prediction of placement in a nursing home [24].

2.2. Outcome Measures. A test protocol consisting of the Motor Assessment Scale (MAS) [22], Berg Balance Scale (BBS) [25], Timed Up and Go TUG) [26], 6-Minute Walk Test (6MWT) [27], and the Barthel Index of Activities of Daily Living (BI) [23] was used.

The patients were tested on admission, and at three, twelve, and thirty-six months after the onset of stroke by an experienced investigator, blinded to group allocation. The tests were performed in the general hospital, in the patients' homes, and in community service centres.

The Motor Assessment Scale is a test of motor function developed by Carr et al. [22]. Each item scores from 0 = no function to 6 = normal function. Hence, the total scores of the eight items range between 0 and 48. The test has been shown to have high inter- ($r = 0.89$ to 0.99) and intrareliability ($r = 0.87$ to 0.98), and high construct cross-sectional validity ($r = 0.88$ and $r = 0.96$) [28].

The Barthel Index of Activities of Daily Living is a test of primary activities of daily living (ADL) developed by Mahoney and Barthel [23] for the purpose of measuring functional independence in personal care and mobility. The items are weighted differently. The scores reflect the amount of time and assistance required by a client. A score of 0 (complete dependence), 5, 10, or 15 is assigned to each level, with a possible total score of 100 (totally independent). The test has high scores for inter- ($r = 0.70$ to 0.88), and intrareliability ($r = 0.84$ and $r = 0.98$) and construct cross-sectional validity ($r = 0.73$ to 0.77) [28]. Scores below 60 indicate a need for institutional care [24].

Walking capacity was monitored by the *6-Minute Walk Test*, using a standardised protocol [27]. The 6MWT was performed in an 85 m long corridor in the hospital or different institutions. In patients' homes, this test was preferably performed outdoors on an 85 m long stretch on an even level. Indoors in patients' homes the longest stretch was chosen, but this was done only twice with two patients, 6 and 12 months after stroke. The patients were encouraged to walk as long a distance as they could in 6 minutes (m), and this

was registered as well as gait velocity (m/s). The 6MWT is also used to assess exercise tolerance [29, 30], thus measuring functional exercise capacity. Gait velocity has been tested among elderly individuals for validity and reliability, with satisfactory results [28, 31], and it has also been used in several stroke studies [32].

The Berg Balance Scale (BBS) is a balance test consisting of 14 items, scored from 0 = no balance to 4 = full balance [25]. This scale has been found to be especially sensitive for the detection of risks of falls in frail elderly persons. An overall score of less than 45 points, out of a maximum of 56, is associated with a 2.7 times increase in the risk of a future fall [33]. The BBS has been used in many studies and has been tested for reliability and validity with good results [28].

Timed Up and Go (TUG) is a functional mobility test that is used in the clinic to evaluate dynamic balance, gait, and transfers [26]. The patient is asked to get up from a chair (46 cm high), with support for the arms, walk three meters, turn, go back, and sit down. The physiotherapist monitors the time taken from the start to the end, when the patient is seated. The test is valid and reliable for function and transfers indoors for frail elderly and has been used in several studies [26, 28, 31].

2.3. Intervention. During the acute phase of rehabilitation at the hospital, both groups received functional task-oriented training tailored to their specific needs. In the original study, the patients were randomised into two separate groups, an intensive exercise group, and a regular exercise group. The subsequent training for the intensive exercise group included a functional exercise programme with emphasis on high intensity of endurance, strength, and balance for the whole first year after stroke. The patients in the regular exercise followed regular procedures with no specific exercises but were tested regularly, as described elsewhere [10–12]. However, both groups were equally active in this first year after stroke and both maintained function, as opposed to earlier studies with no activities after stroke [13]. When the groups were rearranged in functional capacity groups, the exercise patterns at 36 months after stroke showed no significant difference between the groups ($P = 0.6$). In the MAS group <35 a total of 73% were active with regular exercise with a coach (53%) or self-training (20%) versus MAS group >35, where 82% were active, 50% with self-training, and 32% with a coach during the first year after stroke.

2.4. Statistical Analysis. The results were analysed in an SPSS programme version 19. Descriptive statistics were used to summarise demographic, stroke, and baseline characteristics. All analyses were performed on an intention-to-treat basis. Baseline demographics and exercise levels between groups were performed with a one-way analysis of variance. The functional groups MAS <35> were analysed in a general linear model for repeated measurements, with mixed between-within subjects analysis of variance (ANOVA) was performed, using change from baseline, 3, 12, and 36 months after stroke in MAS, BBS, BI, TUG, and 6MWT. Furthermore, the same functional groups MAS <35> were analysed in relation to the original exercise groups' stratification, presented in an earlier study [10–12], in a general linear model multivariate analysis. The significance level was set at $P < 0.05$.

Table 1: Demographics at baseline when admitted to the hospital in the two groups MAS ≤35 and MAS >35.

	Group MAS <35 ($n = 37$)	Group MAS >35 ($n = 38$)	P-value
Age (years)	76.8 (12.9)	70.2 (12.9)	0.03
Males/females	20/17	23/15	0.6
Days in hospital	27.5 (9.7)	10.6 (6.7)	0.001
Medication per day	6.1 (3.1)	5.9 (3.2)	0.8
Systolic blood pressure	167.4 (39)	153.8 (28.6)	0.09
Diastolic	93.9 (19.5)	85.4 (19.3)	0.06
Cerebral infarction/ haemorrhage	28/9	37/1	0.08
Right/left	17/20	21/17	0.4
Married/single	23/14	20/18	0.7
Community support/none	8/29	2/36	0.2

Table 2: Change scores in mean and SD between baseline and 36 months after stroke in two groups in Motor Assessment Scale (MAS), Berg Balance Scale (BBS), Barthel Index (BI), Timed Up and Go (TUG), 6-Minute Walk Test (6MWT) and P-values.

	MAS <35 ($n = 27$)	MAS >35 ($n = 37$)	P-value
MAS	13.2 (13.8)	2 (3.3)	0.001
BBS	18.9 (20.7)	4.3 (11.3)	0.001
BI	35 (38)	4.7 (9.8)	0.001
TUG	+8.6 (35.0)	−3.5 (6.0)	0.06
6MWT	152.2 (170.4)	194.5 (167.9)	0.3

3. Results

Demographic and descriptive data indicate that group MAS <35 was significantly older, initially spent more days in the hospital/rehabilitation unit, and had higher blood pressure than MAS >35 during the period of the study (Table 1). There were significant differences between the groups, as expected, in total MAS ($P < 0.001$), BBS ($P < 0.001$), TUG ($P < 0.001$), 6MWT ($P < 0.001$), and BI ($P < 0.001$) (Table 2) at all test occasions. The Group MAS <35 had lower scores in all tests than group MAS >35 overall, motor function (MAS) were on admission 15.3 versus 44.4 and at 36 months 29 versus 47. The scores for balance (BBS) at the same time periods were 10 versus 50 and 29 versus 53, respectively. Activities of daily living (BI) presented total scores 31 versus 94 and 66 versus 99 in the same groups. Mobility (TUG) presented slower performance in MAS <35 than MAS >35 at baseline 17 s versus 11 s, and at 36 months after stroke 26 s versus 7.6 s, and walking capacity was shorter, 46 m versus 370 m, 198 m versus 565 m in the groups, respectively.

However, both groups improved their motor function as measured with MAS (Figure 2), ADL as measured with

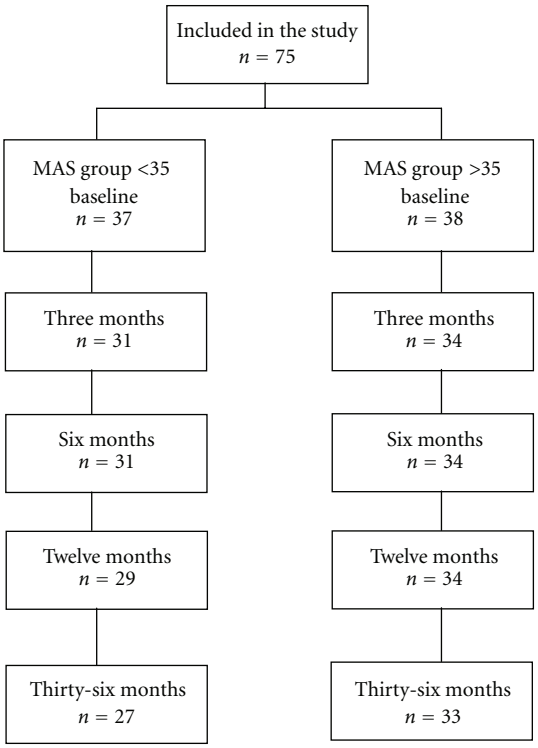

Figure 1: Flow chart of numbers of patients included in the study at each test occasion during a 26-month period.

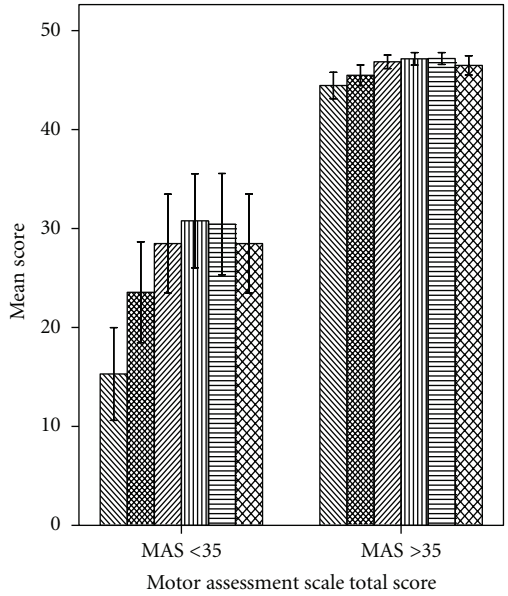

Figure 2: Motor function measured with Motor Assessment Scale total score in the groups MAS <35 (1) and MAS >35 (2) at baseline, discharge, 3, 6, 12, and 36 months, presented in mean with indicated standard errors.

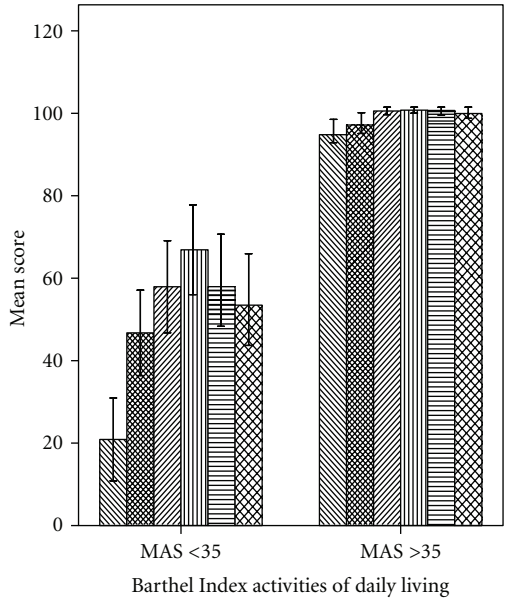

Figure 3: Barthel Index activities of daily living in the groups MAS <35 (1) and MAS >35 (2) at baseline, discharge, 3, 6, 12, and 36 months after stroke, presented in mean total scores with indicated standard error.

BI (Figure 3), balance as measured with BBS (Figure 4), and mobility as measured with TUG (Figure 5) up till six months were it stabilized and stayed till twelve months for to slightly decline. This tendency was in general more prominent in the Group MAS <35. However, change scores showing the rate of improvement from baseline to 36 months after stroke indicated a greater potential for rehabilitation in the MAS <35 in relation to group MAS >35 (Table 2).

Walking capacity (6MWT) improved up till twelve months in both groups, for to show slight deterioration in both groups at the 36-month followup (Figure 6).

The functional groups MAS <35 and MAS >35 analyzed within the original different exercise regimens showed the same significant differences between functional status in total MAS scores ($P < 0.001$), BI ($P < 001$), BBS ($P < 0.001$), TUG ($P < 0.001$), and 6MWT ($P < 0.001$). However, an interesting indication was observed between the organized exercise—and voluntary exercise group regarding improvements from six months to twelve and thirty-six months after stroke in both MAS <35 and MAS >35 (Figure 7). Voluntary exercise group showed a slightly better maintenance of function in both MAS <35 and MAS >35 at twelve and thirty-six months after stroke as exemplified by the 6 Minute Walk Test (Figure 7), the difference was not significant ($P = 0.6$, $P = 0.3$) but the tendency was the same in MAS, BI, BBS, and TUG tests.

4. Discussion

4.1. Improvement Pattern. Both groups improved their capacities and function up till six months after stroke where the gains plateaued for motor function, balance, mobility, and ADL. The findings are inline with, and confirm results from other studies that motor function, and activities show a pattern of improvement up till three to six months after stroke [34, 35]. The peak of performance and optimal function seems to be established at six months after stroke [10–12, 34, 35]. The regained optimal performance is dependent on maintenance of capacities and activities in order to be

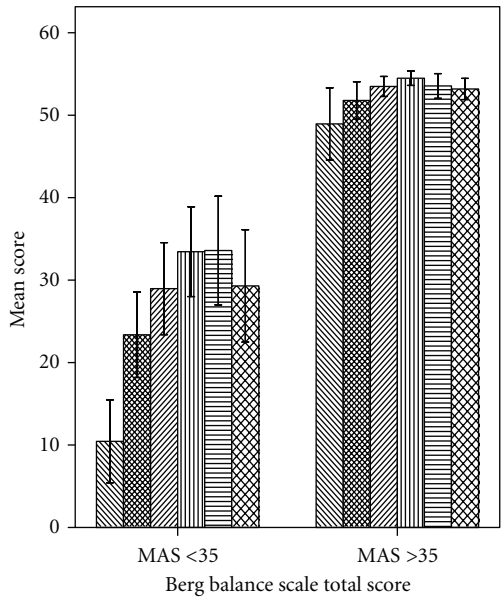

Figure 4: Balance measured with Berg Balance Scale in the groups MAS <35 (1) and MAS >35 (2) at baseline, discharge, 3, 6, 12, and 36 months after stroke, presented in mean scores with indicated standard error.

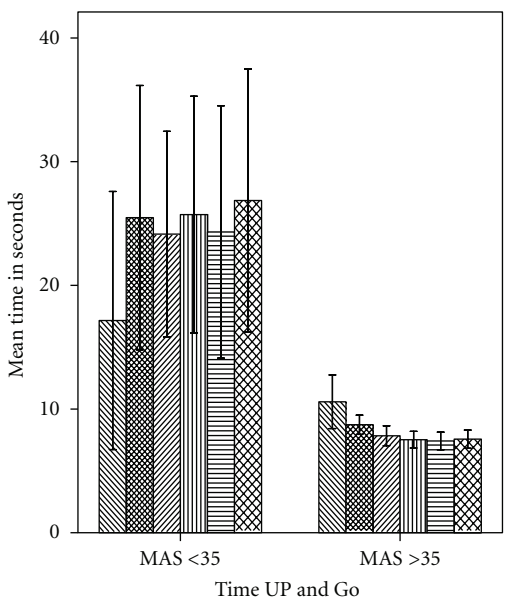

Figure 5: Timed Up and Go in the groups MAS <35 (1) and MAS >35 (2) at baseline, discharge, 3, 6, 12, and 36 months after stroke, presented in mean time with indicated standard error.

sustained, and if training is not provided the performance is likely to deteriorate [13]. This is inline with physical function in the general population and the recommendations for physical activity [20].

Motor function, balance, and ADL, on the other hand in the MAS group <35, had a steeper improvement pattern than in the MAS group >35 which indicated that persons with moderate and severe stroke are highly susceptible for exercise and training although they did not reach the same functional

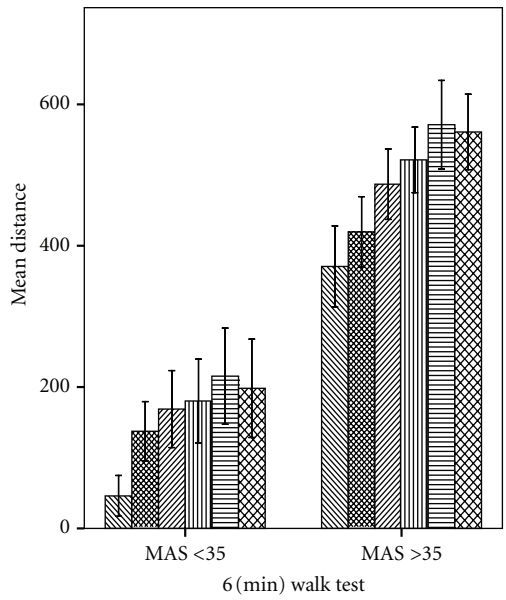

Figure 6: Walking capacity measured with 6 Minute Walk Test in the groups MAS <35 (1) and MAS >35 (2) at baseline, discharge, 3, 6, 12, and 36 months after stroke, presented in mean distance walked with indicated standard error.

levels as persons with minor stroke. This is inline with other studies, which have shown that persons with a low capacity increase their capacity to a higher degree than a person who has higher capacity, if exercising [20].

Mobility, as measured with Timed Up and Go, stabilized at six months, then deteriorated in the MAS group <35, but remained stable in MAS group >35 (Table 2). The task getting up from a chair, move around, and return to the chair is repeated several times during the day, and, thus, in theory, it would be maintained, as hypothesized in the "use it or lose it" theory [36]. The MAS group >35 presents scores that are well within the limits for a comparable group of healthy elderlies already at three months after stroke and maintain this function on a group level up till 36 months. The MAS <35, however, had difficulty with the task at baseline and instead of improving as time passed, they deteriorated and, on a group level, they were much slower than their healthy counterparts and the MAS group >35 at 36 months. Explanatory factors might be that the task is complex and requires power, coordination, and perception to a higher degree than walking on an even surface. The bodily capacities strength and power are known to deteriorate with age [16–18]. In combination with the paresis in a patient with stroke, which might lead to poor coordination and in combination with reduced perception, it will have severe influence on performance, more so in a complex than in a simple task. One might also speculate if the combination of reduced capacity in several body functions after a stroke in combination with age-related changes might reinforce each other.

Walking capacity in terms of distance but also in speed showed a slightly different pattern than the other parameters in this study. The improvement continued up till twelve months, for to stabilize and then slightly show deterioration

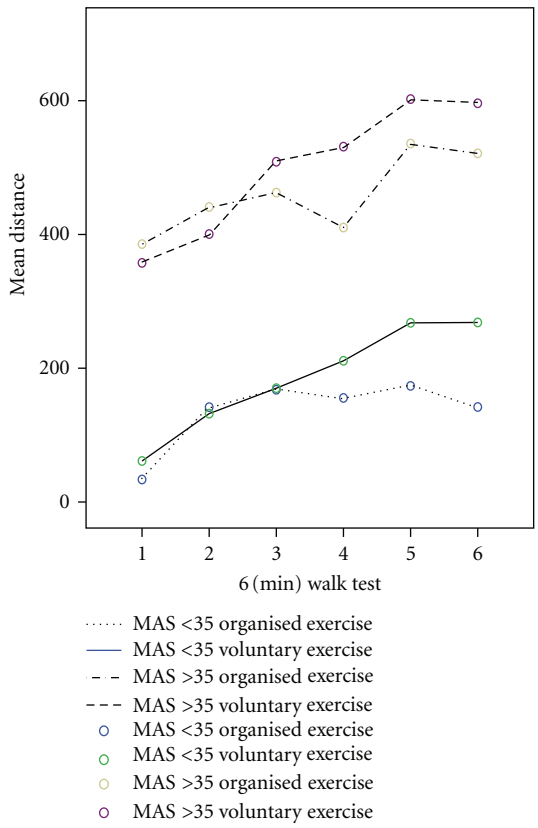

Figure 7: Walked distance measured with 6 Minute Walk Test at baseline, discharge, 3, 6, 12, and 36 months after stroke. Groups are divided in functional level: MAS <35> and subgroups: organized versus voluntary exercise.

at the assessment at 36 months after stroke (Table 2). Exercises were maintained up till one year in the original trial, and exercise patterns were similar in frequency and intensity in both groups, and as a consequence the functional capacity was also maintained up to one year [10–12]. But, as the trial ended, so did the regular tests and support from the research team to the participants and as a result functional capacity slightly declined inline with use-it-or-loose-it theories [36]. However, the decline in walking capacity at three years was more severe for in the MAS group <35, because of the lower capacity at baseline and at the 12-month assessment. This indicates the importance of some sort of extra exercises in this group. The energy cost when walking with less motor function will be higher, and asymmetry may impose more strain on structures, joints, and weight bearing soft-tissue which might cause pain or discomfort, all of which will indirect influence capacity and endurance [37].

The fact that our better performers had a slower progress on the scales MAS, BBS, and BI is to some extent explained by the fact that they reach maximum scores/ceiling effect, faster than the poorer performers. Scores in MAS, BBS, and BI are ordinal scales compared with the outcome measures 6MWT and TUG which, on the other hand, are quantitative and therefore there is no floor or ceiling effect [28]. So, for high performers, the ordinal scale becomes less sensitive to change than for the low performers.

4.2. Difference in Performance between the Functional Groups. The groups were divided according to their function at baseline. This also turned out to be predicative for their longitudinal development, where MAS group <35 showed a lower performance all through the three years as compared to MAS group >35. This supported the first part of the hypothesis that the functional gain during the period would be lower in persons with more severe stroke. However, the MAS group <35 improved their scores approximately with 46% in MAS, 73% in 6MWT, 65% in BBS, and 53 in % BI compared to the MAS group >35 with 4% in MAS, 25% in 6MWT, 8% in BBS, and 5% in BI from baseline to three months after stroke (Table 2). The improvements in the MAS <35 group were major, and, in regard to priority discussions, for whom rehabilitation is worthwhile, this would indicate that persons with <35 on a MAS total score should be at focus for rehabilitation. This was contrary to our second part of the initial hypothesis that progress in rehabilitation would go slower. Instead it went faster in the group with poorer function. The same tendency has also been observed in regard to poor physical function and physical activity among healthy persons where the persons with less physical capacity gain function in a more rapid tempo than their counterparts with a better physical capacity at baseline [20].

On the other hand, the MAS group <35 had in total scores function and capacity below norm levels in walking, mobility, with fall risk, and dependence in ADL, whereas the MAS group >35 was comparable to healthy counterparts [31]. Also in regard to TUG, the MAS group <35 showed a decline with 33% compared to MAS group >35, which improved with 46% from baseline to 36 months after stroke (Table 2). This indicated that TUG, as a complex functional activity, might be predictive of function to a higher degree than the other outcome measures used in this study.

4.3. Improvement Pattern and Performance in the Functional Groups in Relation to Exercise. The improvement patterns showed the same directions when analyzed in the original exercise groups in regard to function. The MAS >35 group was stronger in performance, but the MAS <35 group showed a steeper improvement curve. However, the exercise regimens, organized versus voluntary, had an interesting influence on performance 6, 12, and 36 months after stroke in favor of voluntary exercises both for MAS <35 and MAS >35 (Figure 7). This tendency underlines the importance of empowerment and self-efficacy for the individual in a long-term context of rehabilitation but also for motor learning [38]. Both persons in MAS <35 and MAS >35 had a better progress when they could decide themselves when and how the physical exercise should take place (Figure 7). All persons participating in the studies were tested regularly. This had a positive influence in itself on motivation and goal achievement [10–12]. However, the organized exercise group seemed to be more reliant on their "contact PT" to maintain exercises, whereas the voluntary group themselves organized their training in accordance with the possibilities provided in the community. So, the voluntary group was equally active and frequency of exercise was the same as in the organized group [10–12]. The results indicate enhanced

empowerment and health-related quality of life in favor of the voluntary group for both MAS <35> [11]. Explanatory factors may be that in order to make the rehabilitation process "your own," to learn, retain and transfer motor abilities, internal augmentation is of main importance, rather than external augmentation from a therapist. It seems vital that the individual is personally involved and motivated in the planning and execution of training. The tendencies in this study show that this is equally applicable to persons with high and low functional level after stroke (Figure 7).

The exercises were in the organized group standardized so that the participants should maintain a high intensity, 2-3 times a week. In combination with daily activities, this was hypothesized to facilitate and maintain motor learning and improve physical fitness [39]. The voluntary group, on the other hand, decided their time and exercise schedules, from their individual status, based on their test results. The intensity levels of the programmes were reported by the participants themselves, and there was no control other than the test occasions. Endurance capacity was indirectly measured with 6MWT, and the tendency of the group supports the impression of increased capacity in the voluntary group compared to the organized (Figure 7).

However, as the registration of exercise levels showed, both groups exercised on a higher intensity than what is defined as physical activity [20, 39]. Despite this, the results indicate a poorer physical fitness level (6MWT) in the MAS <35 group than MAS >35 group at both 12 and 36 months, 216 m versus 577 m, and 198 m versus 565 m, respectively. In comparison, a healthy older person of the same mean age and nationality perform is mean 617 m (SD 78.6) [40].

These results capture the difficulty with rehabilitation where persons that can achieve independence are at priority. The persons gaining most function from rehabilitation does not seem to be the ones that will gain independence but the ones that will still need some assistance. So, in many ways, the functional gains the MAS group <35 achieved are very important in view of secondary problems after stroke like immobility, pain, and incontinence. The improvements will not only have an impact on health-related quality of life, family life, and the individual's coping strategies, but one would assume also for health care costs.

The impressive improvements in the MAS <35 indicates a need for alternative rehabilitation for this disabled, but not independent group also in a longitudinal perspective. The MAS group <35 had not the bodily capacities which enables them to maintain function on a self-supportive level as the "use-it-or-lose-it" theory implies.

The MAS group >35, on the other hand, seems to be able to return to their ordinary lives and achieve a high functioning level with little or no problems in motor function, balance, mobility, and activities of daily living (Table 2). The abilities seem to be maintained through "daily use" and through self-training. This is inline with the "use-it-or loose-it" theories, but it also underlines the fact that in order for this theory to be valid, the individual needs the bodily capacities to be *able* to "use it."

There are some weaknesses in this study. The sample size was relatively small at three-year followup (Figure 1) due to several factors. In many ways, this illuminates a typical development over time in a population of stroke; mortality is high in this group; in addition dementia is not un-common as part of the secondary problems a person with stroke might encounter and some dropped out because it was too strenuous to get to the clinic for a test. A larger sample size would have made up for the dropouts and the results less vulnerable, but this was not an option in this study from the beginning. Another weakness is related to exercises which were not standardized from one year till three years after stroke, neither were they standardized in time, but there are to our knowledge no studies indicating any particular recommendations in this respect. Rather the contrary, persons with stroke are expected to continue their lives and social roles and cease being patients after their initial rehabilitation.

5. Conclusion

The functional capacities in acute stroke patients have a major impact on motor function, balance, mobility, and activity of daily living in a longitudinal perspective, where persons with stroke with MAS <35 at baseline show a lower performance in all our tests from baseline to 36 months after stroke. MAS group >35 improved functional abilities over the three years and could return to their homes and social roles. However, stroke patients with MAS <35 at baseline showed a better improvement relatively, thus indicating the importance of maintenance of exercise and training after stroke for all persons with stroke. The importance of possibilities to maintain function after stroke regardless of functional level was also confirmed.

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