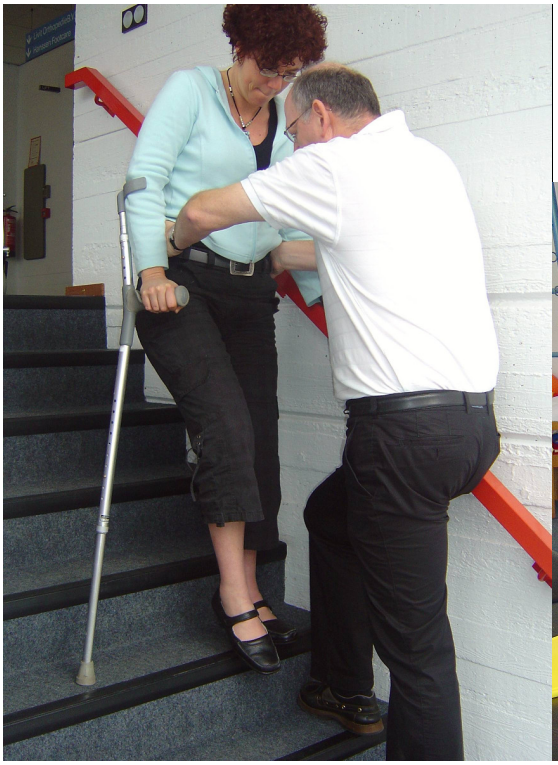
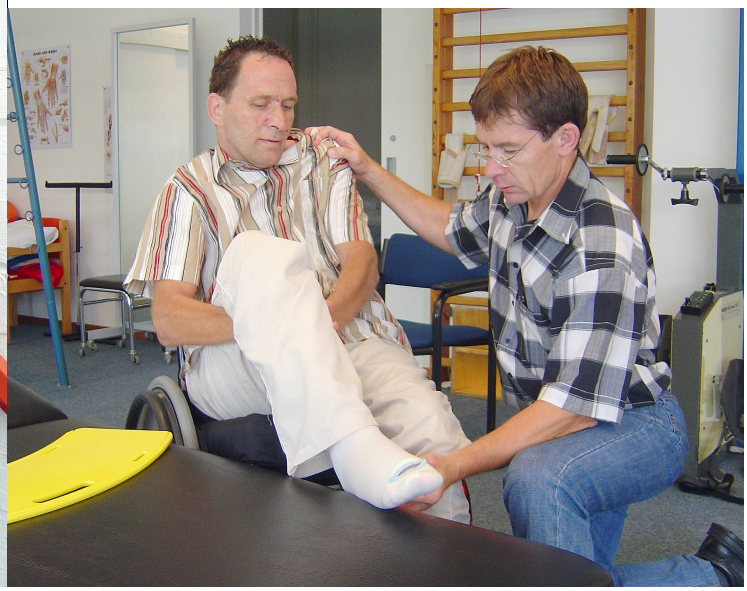
Newsletter IPNFA research committee

A new year has started, so happy New Year and here is the first newsletter of 2013. We present some abstracts that were pointed out to us by several of our colleagues who are involved with their master studies. In this way we all can benefit from their efforts and along this way we see some support for our PNF approach. Also we like to share some of the last meeting with our readers, so we asked and received some abstracts of the presentations from the education day at the meeting in Budapest. On behalf of the research committee, I wish a joyful reading. Fred.

We are already looking forward to our next meeting in Seoul. Our host Seong-soo Hwang showed us fantastic pictures of his country, city and culture.
Now we would like to suggest making the brakes at the meeting in Seoul even more interesting by having a (digital) picture gallery of our PNF culture.
Wouldn't it be great to show each other how our PNF work is performed? One could think of PNF in clinical patient work or sessions of teaching PNF in courses. Imagine how encouraging it is to see participants active with each other or who are active with patients.
Maybe we could have a kind of contest, all people who attend the meeting could vote on the most impressive picture, the best looking PNF performance etc.
At the end of the meeting we would have a winner.





"Facilitation of Stairs & Transfers, so important for participation":
Dominiek Beckers, IPNFA senior instructor.

Objectives: The purpose of this lecture was to emphasize on the importance of optimal PNF-training of stairs and transfers to obtain maximal independence in daily life. Stairs and transfers are an important part of all standardizes DLA tests, as the Barthel Index (25%), the FIM or the SCIM. The goal was not a deep experimental research, but rather an overview and advices how to facilitate our patients to reach maximal results in taking stairs as well as in making all kind of transfers.
Method: The evidence of this presentation is build on literature, but most of all based on evidence based practice in rehabilitation. Stairs and transfers include always a risk and lead often till accidents, falls or fractures. Specially older and disability people belong to this risk group. Standards are presented: the training need an objective analysis of the patients capacities and the risk factors before selecting the correct facilitation and treatment plan. Besides independence tests, different balance tests are useful to plan the focus and evaluate the PNF-therapy results.
Results: Different case studies with more than 35 movies (hemiplegic patients, brain damage, SCI, amputees) are presented with their PNF-therapy and their treatment results. Emphasis on our PNF-philosophy was included with principles of ML (with graded activities) and motor control principles (hands on in the cognitive stage)
Discussion: If stairs and transfers make about 25% of our daily independence: we should not include these activities in all our PNF-course levels??
Conclusions: Stairs and transfers should be an integrated part of our rehabilitation training and should be practical implemented in all our PNF-courses.

Treatment of the Complex Regional Pain Syndrome integrating the PNF Concept; by Barbara Dopfer IPNFA Advanced Instructor, Certified Hand therapist

Introduction: CRPS is a complex disease with a neuropathic pain pattern. Severe pain in the affected extremity that cannot be allocated to the initial trauma is the cardinal symptom that is attended with various vegetative, motor and sensory disorders. The patients are affected on all levels of the ICF. CRPS can occur after a trauma, stroke or myocardial infarct. Incidence numbers are between 5.5 and 26.2 per 100.000. The hand is twice as often affected as the foot.
The objectives of the lecture are to provide information about the hypotheses of the causes and the diagnostic criteria and to show therapeutic approaches with consideration of the PNF concept.
The hypotheses of the causes of CRPS are :) An enhanced neurogenic inflammation)A pathological sympathic afferent coupling)Changes in cortical representation of the affected body part)Genetic dispositions are discussed.
With the application of the Budapest criteria (IASP 2003), CRPS can be diagnosed with a sensitivity of 99% and a specificity of 69%.
A multi modal therapy should be performed consisting of medication, physical therapy or hand therapy and psychological therapy.
There is good evidence for the following medication (R.S. Perez et al. 2010):

- WHO analgesic ladder
- Antidepressants
- Free radical scavengers (DMSO), bisphosphonates, cortico steroids
- Calcitonin
- Vitamin C
- Vasodilatory medication, sympathic blockades

There is also good evidence for the effectiveness of physical and occupational therapy with CRPS (Oerlemans et al, McGabe et al, Moseley).The objectives of physical therapy are:

- Reduction of pain
- Treatment of the autonomic disorders
- Reduction of the sensoric and motor disorders
- Therapy on all levels of the ICF according to study results on motor learning

Reduction of pain can be achieved with patient education and neuro-cognitive treatment interventions such as mirror therapy and the motor imagery program MIP described by Dr. L. Moseley. The PNF concept contributes an indirect treatment approach, intensive training and breathing techniques for decreasing pain and sympathic hyperactivity.
Autonomic dysfunctions can be treated with lymphatic drainage, moderate cooling, and electrotherapy. With chopping and lower trunk rotation, deficits of neural tissue gliding can be addressed. Stimulation of the thoracic spine to normalize sympathic activity can be done with lifting. The sensoric dysfunctions consisting of hypo and hyper sensibility are treated with exercises for recognition of objects, sensoric baths and sensoric memories. Proprioceptive information is necessary to stimulate cortical representation and pain reduction. Exercises for weight loading in different positions activate the proprioceptors. Joint mobilizations, stimulation of muscle activity without the increase of pain level are further treatment objectives. In addition to one-on-one treatment sessions the patients profit from training in pairs or groups.
Conclusion:
Effective therapy means:

- No increase of pain during or after therapy
- An early onset of therapy (within 8 weeks) results in better hand functionality
- The process of rehabilitation can take long (1 year or longer)
- Complete restoration of hand functionality cannot always be achieved

The Positive Approach in the PNF Concept using the Example of Pelvic Elevation;
Marianne Heidmann

Background and clinical observation:
About 20 % of the stroke patients do not develop any locomotive capacity. Neuropsychological disorders, like the neglect syndrome in combination with stroke, have a dramatic impact on the process and outcome of the rehabilitation results. These patients hardly have a voluntary access to their involved side. The phenomenon of the PNF specific irradiation and cross education effect with the impact on indirect, involuntary activation of movement, and the increase of strength in the contra lateral side after unilateral training, seems to be a purposeful therapeutic tool, to face such patient problems.
Objective
This study tries to answer the question, whether the indirect approach in PNF (Proprioceptive Neuromuscular Facilitation) is a useful tool to facilitate an anterior pelvic elevation as a prerequisite for a swing phase in gait.
Reasoning and Hypothesis
The physiological pelvic drop of 4-7°(Perry 1992, 2003, Stüssi et al. 2008) was the underlying baseline for the measured criterion of pelvic elevation. According to the pelvic drop of 4°, a pelvic elevation of at least 2.5 cm is supposed to be achieved. A stance activity of the right leg leads to a contra lateral anterior Elevation of the pelvis of at least 2,5 cm.
Method
An observational cross sectional study design was performed on 32 blinded healthy volunteers. All volunteers were positioned in side lying, in a defined way; the lower right leg was pushed with the whole foot palm into a wall. The measured criterion was the spontaneous magnitude of a contra lateral anterior pelvic elevation. Also it was evaluated whether there is an impact of the gender, body size and body weight on the measurements.
Results
All subjects showed a spontaneous elevation of the contra lateral pelvis ventrally and cranially with an average of 6.3 cm (N = 32, mean = 63.50, median = 64.67, mode =64.67, SD = 22.771; T-test: t = 9,56; df =31; p < 0,0001).
The independent variables (gender, body height and body weight) showed within the correlation analysis no significance. For inferential statistical analysis the t-Test, Mann-Whitney- U –Test, Pearson Correlation analysis was applied.
The same procedure of indirect stimulation was applied to a stroke patient with severe neglect syndrome and paresis of the left body side with the purpose to demonstrate an indirect reaction of pelvic elevation as well. The patient demonstrated the same results in respect to the healthy group.
Conclusion
The indirect approach with the purposeful and specific use of the patient's good potential seems to be an efficient tool to activate the pelvic elevation over irradiation.
This was shown in 32 healthy subjects and in one stroke patient with a severe neglect syndrome. This study just demonstrated the movement of the pelvis over irradiation. It does not explain the underlying mechanism of the pelvic elevation. Further research is needed to look for possible neuromuscular effects by using EMG. Furthermore this procedure must be proven in a study with a larger population.

ADLS problems of 158 polish patients in PNF advanced courses between 2005 – 2010
Authors: Aleksander Lizak, Agnieszka Stępień (Poland)

The aim of the paper was the presentation of 158 orthopedic (76) and neurological (82) patients treated with the PNF method during advanced courses in Poland between 2005- 2010. The particular emphasis was laid on the ICF as a basis for assessment of patients on all levels which are specified in ICF. Of special importance was the assessment of patients' problems in activities of daily living, because an activation of patients in their everyday life was seen as the main goal of the therapy and a reference point to establish its effectiveness. At the structural and function level, patients were assessed using the following tests: Lovett test for muscle weakness, Ashworth scale for spasticity, Berg scale for balance problems, mirroring test for deep sensation, range of motion test (ROM). In order to assess patients' activity level following tests were usually performed: Timed walking test, Timed up and go test, Functional Reach test, Manipulation test of the upper extremity and Changing position tests. The most important part of the study was to assess the level of patient activity. We observed some similarities in the problems on the level of activity in the group of neurological and orthopedic patients. 68% of neurological patients as well as 41% of orthopedic patients had problems with walking and moving. 50% of neurological patients and 34% orthopedic patients had problems with changing and maintaining the position of the body. A large group of neurological patients (50%) also had problems with carrying, moving and handling objects. In both groups muscle weakness was a major disturbance on the level of structure and function of the body (71% of neurological patients, 88% of orthopedic patients). Other dysfunctions were spasticity (46% of neurological patients) and ROM limitation (29% of neurological patients, 33% of orthopedic patients). We found that in orthopedic group, the serious problem in activities of daily living was pain (22%). These data should be taken into account in planning, documenting and evaluating the effectiveness of therapy.

Parliament building in Budapest

THE EFFECT OF POSITIONING AND PNF-EXERCISE TO POSTOPERATIVE BLEEDING AFTER HIP REPLACEMENT **Steinhausz V, *Gombos G* , Schmidt B. University of Pécs, Zalaegerszeg, Hungary,**

OBJECTIVES: Postoperative positioning has beneficial effects on postoperative blood-saving, HGB and HTC reduction after knee replacement, and reduces the complications of transfusion. METHODS: Total of 96 people with hip replacement (age 69±20) were included in 4 groups who were treated on Orthopaedic Department in Zala County Hospital in 2012. *I.a.group:* traditional way of physiotherapy following the hospital protocol (not upraised lower limb) *I.*b.group: the same to I.a., supplemented with one special exercise from PNF-method (irradiation, effecting the operated side; repeat it 5-15 times/hour during the first 3 day) *II.a.group:* placed the lower limb in 30^{o} hip and knee flexion + traditional physiotherapy, *II.b.group:* same to II.a, supplemented with the special PNF exercise. The postoperative blood volume (after 6, 24, 48, 72 hours) and HGB, HTC (pre- and postop.24^{h}) were measured. Data were analysed by Wilcoxon-tests applying SPSS statistic software. RESULTS: The 30^{o}hip and knee flexion increased the postoperative bleeding (mean(ml)±SD 506.3±193.4 vs 570.8±222.4) with 12% after 6 hours, but the difference was not significant (p=0,1494). The applied specific PNF exercise increased the volume of the 6 hours postoperative bleeding with 5.6% (mean(ml)±SD 514,16±215,7 vs 543,05±202,0); in 72 hours 5.3% (mean(ml)±SD 1080,55±327,6 vs 1138,44±368,4); but the difference was not significant (p=0,519 vs 0,4298). There were not significant differences between the four groups regarding the postoperative bleeding from all aspects. HGB and HTC reduction were near similar in all groups; the differences were not significant among the groups. CONCLUSIONS: This study proved that the 30^{o} hip and knee flexion slightly increased the postoperative bleeding but it's not a significant level, so it's not suggested for blood-saving. PNF exercise has slightly increased the postoperative bleeding but it is also not a significant level. Maybe PNF exercise increases mildly the elimination of the produced wound fluid

We looked and received ---- > some nice abstract with the help from several IPNFA colleagues involved in their master studies all to be shared with us. The full text articles are available, just e-mail to Fred

Tomasz Maicki ea. MEDSPORTPRESS, 2012; 3(4); Vol. 12, 263-273

Background. *This study shows an analysis of two rehabilitation methods in order to determine the differences between groups and changes after the therapy in terms of reducing pain, restoration of mobility and proper function of the cervical spine.*
Materials and Methods*. The study was conducted on a group of 80 patients referred to rehabilitation due to restricted mobility and pain in the cervical spine, which resulted in impairment in everyday life. Patients were divided into two groups: group 1 consisted of 40 patients treated with PNF concept, and group 2 consisted of 40 patients treated with manual therapy elements. The study used a survey: Functional Index Scale and Oswestry scale for cervical and McGill pain Questionnaire. Additionally range of motion in certain planes was measured by the CROM device.*
Result*. Statistically significant differences were obtained in both groups of patients according to their individual rehabilitation program based on PNF concept and elements of manual therapy. However, patients who received PNF treatment showed greater improvement in mobility, function and pain relief.*
Conclusion. *Results based analysis shows that therapy in group 1 and 2 was efficient, however PNF method proved to be more effective in comparison to treatment with manual therapy elements.*

Luciana Bahia Gontijo ea. Evaluation of Strength and Irradiated Movement Pattern Resulting from Trunk Motions of the Proprioceptive Neuromuscular Facilitation**.** *Rehabilitation Research and Practice,* Volume 2012, Article ID 281937, 6 pages.

Introduction. The proprioceptive neuromuscular facilitation (PNF) is a physiotherapeutic concept based on muscle and joint proprioceptive stimulation. Among its principles, the irradiation is the reaction of the distinct regional muscle contractions to the position of the application of the motions.
Objective**.** To investigate the presence of irradiated dorsiflexion and plantar flexion and the existing strength generated by them during application of PNF trunk motions.
Methods**.** The study was conducted with 30 sedentary and female volunteers, the PNF motions of trunk flexion, and extension with the foot (right and left) positioned in a developed equipment coupled to the load cell, which measured the strength irradiated in Newton.
Results**.** Most of the volunteers irradiated dorsal flexion in the performance of the flexion and plantar flexion during the extension motion, both presenting an average force of 8.942N and 10.193 N, respectively.
Conclusion**.** The distal irradiation in lower limbs became evident, reinforcing the therapeutic actions to the PNF indirect muscular activation.

Effects of treadmill training with partial body weight support and the proprioceptive neuromuscular facilitation method on hemiparetic gait: a comparative study

T. Ribeiro, H. Britto, D. Oliveira, E. Silva, E. Galvão, A. Lindquist

From:
European Journal of Physical and Rehabilitation Medicine
Volume 48- 2012

Background. **Gait disturbance is common after stroke; however, there is no consensus regarding the optimal therapeutic rehabilitation of hemiparetic gait.**

Aim. **To compare the effects of the treadmill training with partial body-weight support (TPBWS) and Proprioceptive Neuromuscular Facilitation (PNF) method on gait of subjects with chronic stroke.**

Design. **Randomized clinical trial, comparing two experimental groups (comparative study).**

Setting. **Laboratory for Human Movement Analysis of UFRN.**

Population. **Twenty-three subjects, with a mean age of 56.7±8.0 years and a mean time since the onset of the stroke of 27.7±20.3 months, able to walk with personal assistance or assistive devices.**

Methods. **Two experimental groups underwent gait training based on PNF method (N.=11) or using the TPBWS (N.=12), for twelve sessions. Evaluation of motor function (using the STREAM and motor FIM), and kinematic gait analysis were carried out before and after the interventions.**

Results. **Increases in the STREAM scores (F=49.189, P<0.001) and in motor FIM scores (F=7.093, P=0.016), as well as improvement in symmetry ratio-swing time of the paretic leg/swing time of non-paretic leg - (F=7.729, P=0.012), were observed for both groups. Speed, stride length and double-support time showed no change after training. Differences between groups were observed only for the maximum ankle dorsiflexion over the swing phase (F=6.046, P=0.024), which showed an increase for the PNF group. Other angular parameters remain unchanged.**

Conclusion. **Improvement in motor function and in gait symmetry was observed for both groups, suggesting similarity of interventions. However, the sample size should be carefully considered in generalizing the results to other populations.**

Clinical Rehabilitation Impact. **The results showed some equivalence between these two approaches with regard to motor recovery, functionality and temporal symmetry of hemiparetic gait, suggesting that the cost-effectiveness of each treatment may have a important role in this choice.**

KEY WORDS: Stroke - Paresis - Rehabilitation - Gait.

Pamela W Duncan ea. Body-Weight–Supported Treadmill Rehabilitation after Stroke *N Engl J Med* 2011;364:2026-36

Background

Locomotor training, including the use of body-weight support in treadmill stepping, is a physical therapy intervention used to improve recovery of the ability to walk after stroke. The effectiveness and appropriate timing of this intervention have not been established.

Methods

We stratified 408 participants who had had a stroke 2 months earlier according to the extent of walking impairment — moderate (able to walk 0.4 to <0.8 m per second) or severe (able to walk <0.4 m per second) — and randomly assigned them to one of three training groups. One group received training on a treadmill with the use of body-weight support 2 months after the stroke had occurred (early locomotor training), the second group received this training 6 months after the stroke had occurred (late locomotor training), and the third group participated in an exercise program at home managed by a physical therapist 2 months after the stroke (home exercise program). Each intervention included 36 sessions of 90 minutes each for 12 to 16 weeks. The primary outcome was the proportion of participants in each group who had an improvement in functional walking ability 1 year after the stroke.

Results

At 1 year, 52.0% of all participants had increased functional walking ability. No significant differences in improvement were found between early locomotor training and home exercise (adjusted odds ratio for the primary outcome, 0.83; 95% confidence interval [CI], 0.50 to 1.39) or between late locomotor training and home exercise (adjusted odds ratio, 1.19; 95% CI, 0.72 to 1.99). All groups had similar improvements in walking speed, motor recovery, balance, functional status, and quality of life. Neither the delay in initiating the late locomotor training nor the severity of the initial impairment affected the outcome at 1 year. Ten related serious adverse events were reported (occurring in 2.2% of participants undergoing early locomotor training, 3.5% of those undergoing late locomotor training, and 1.6% of those engaging in home exercise).As compared with the home-exercise group, each of the groups receiving locomotor training had a higher frequency of dizziness or faintness during treatment (P = 0.008). Among patients with severe walking impairment, multiple falls were more common in the group receiving early locomotor training than in the other two groups (P = 0.02).

Conclusions

Locomotor training, including the use of body-weight support in stepping on a treadmill, was not shown to be superior to progressive exercise at home managed by a physical therapist. (Funded by the National Institute of Neurological Disorders and Stroke and the National Center for Medical Rehabilitation Research; LEAPS ClinicalTrials.gov number, NCT00243919.)

Hyung-Kyu Kang ea. Effects of treadmill training with optic flow on balance and gait in individuals following stroke: randomized controlled trials. *Clinical Rehabilitation* 26(3) 246–255

Objective: This study examined the effects of treadmill training with optic flow on the functional recovery of balance and gait in stroke patients.

Design: Randomized controlled experimental study.

Participants: Thirty patients following stroke were divided randomly into the treadmill with optic flow group (n¼ 10), treadmill group (n¼ 10) and control group (n¼ 10).

Interventions: The subjects in the experimental group wore a head-mounted display to receive speed modulated optic flow during treadmill training for 30 minutes, while those in the treadmill group and control group received treadmill training and regular therapy for the same time, three times a week for four weeks.

Main measures: The data were collected using timed up-and-go test, functional reach test, 10-m walk test, and six-minute walk test before and after treatment.

Results: The timed up-and-go test in the treadmill with optic flow group (5.55_2.04) improved significantly greater than the treadmill (1.50_0.93) and control (0.40_0.84) groups. The functional reach test in the treadmill with optic flow group (2.78_1.44) was significantly higher than the control group (0.20_0.16) only. The gait velocity in the treadmill with optic flow group (0.21_0.06) showed a significant decrease compared to the treadmill (0.03_0.02) and control (0.01_0.02) groups. Finally, the six minute walk test in the treadmill with optic flow group (24.49_11.00) showed significant improvement compared to the treadmill training (4.65_3.25) and control (1.79_3.08) groups.

Conclusion: Treadmill using optic flow speed modulation improves the balance and gait significantly in patients with stroke who are able to participate in physical gait training.

Comments from the research committee on the abstracts of the articles:

Looking at the abstracts specifically the three about gait in stroke patients, the general impression is that hands on therapy (like the PNF concept is advocating) is still a defendable treatment approach. Ribeiro and colleagues clearly state that besides the technique and effect of the treatment, costs should be considered. Imagine the cost of BWS on treadmills. Still a therapist is required, and that are the only costs for PNF.
The conclusion of Duncan and colleagues is not really different. Home based (so by a therapist) seems to be equal to BWS treadmill training. What did the therapist exactly do? One might assume a certain hands on therapy.
Hyung-Kyu and colleagues compared the use of a specific optic device, mounted on the head of the patient, with patients without the device and patients without a treadmill. Interesting for us PNF oriented therapist would be how we could incorporate visual feedback into gait training in stroke patients.

Not only in gait but also on hand function (dexterity), classic hands on therapy is still an approach to concider. Lo and colleagues (see the last abstract below this section) clearly conclude that intensive therapy (like one of our phylosophy points) is equal to modern technical approaches as robotics.

Furthermore the two first articles (Maicki and Gontijo) demonstrate the possitive effects of the PNF concept in musculoskeletal conditions and the basic procedure of irradiation.

Albert C. Lo ea. Robot-Assisted Therapy for Long-Term Upper-Limb Impairment after Stroke. *N Engl J Med* 2010;362:1772-83.

Background
Effective rehabilitative therapies are needed for patients with long-term deficits after stroke.
Methods
In this multicenter, randomized, controlled trial involving 127 patients with moderate-to-severe upper-limb impairment 6 months or more after a stroke, we randomly assigned 49 patients to receive intensive robot-assisted therapy, 50 to receive intensive comparison therapy, and 28 to receive usual care. Therapy consisted of 36 1-hour sessions over a period of 12 weeks. The primary outcome was a change in motor function, as measured on the Fugl-Meyer Assessment of Sensorimotor Recovery after Stroke, at 12 weeks. Secondary outcomes were scores on the Wolf Motor Function Test and the Stroke Impact Scale. Secondary analyses assessed the treatment effect at 36 weeks.
Results
At 12 weeks, the mean Fugl-Meyer score for patients receiving robot-assisted therapy was better than that for patients receiving usual care (difference, 2.17 points; 95% confidence interval [CI], −0.23 to 4.58) and worse than that for patients receiving intensive comparison therapy (difference, −0.14 points; 95% CI, −2.94 to 2.65), but the differences were not significant. The results on the Stroke Impact Scale were significantly better for patients receiving robot-assisted therapy than for those receiving usual care (difference, 7.64 points; 95% CI, 2.03 to 13.24). No other treatment comparisons were significant at 12 weeks. Secondary analyses showed that at 36 weeks, robot-assisted therapy significantly improved the Fugl-Meyer score (difference, 2.88 points; 95% CI, 0.57 to 5.18) and the time on the Wolf Motor Function Test (difference, −8.10 seconds; 95% CI, −13.61 to −2.60) as compared with usual care but not with intensive therapy. No serious adverse events were reported.
Conclusions
In patients with long-term upper-limb deficits after stroke, robot-assisted therapy did not significantly improve motor function at 12 weeks, as compared with usual care or intensive therapy. In secondary analyses, robot-assisted therapy improved outcomes over 36 weeks as compared with usual care but not with intensive therapy. (ClinicalTrials.gov number, NCT00372411.)