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THERAPY

THE SPECIALIST MAGAZINE FROM MEDICA MEDIZINTECHNIK GMBH

Integrated Solutions

It's time to reshape clinical treatment pathways

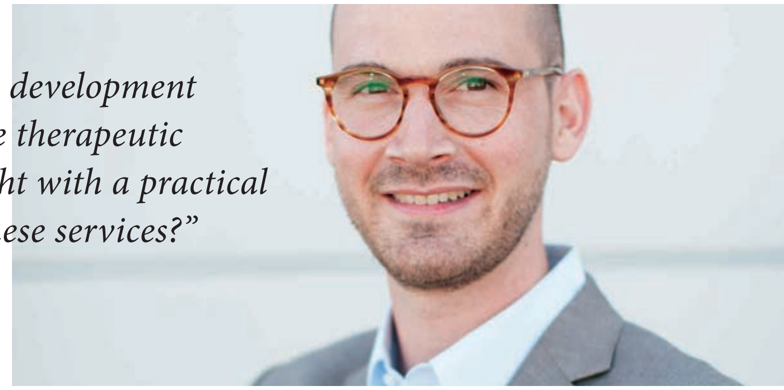
THERAPY & PRACTICE
Evidence-based therapy for MS

SCIENCE
Device-based circuit class therapy

TECHNOLOGY
Down with setup times!

Free

"The results from science, research and development must be consistently integrated into the therapeutic decision-making processes and be taught with a practical application. But who is available for these services?"



Editor Jakob Tiebel

FOREWORD

Integrated Solutions

Dear Readers,

Services that go above and beyond the portfolio of machines are where the future lies, whatever the business idea: a new construction on a greenfield site, the expansion of existing production or of a building. And what about reshaping clinical treatment pathways? Why not! The trend today is heading towards complete construction solutions, including sound advice on all topics relating to the service environment.

In this issue we've focused on this forward-looking topic – with an emphasis on therapy, of course. I'm particularly pleased that many young, scientifically committed therapists are already tackling this issue.

At first glance, this issue may seem a bit heavy on the theory – which is true, but it's certainly worth taking a closer look, as all the topics have a high degree of practical relevance. So, with this in mind, have fun reading this edition of THERAPY Magazine!

Best wishes on behalf of the editorial team,

Jakob Tiebel
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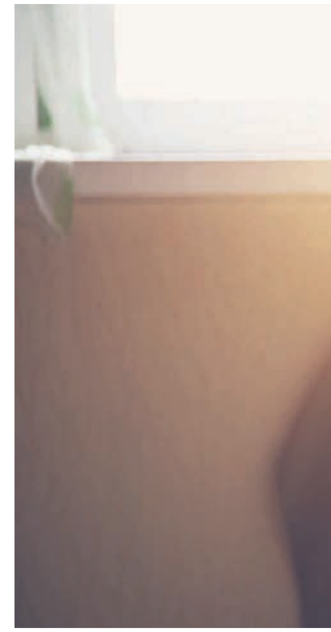
(and tell us what you think!)

Modern device-based therapy processes still contrast heavily with the usual ways of working in neurorehabilitation.



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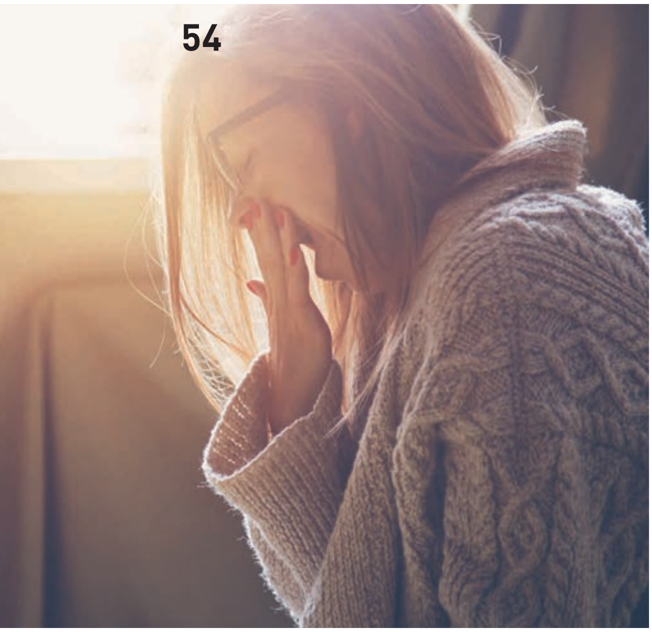

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INTEGRATED SOLUTIONS

Redesigning clinical treatment pathways for a best practice model for modern gait training

Jakob Tiebel, Melanie Grom

What factors are particularly important for successful mobility rehabilitation following a stroke? Which rehabilitation measures have been proven to improve balance, standing and walking ability? What are the most likely strengths and what opportunities will there be for rehabilitation facilities by being more open to change? What are the current weaknesses and what risks need to be avoided?

The restructuring taking place in the German healthcare system over recent years has resulted in increasingly competitive conditions among hospitals and rehabilitation units [4]. A willingness to change is required in order to survive as a competitor against other service providers in the long term. Healthcare reforms have brought about significant changes in management and business administration. This has put many departments under pressure. There is a need for far-reaching restructuring measures, which must at least match the speed and scope of change in environmental factors and framework conditions [29, 34]. Optimisation measures have to be initiated and

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successfully implemented at lightning speed, since – just as in Darwin's theory of evolution – those who will survive in the long term are not the ones who are largest and who defy everything, but the ones who manage to adapt fastest and most effectively to the changing conditions. As a result, those who wish to remain successful will need to change faster in the competitive environment, become more targeted, and develop more sustainably – and those who do not move with the times will be left standing [29].

Neurological symptoms on the rise

After decades of very little change in the healthcare system, in recent years change has become one of the only remaining constants [30]. The structural developments of an ageing society, the increase in chronic diseases and the onward march of medical and technological progress have led to fundamental changes in the requirements of rehabilitation medicine. The shift in the morbidity spectrum towards chronic diseases means that neurological symptoms and syndromes, in particular, are on the increase. The most common treatments are for age-related diseases such as stroke, common illnesses such as polyneuropathy, neurodegenerative diseases including Parkinson's disease and autoimmune diseases such as multiple sclerosis [2, 28, 35]. Stroke in particular is one of the most significant diseases in western industrialised nations. It is one of the most common causes of permanent restrictions to independence and quality of life [15, 27].

According to Darwin's theory of evolution, those who manage to adapt most quickly to changing conditions will prevail in the long term.

Taking into account the additional costs incurred from the loss of productivity, stroke is the disease with the highest burden on the healthcare system [8]. The epidemiological data on strokes and other neurological diseases forms an important basis for planning future care needs and using existing potential for optimisation, since the costs of treatment, rehabilitation and care are an increasing challenge for the healthcare system [15, 35].

Values and value in therapy

Given this background, questions relating to effectiveness and efficiency are becoming increasingly important in order to reduce the consequences of neurological diseases and to achieve the best possible reintegration into daily life, employment and society, whilst keeping costs at a reasonable level [35]. Experts overwhelmingly agree that this requires thorough optimisation in terms of effectiveness, transparency and economic efficiency in order to guarantee high-quality care, despite the tough financial conditions [1].

In particular, the use of quality-assurance evidence-based measures is being discussed as a potential solution [1], whereby it must be noted that the process of quality generation must inevitably be accompanied by a restructuring of context-relevant process flows in order to reconcile "values" and "value", i.e. a focus both on values from a medical and therapeutic point of view and value in the sense of goal-oriented economic activity [31]. In this regard, healthcare facilities generally face more difficulties than, for example, purely business-oriented companies. Healthcare facilities have much more complex characteristics. The organisational structure of rehabilitation departments is usually based around functional units instead of processes, and in patient care, the demand for individuality is still higher than for standardisation. In many departments, especially in the therapeutic disciplines, there is also a lack of focus on business-oriented targets [4].

Paradigm shift thanks to plasticity

With regard to an evidence base, the proof that lifelong plasticity of the nervous system forms the basis of functional motor rehabilitation is one of the decisive catalysts for the paradigm shift in neurorehabilitation. Due to the scientific findings on the ability of the central nervous system to reorganise and the effectiveness of therapeutic interventions, neurology has developed over the last 25 years from a discipline of observation to one of treatment [10]. The implementation of clinical approaches based on evidence and guidelines has become increasingly important. The knowledge of neuroplasticity has cleared the way to use treatment techniques in a targeted manner to favourably influence the restitution of functions after damage to the brain. And so the view of the patient has also changed fundamentally in motor therapy [18]. Traditional treatment methods are increasingly receding [19]. They are being replaced by approaches to treatment that are scientifically investigated, heavily geared to models of learning theory and are far more effective [18, 33].

Differentiated recommendations for therapy

The treatment spectrum has also continued to expand over the last decade due to the use of device-based therapies and modern technologies [7]. In particular, there is good evidence for electromechanical-assisted standing and gait therapy. In December 2015, the guideline of the DGNR for the rehabilitation of mobility after stroke ("ReMoS") was published. In systematic literature research, the working group reviewed more than 1,500 scientific publications and selected around 200 randomised controlled studies and systematic reviews in accordance with the highest quality criteria and incorporated these into the guideline. The use of conventional and electromechanical-assisted gait therapy in particular, as well as the targeted training of strength, endurance and balance with regard to improving standing and walking ability in the different stages following a stroke, were investigated on the basis of the data. Such an intensive and differentiated analysis of available literature had not existed until then. No other guideline provides such clear and differentiated recommendations

According to experts, effectiveness, transparency and efficiency must be optimised in order to ensure continued high-quality care.

Modern device-based therapy processes still contrast heavily with the usual ways of working in neurorehabilitation.

for therapy for patients who are initially unable to walk or whose walking is restricted in the acute, subacute or chronic stage following a stroke [24].

Device-based therapy vs. customised individual treatment

Due to an explicit requirement for the use of electromechanical gait trainers, treadmills and similar, their importance in physiotherapy has increased significantly. However, the possibilities that result from the targeted use of the apparatus are far from exhausted. Even if the devices are available in clinical departments, they are usually used only sporadically in gait therapy. On the one hand, this is due to a lack of integration into the clinical routine and, on the other hand, to the fact that customised treatment is still regarded as the higher-quality form of therapy and is therefore preferred [14]. The modern device-based therapy processes still contrast strongly with the usual ways of working in neurorehabilitation, which still tends to be dominated by manual activities, close contact with the patient and a holistic perspective on the treatment process.

Correct treatment focus?

This is not only a business problem but also a therapeutic one. As important predictors for achieving a positive outcome, in terms of keeping the degree of disability to a minimum following neurological damage, the earliest possible initiation of therapy [6] and the highest possible intensity of therapy is described [20, 23]. A daily treatment duration of up to three hours is recommended, depending on the patient's physical capacity [3]. Studies on the dose-response relationship have shown that providing more therapy time and maximizing active exercise-oriented training time can significantly improve the functional outcome of neurological patients [9, 20]. Therapists are therefore called upon to boost performance with existing resources if the current standard of therapy is not only to be maintained, but even improved, given the same funding base [9]. In clinical practice, however, it has been shown that on average, patients tend to receive too little therapy, are doing physical activity for less than two-thirds of the time within one treatment session, and do not achieve the number of repetitions necessary for changes in neuroplasticity. Whether the focus of treatment is on the frequent repetition of a functional activity depends very much on the setting and the expertise and personal motivation of the treating therapist [16].

Knowledge transfer – a big hurdle

The successful implementation of evidence-based guidelines into clinical practice does not appear to be quite as trivial as commonly thought. In the specialist literature, various strategies for implementation are set out and, in part, the subject of heated debates [11, 12, 13]. In general, a "mixed teaching strategy" is recommended, aimed at ensuring effective knowledge transfer into clinical practice [13]. In this regard, Mehrholz refers to an implementation model by Lomas and Kitson, who propose a "teaching strategy via knowledge transfer" [17, 21]. Under this arrangement, the results from science, research and development are consistently integrated into the therapeutic decision-making processes, with training being given without fail in the practical application [32]. But who is available for these services? It seems that this problem is still not resolved and is largely left to the commitment of individuals.

An efficient approach to modern gait training in Magdeburg

Search for orientation in therapy

Many clinics are still far from meeting the requirements of the theoretical models given in the literature. The therapists involved in the treatment would have to be given much more consistent and effective specialist knowledge. Finally, the paradigm shift has led to a completely altered understanding of the role of therapists [7]. For many therapists, the structural changes in clinical practice and the lack of knowledge transfer are triggering a search for orientation. Habitual, learned approaches in treatment, which were considered correct, are suddenly being called into question, and concerns that in future modern treatment robots might take over differentiated therapeutic work entirely and make specialist therapeutic skills superfluous often lead to “rejection out of self-preservation” [5, 25]. Individualised treatment will continue to be a key component in the therapy strategy. It can only be optimized and supported by the standardization of treatment pathways and the use of technology-based procedures that comply with the guidelines.

Lack of integration has expensive consequences

It can therefore be stated that strategic approaches to the effective integration of guidelines into clinical practice are hardly practised in reality. In addition, therapists still have major reservations about device-based training approaches, although they have been well studied scientifically. Existing devices are usually used only sporadically and lack clear definition. This in turn leads to poor utilisation, which ultimately makes a very expensive investment appear uneconomical.

From evidence to clinical practice – a best practice model

With the THERA-Trainer Complete Solution for Gait Rehabilitation, medica Medizintechnik GmbH has brought a complete device-based concept for neurological rehabilitation onto the market. The company is thus addressing the challenge, faced by many clinics, of offering scientifically established and effective therapies despite the lack of resources, cost pressures and time constraints.

With the multi-phase group therapy concept, which offers the opportunity to train strength, endurance, mobility, balance, standing and walking in a task-oriented manner, using the latest robotics and computer technology, the requirements of the guidelines for the rehabilitation of mobility following a stroke can be consistently implemented in everyday clinical practice.

An individual solution is developed with each customer and is tailored to the current operational reality of the clinic. Through an in-depth analysis of the initial situation and the customised design of the solution, the care processes in gait training are effectively optimised and the utilisation of the training and therapy equipment increased. The Complete Solution is not a substitute for therapists, but instead facilitates and supports their work. In addition, it enables a single therapist to treat several patients at the same time.

An efficient solution approach for modern gait training

With the Complete Solution concept, THERA-Trainer primarily addresses the described organisational and process weaknesses in clinics. With this approach, previously unused economic potential in clinics can be utilised, while at the same time achieving effectively better treatment outcomes. The focus is not on the individual products, but on an optimised therapy process and the full set of devices as a complete solution. The innovation lies in integrating these products intelligently into a high-efficiency setting.

The overall solution facilitates the work of therapists, maximises the likelihood of patient success and systematically establishes current research results into everyday clinical practice. Thus, by restructuring the therapy processes of a clinic and implementing standardised treatment pathways, the therapy frequency can be increased without an over-concentration of resources, in order to achieve the best possible outcome for patients while simultaneously releasing existing economic potential.

Pilot project: effective use through clear processes

An initial pilot project was launched last year in collaboration with one of Germany's largest healthcare providers. The first THERA-Trainer Complete Solution in Germany was installed in the neurological centre at MEDIAN Klinik in Magdeburg. The close cooperation showed that with clearly defined processes, effective use can be achieved, generating high patient motivation and satisfaction. This can be seen as an example for many neurological departments. Prof. Dr. Michael Sailer, Medical Director of MEDIAN Klinik in Magdeburg, confirms that a differentiated use of the complete solution was made possible with professional support. The process of carrying out a preliminary analysis of a department's therapy processes, followed by the creation of new therapeutic pathways, is of vital importance for cost-effective use.

Initial studies show a significant increase in efficiency

The processes in Magdeburg were analysed over an intervention period of three weeks. 27 patients with neurological phases B and C were included in the device-based circuit training after a start-up phase. During the intervention period, on at least two days a week, the patients attended one out of three 90-minute treatment blocks taking place every day. They were asked to do one unit each at

The overall solution facilitates the work of therapists, maximises the likelihood of patient success and systematically establishes current research results into everyday clinical practice.

The development of new technologies and their practical use can significantly increase frequency of therapy for patients and boost training motivation.

three available training stations (standing frame, gait trainer, movement exerciser). In each case, two therapists were responsible for the care of up to six patients per treatment block.

To assess the effective training time, the net times at the three training stations were recorded by the therapists using a computer and a documentation sheet. On average, patients in one treatment block did 25 (± 5) minutes of standing balance training, 21 (± 4) minutes of walking and 16 (± 1) minutes of strength and endurance training on the movement exerciser. Overall, this resulted in a net therapy time averaging 62 (± 3) minutes. Typically, patients spent an additional 15 minutes on low-threshold additional therapy and participant observation as other patients trained on the equipment. The other 13 (± 3) minutes were for the setup times at the individual training stations.

Opportunity for intensive cooperation between the rehabilitation sector and industry

In recent years, especially in the field of neurological rehabilitation, the industry is undergoing an unbroken process of change: The path is leading away from traditional therapeutic treatments to comprehensive evidence-based concepts. Due to the development of new technologies and their practical use, therapy frequency can be significantly increased for the patient and the motivation to train is boosted.

Adapted to individual customer needs, THERA-Trainer develops a standardized treatment process taking into account all interest groups. This is therefore about more than just devices – the process is crucial. Initial studies show a significant increase in efficiency. An unprecedented form of cooperation with the industry has therefore opened up, paving the way for setting new standards. It is now up to clinical departments to seize this opportunity.

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INTEGRATED SOLUTIONS

The gait lab

Innovative gait rehabilitation in neurology

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Problem

In Germany alone, approximately 262,000 people suffer a stroke every year. 70% of patients who have suffered a stroke have considerable restricted mobility and 20% are wheelchair-dependent for life. Mobilising patients with high-grade palsy requires high-frequency and intensive physiotherapy, particularly in the first three to six months.

When it comes to ensuring optimal rehabilitation outcomes in line with the recommended guidelines, gait rehabilitation often falls short against the full round of physiotherapy tasks. Scientifically recommended intensities cannot be achieved with conventional physiotherapy for acquired brain injury. As a well-founded solution, Buschfort et al. developed a gait lab (GL) in 2016. This is a unique therapy system that enables poststroke patients to train in a customised, device-based group setting.

Method

The gait lab consists of four training stations. At the same time, up to five patients train three to five times a week at the different stations and are instructed by two physiotherapists. In combination with conventional physiotherapeutic individual therapy, this makes it possible to increase the therapeutic intensity of gait training by up to 250%. This means that gait rehabilitation meets the requirements as recommended in the ReMoS S2e guideline. Most of the therapy recommendations in the guideline are an integral part of the gait lab design (see table). In addition, a treatment algorithm, in the sense of an electronic exercise catalogue, was derived from this guideline in order to ensure high-quality, effective and evidence-based training for each patient at the appropriate performance level.

The gait lab consists of four training stations.

The first exercise station – a computer-assisted balance trainer – offers patients the chance to do weight shifts and targeted leg training. This device also has a biofeedback function for training with an external focus.

The second element of the concept is a type LYRA gait trainer. This is an end-effector-based device that enables patients to train with partial or complete body weight support. Patients who have not been able to walk independently benefit from repetition and the high number of steps for motor learning. Patients who are unable to walk experience an optimal learning condition with a daily number of 500 steps during a 30-minute training session on the gait trainer.

Treadmill training is the third station in the gait lab. It focuses on developing walking distance and speed, as this is what the guideline recommends as a focal point at this stage of therapy.

The last element is the Easy-Walk-System. Up to four patients can practise the Easy-Walk at the same time. A special belt suspension along an oval track (20 m walking distance) enables gait or balance training in a secure setting.

In physiotherapeutic diagnostics, standardised assessments are used to determine the severity of mobility impairment and to set a goal for therapy in the gait lab.

Patients are allocated to the individual training stations in the gait lab based on the key target and the recommendations of the ReMoS S2e guideline. The patient's training profile, including all exercise modalities, stems from the specially designed electronic exercise catalogue complete with filter function. The exercise catalogue is used for continually shaping therapy content in the gait lab to the underlying evidence and for ensuring consistent therapy quality.

Parameter	Positively evaluated examples	Integral part of the design in GL
Walking ability	Electromechanical-assisted training	✔
	Circuit therapy	✔
Balance	Sitting balance training	–
	Standing balance training	✔
	Circuit therapy	✔
	High-intensity exercise	✔
	Strength and endurance training	✔
	Standing balance training with biofeedback	✔
Distance	Circuit therapy	✔
	Electromechanical-assisted training	✔
	Strength and endurance training	✔
Walking speed	High-intensity exercise	✔
	Treadmill training	✔
	Speed training	✔
	Strength and endurance training	✔

Guideline-based therapy recommendations (Dohle et. al, 2015).

At least one training station in the gait lab corresponds to each performance level on the way to achieving walking ability. Patients develop and enhance basic walking functions in a systematic sequence that "step by step" lead to everyday mobility.

Initial results

A randomised and controlled pilot study presents initial results on the practicability of the gait lab in everyday clinical practice and on the efficacy of walking ability among the study participants. Compared to the control group, the results show significant improvements in the intervention group's walking ability

Given that walking, paired with independence, is a central goal of almost all neurological patients, the gait lab has a high level of acceptance in the therapy process.

In terms of developing basic walking abilities, intensive training in the gait lab shows clear and particularly stable effects, making it a highly attractive solution for users across all phases of neurorehabilitation.

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For more information, please visit
https://www.youtube.com/user/THERAtrainer
THERA-Trainer Complete Solution at NRZ

Device-based circuit therapy in neurological gait rehabilitation

Ann-Kathrin Miller

Initial situation

One of the most important goals in neurological rehabilitation is the recovery and/or improvement of walking ability in most patients [1]. The success of physiotherapy measures within gait rehabilitation is fundamentally associated with a large number of repetitions and high treatment intensity. This is also confirmed in the latest German guideline for rehabilitation of mobility after stroke [2].

But there are two key reasons that make it difficult for service providers to ensure a large number of repetitions. Achieving the specified therapy time and frequency is barely possible in practice. Therapy frequency would have to be increased accordingly while budgets remain the same. In addition, therapists who treat patients with severe neurological damage are exposed to a high level of physical strain during gait training [2]. In order to compensate for this and to ensure patient safety, therapy is sometimes only possible with two therapists per patient. Gait rehabilitation therefore requires a significant level of staffing, and it is both expensive and time-consuming.

If adding device-based circuit therapy to enhance physiotherapy treatment without impacting treatment quality were to succeed in this context, this would benefit patients, the rehabilitation facility and the therapists involved. A new approach is therefore to increase the therapy frequency and intensity using device-based circuit therapy. The therapist is then in a position to look after several patients. This reduces staffing requirements and helps translate therapeutic recommendations into practice. The question remains as to whether device-based circuit therapy in conjunction with slightly reduced individual physiotherapy is effective. There is currently no valid data to support this.

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Methodology

To analyse this question, data was collected at the MEDIAN Klinik NRZ in Magdeburg where treatment using device-based circuit therapy has been provided since 2017. The circuit in Magdeburg consists of two balance trainers, an end-effector gait trainer and four movement exercisers. Training takes place two to three times a week for 90 minutes with two physiotherapists on hand. This means that up to five patients can improve their walking ability using device-based circuit therapy in a group setting.

The sample included 10 patients. Training progress was assessed using the Functional Ambulation Categories (FAC) and the Rivermead Mobility Index (RMI). Both assessments were collected at admission to rehabilitation and at discharge. All patients in the study population were initially unable to walk.

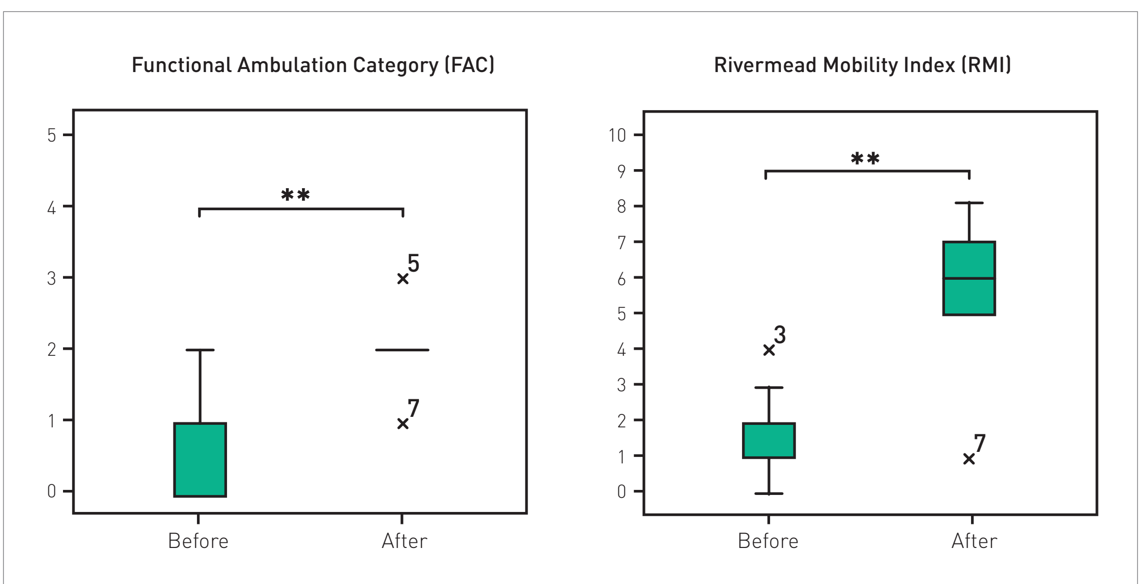
A questionnaire was drawn up to record patient acceptance of device-supported circuit therapy in addition to medical effectiveness. The aim of the questionnaire was to present the subjective patient benefits from this form of therapy. The assumption behind the questionnaire was that patient acceptance comprises a number of aspects. Questions covering the fields of technology, mental state, effectiveness and social interaction were put together and analysed.

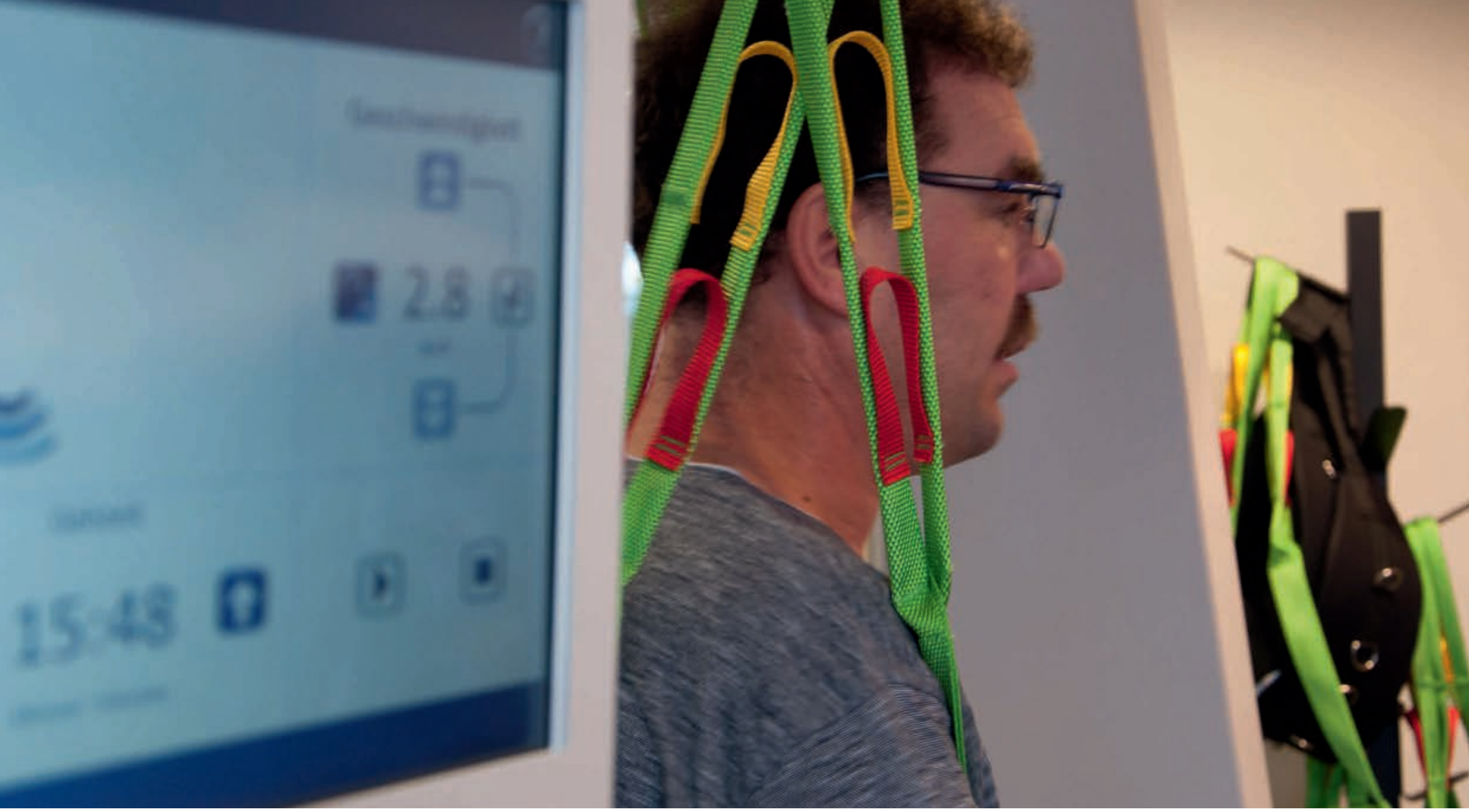
Results

The following figure shows the improvements in FAC and RMI scores among the study population between admission to and discharge from rehabilitation.

An improvement in walking ability based on FAC data was already apparent in this small cohort. All patients improved by at least one category during the study period. At the time of admission, the study population was unable to walk and stand with a median of 0 (this is a statistical mean). With a median of 2 at discharge from rehabilitation, patients who were unable to stand and walk at the start could now walk with human assistance. This mobility improvement is also reflected in the RMI results. The RMI median at admission to rehabilitation was 1 and 5.5 on discharge.

In terms of subjective benefit from the patient perspective, the response distribution confirmed the hypotheses for the fields covering technology, mental state and effectiveness. Taken together, the general opinion is that the circuit devices are safe and stable, and that therapy is fun and helps recover walking ability. What could not be confirmed is the assumption that device-based circuit therapy is motivating through increased social interaction among patients.





In summary, it can be stated that 4 out of 5 hypotheses regarding patient acceptance were evaluated positively. It can be said that the patients in this sample accept device-based circuit therapy as a form of therapy and personally recognise a benefit.

The data collected at MEDIAN Klinik NRZ in Magdeburg has demonstrated that device-based circuit therapy can be effective for patients. Improvement in walking ability was confirmed based on FAC and RMI scores, which means an improved quality of life for the patient. To what extent this result depends on other therapies cannot be conclusively determined. It is clear that the patients get more therapy time with altered therapy management. This makes neurorehabilitation for those affected more physically and mentally demanding. The frequently argued response that group therapy is an inferior form of therapy can now be refuted. Patients benefit from device-based circuit therapy. However, this study can only confirm this for severely affected patients in the subacute phase. Further studies are needed to determine the effectiveness of device-based circuit therapy in chronic patients or in patients who are already able to walk.

LITERATURE

[1] Hesse, S. et al. (2015): Das Lokomotionsstudio: eine effektive und effiziente Lokomotionstherapie in der Gruppe für Patienten der Phasen B, C und D der neurologischen Rehabilitation [The locomotion studio: effective and efficient locomotion therapy in the group for patients in phases B, C and D of neurological rehabilitation], in: Neurologie & Rehabilitation, 4/2015, pp. 195-200.

[2] ReMoS Arbeitsgruppe [working group] (2015): S2e Leitlinie Rehabilitation der Mobilität nach Schlaganfall (ReMoS) [S2e Guideline Rehabilitation of mobility after stroke (ReMoS)]., in: Neurologie & Rehabilitation, 7/2015, pp. 355-494.

Circuit class therapy improves mobility after stroke

Is circuit class therapy more effective than conventional physiotherapy when it comes to improving walking after stroke?

The latest version of the Cochrane Review by Coralie English and colleagues at Newcastle University presents the findings. In the new version of the review, which was first published in 2010, the researchers considered 17 studies involving a total of 1,297 participants and compared circuit class therapy with conventional therapy in stroke patients.

Special care was taken in the course of research to ensure that only high-quality studies with a low risk of flawed results were included in the evaluation.

A large number of these publications reported on the benefit of circuit therapy in terms of the improvement in walking ability after stroke. Statistical analyses provide moderate evidence that circuit class therapy is more effective than conventional forms of therapy in terms of the ability to walk further and faster, and with greater independence. Furthermore, circuit therapy seems to have a positive influence on the balance ability of stroke patients.

DOI: 10.1002/14651858.CD007513.pub3.

A decrease in immobility and an earlier discharge from inpatient rehabilitation could not be clearly demonstrated on the basis of statistical calculations. However, the subgroup study shows that circuit therapy has a positive effect not only in the early phase but also in the late phase after stroke. This confirms the assumptions that patients can make progress after stroke for longer than previously established.

Further research is needed to find out which patients can benefit the most from circuit therapy and which exercises are the most effective. It is a fact, however, that circuit class therapy is an effective alternative to conventional forms of therapy, although it still receives too little attention in everyday clinical practice.

ORIGINAL ARTICLE

English C, Hillier SL, Lynch EA. Circuit class therapy for improving mobility after stroke. Cochrane Database of Systematic Reviews 2017, Issue 6. Art. No.: CD007513.

Circuit therapy in brief (also known as circuit training, circuit class training, circle training or just CT) is a special training method in which different stations are completed one after the other. Circuit therapy targets strength, endurance, mobility and coordination depending on the implementation mode. The stations are set out in a circle. A specific exercise is completed at each station.

Circuit class therapy is task-oriented training carried out in groups. Classes consist of at least 3 patients who are looked after by one therapist (care ratio 3:1). Circuit class therapy is characterised by a succession of different exercise stations arranged in one or more circuits, the composition of which is to help patients achieve a specific training goal, such as standing and walking. It therefore includes specific exercise tasks to achieve everyday goals.

Eric, Max, Lars and Daniel at the Stiftung Deutsche Schlaganfall-Hilfe support group for young people affected by stroke in Duisburg

"With 30,000 people under 55 affected each year, the number of young people affected in Germany is greater than expected"

SCIENCE

Stroke in young people

No cause is the better kind of news

Age is the top risk factor for stroke. But it also affects younger people – only differently.

Dr Lars Kellert, consultant at LMU Munich, has evaluated with other authors numerous studies on stroke in younger people. With 30,000 people under 55 affected each year, the number of young people affected in Germany is greater than expected. Classic risk factors such as diabetes, high blood pressure and lipid metabolism disorders hardly play a role in these cases. According to Kellert, up to 25 percent of juvenile strokes are caused by spontaneous dissections of a cervical artery, which lead to vascular occlusions. Coagulation disorders are another cause.

In up to half of strokes among young people, doctors find no cause despite intensive diagnostics. But Kellert does have one good message for these patients: "If there's no clear cause, the recurrence risk is significantly lower", he explains. But patients need to learn to live with the uncertainty. "But in principle, it's the better kind of news."

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SCIENCE

Come on let's TWIST again

In the first few weeks after stroke, a fairly accurate prediction can be made using the TWIST algorithm to determine whether and how well stroke patients will be able to walk again after six to twelve weeks of rehabilitation. All that's needed is two simple motor tests, which can be carried out by the therapist at the patient's bed.

DOI: 10.1177/1545968317736820

Background

The probability of being able to walk independently again after stroke is vitally important for patients and their relatives. The ability to move independently determines the degree of autonomy in everyday life after rehabilitation and associated with this the necessary steps in planning a patient's discharge from hospital.

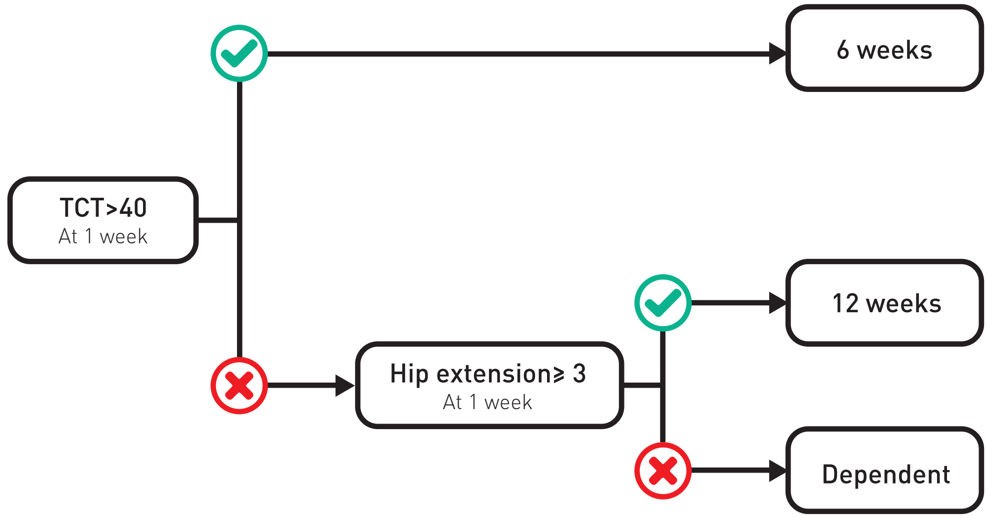
A study published last November by Marie-Claire Smith and colleagues in Neurorehabilitation and Neural Repair investigated possible factors to predict independent walking ability after stroke.

Using an algorithm derived from the study results to predict walking ability, the authors made a significant contribution to planning rehabilitation measures. The possibility of predicting whether and when a patient will be able to walk independently again after stroke helps patients and their relatives to develop realistic expectations regarding the level and duration of possible functional recovery. The prediction supports doctors and therapists in planning multi-disciplinary goals and in anticipating possible consequences for post-inpatient care.

Methods

The study recruited stroke patients unable to walk independently with lower limb weakness (<100 on the Motricity Index Score for the lower limb) within the first three days after an acute stroke event. The researchers used the Functional Ambulation Categories (FAC) to determine walking ability. An FAC score ≥4 was deemed an indicator for independent walking ability. In addition to the FAC, the Trunk Control Test (TCT) was also carried out. The Trunk Control Test is a quick and easy procedure for capturing trunk control in patients with pronounced neurological diseases. The test result can be used in the early phase after stroke to predict how well a patient will recover motor skills and how likely it is that they will be able to walk again. In addition, muscle strength for hip flexion, hip extension, hip

TWIST algorithm



The figure shows the TWIST algorithm. Patients with a TCT score >40 in the first week after stroke are 95% likely to walk independently again after 6 weeks. In patients with a TCT ≤40, it is muscle strength in the hip extensions that is critical for the outcome after 12 weeks. Patients with a muscle strength ≤3 in the first week after stroke can walk independently after 12 weeks. The remaining patients require assistance even after 12 weeks. They are unable to walk independently.

abduction, knee flexion and knee extension, as well as dorsal extension and plantar flexion, was determined using the Medical Research Council (MRC) muscle scale. All assessments were collected within the first week after the acute event.

The test results can be used to make predictions.

Depending on the severity of the disease, about one third of patients underwent additional examinations using transcranial magnetic stimulation (TMS) and magnetic resonance imaging (MRI). Using TMS and MRI, the researchers hoped to be able to capture biomarkers relevant for predicting motor outcomes.

Using a CART analysis (Classification of Regression Tree), the factors (based on the measurement results obtained) were identified with which it is possible to predict whether a patient will achieve independent walking ability within the first 6 to 12 weeks or will continue to need assistance.

Results

A total of 41 patients were recruited and included in the study during the evaluation period. 24 of the 41 patients were female. The average age was 72 years (43 to 96 years). The CART analysis enabled the researchers to develop the "Time to Walking Independently after Stroke (TWIST) algorithm", which, according to the authors, can predict with 95% accuracy the walking ability of stroke patients.

Patients with a TCT score >40 in the first week after stroke are highly likely to be able to walk independently again 6 weeks after the acute event. Patients with a TCT score ≤40 are expected to be able to walk independently after 12 weeks if they have a muscle strength ≥3 in the hip extensions. In contrast, patients with an MRC score <3 in the hip extensions will continue to need assistance with walking after 12 weeks.

The results from the neurophysiological measurements and imaging procedures did not provide any useable results for a more differentiated prediction.

Conclusion

In this exploratory study, the TWIST algorithm was used to predict whether and when stroke patients will achieve independent walking ability. It included the use of simple assessments, which were carried out within the first week after stroke at the patient's bed. According to the authors, more large-scale research will be necessary in the future to develop and validate the algorithm.

Comments

In her study, Marie-Claire Smith and her colleagues tested predictors for the recovery of walking ability after stroke and concluded that a fairly accurate prediction based on easy-to-perform assessments (TCT and determining MRC hip extension scores) is possible. The tests can be carried out within the first week at the patient's bed. The TWIST algorithm derived from the study results can support clinical decision making and predict expected functional recovery.

Jakob Tiebel

ORIGINAL ARTICLE

Smith, Marie-Claire (BHSc), BarberP. Alan, (Phd), Stinear Cathy M. (PhD). The TWIST Algorithm Predicts Time to Walking Independently After Stroke. 2017 Vol 31, Issue 10-11, pp. 955 - 964.

SCIENCE

Electromechanical gait therapy from the physiotherapist's perspective

Neurological rehabilitation has changed enormously in the last 25 years. Evidence-based approaches based on findings relating to neuronal reorganisation and neuronal plasticity are achieving increasing recognition in physiotherapy. Electromechanical approaches are a promising field that has been on the rise in recent years. End-effector-based gait therapy is currently gaining ground in physiotherapy. And what do practitioners think of the new methods?

Jule Maria Sophie Ecke, MSH Medical School Hamburg

DOI: 10.6084/m9.figshare.6016073

Initial situation

The benefits of end-effector-based gait therapy for stroke patients are already documented in the S2e-Guideline “Rehabilitation of mobility after stroke” (2015). When it comes to designing a therapy programme for patients who are initially unable to walk in the subacute stage after stoke, recommendation grade B (“should”) advises the use of end-effector-based gait therapy to improve their walking ability. However, in order to establish meaningful use of end-effector-based gait training in everyday clinical practice, it requires acceptance by the physiotherapists delivering the treatment. After all, it is the physiotherapist who selects the approach for delivering targeted therapy. It is assumed that physiotherapists will choose a new approach to therapy only if they themselves are convinced by it. If a clinic establishes a new therapy device, the physiotherapist must therefore be convinced by this new approach in order to use it expertly in everyday clinical practice.

Methodology

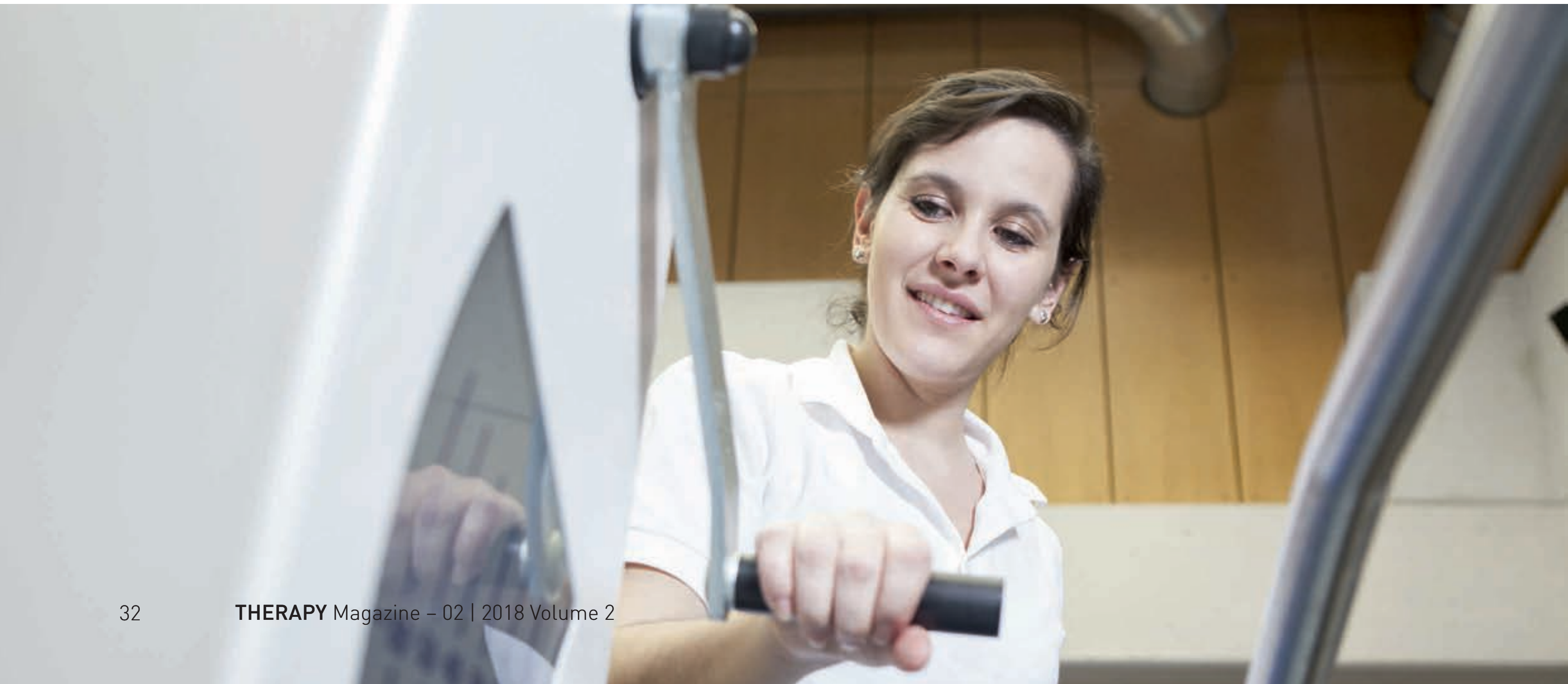
The dissertation investigated the views and opinions of physiotherapists who in the future are expected to work with end-effector-based devices in everyday clinical practice. An evaluation took place of how to ensure successful introduction of devices.

To do this, a survey was carried out at two clinics with 48 physiotherapists. The physiotherapists were asked questions relating to experience, knowledge and views on electromechanical gait training.

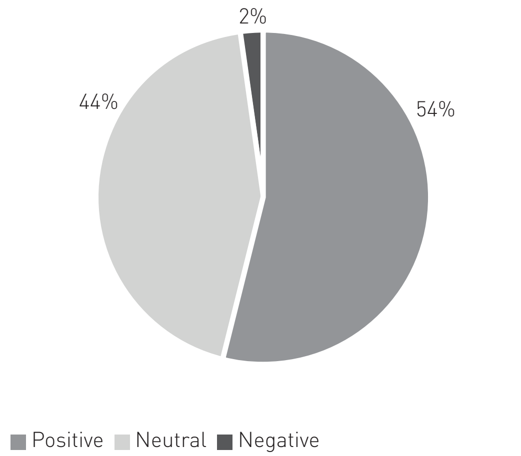
Results

The results of the investigation showed that the physiotherapists so far had little experience and knowledge of the devices. In particular, they emphasised that electromechanical gait therapy is an addition to conventional physiotherapy and will never replace hands-on therapy by a physiotherapist. According to the physiotherapists surveyed, the use of electromechanical gait trainers makes it possible to increase therapy intensity for the patient, while at the same time reducing physical exertion on the physiotherapist. Use of electromechanical devices is not expected to harm physiotherapist-patient contact. The physiotherapists indicate the need for training if these devices are to be introduced and recommend use by an expert team. In general, the physiotherapists surveyed deem electromechanical gait therapy to be in keeping with the times.

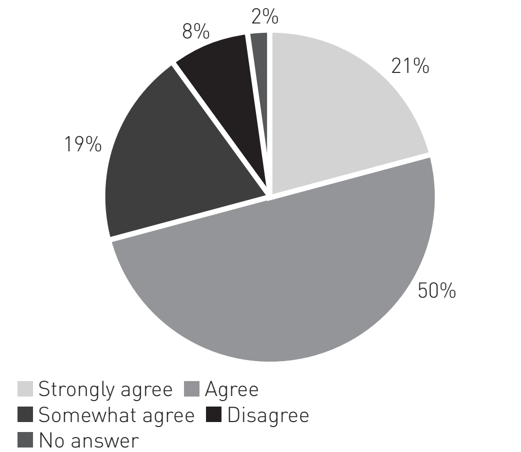
Overall, the physiotherapists surveyed are positive about the introduction of electromechanical devices and view electromechanical gait therapy as a possible complementary approach for inpatient treatment. It was shown that introducing



Views of participants on general device-based therapy



Views of physiotherapists on reduced physical exertion with electromechanical gait therapy



electromechanical gait trainers for the patient can be key in terms of motor learning during therapy, because each therapy session can include a high repetition rate of gait cycles, which activates more plasticity and learning processes in the patient's brain.

The study also demonstrated that a clinic can ensure the quality of its therapy by introducing electromechanical gait trainers. Electromechanical gait therapy should be made available as an additional therapy offer in addition to standard care. A possible side effect for the clinic is a saving on physiotherapists, but this is not the primary aim of introducing electromechanical gait trainers.

Moreover, a therapeutic concept for the introduction of electromechanical gait trainers in everyday clinical practice should be developed. In this therapy concept, electromechanical gait therapy should be listed as an additional and complementary offer, because conventional physiotherapy can be greatly supported with the use of new technologies. In the context of the therapy concept, the individual therapy design for the patient must also be mentioned. It must always depend on whether the patient can use electromechanical gait therapy, because not every patient benefits from this type of therapy. This is where the introduction of an assessment could be helpful when a patient is admitted. This assessment could be developed in further research.

The successful introduction of an electromechanical gait trainer in everyday clinical practice would necessarily require physiotherapists to know about scientifically proven approaches to therapy and they should also be trained in evaluating scientific studies. This is not currently the case with many physiotherapists. Also, only an expert team should perform electromechanical gait training. This too requires physiotherapists to be trained to use the devices. The physiotherapists delivering the treatment should know the possibilities and limitations of the devices so that they can respond accordingly during a patient's course of therapy.

Future research will need to evaluate how all these conditions can be translated into everyday clinical practice. Only in this way can electromechanical gait training by physiotherapists be successfully translated into everyday clinical practice.

"Recent studies reveal that ischemic stroke survivors could experience similar or even greater functional improvements compared to haemorrhagic stroke survivors."

DOI: 10.1371/journal.pone.0178636

SCIENCE

Haemorrhagic vs ischemic strokes

The type of stroke does not influence the outcome of robotic-assisted gait therapy

Frédéric Dierick, Mélanie Dehas, Jean-Luc Isambert,
Soizic Injeyan, Anne-France Bouché, Yannick Bleyenheuft, Sigal Portnoy

Background

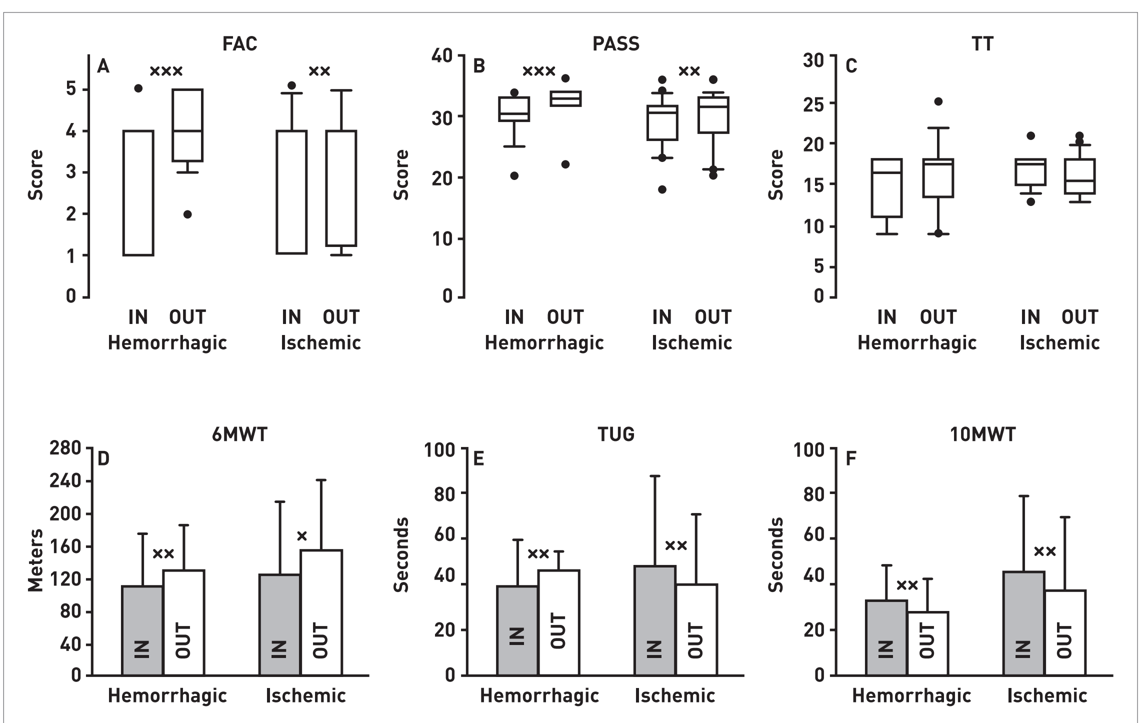
Contrary to the general opinion of many specialists, i.e. that haemorrhagic stroke survivors have better functional prognoses than ischemic stroke survivors, recent studies reveal that ischemic stroke survivors could experience comparable or even greater functional improvements. Until recently, however, there were no findings on the influence of the stroke subtype on gait and posture results after robotic-assisted gait training. Frédéric Dierick from Haute Ecole Louvain en Hainaut, Belgium, and his co-authors have reported on this in an article entitled "Haemorrhagic versus ischemic stroke: Who can best benefit from blended conventional physiotherapy with robotic-assisted gait therapy?"

Objective

In their study, the researchers compared gait and posture results of haemorrhagic and ischemic stroke patients, all of whom received a 4-week treatment programme in which a conventional bottom-up physiotherapy approach was combined with exoskeleton top-down robotic gait training (RAGT).

Methodology

A total of 40 hemiparetic stroke patients were recruited: 20 patients in the state after haemorrhagic stroke and 20 patients in the state after ischemic stroke (see figure on the right). The two study groups were matched with regard to age, gender, side of the hemiparesis, as well as the severity of the stroke and resulting locomotor impairments. Researchers measured functional improvement using the Functional Ambulation Categories, the Tinetti test, the 6-minute walking test, the Timed Up and Go (TUG), and the 10-metre walking test. All assessments were performed at the beginning and after a four-week intervention phase. The functional gains were then calculated and evaluated for all tests (see figure below).



	Hemorrhagic (HG)	Ischemic (IG)	P
Patients, n	20	20	
Age, years	55.9 ± 12.3	56.3 ± 11.2	0.926
Gender, n (male/female)	9/11	9/11	
Side of hemisphere lesion, n (left/right)	12/8	12/8	
Barthel Index (BI)	47.50 (37.5-55.0)	47.50 (37.5-55.0)	
Functional Ambulation Category (FAC)	3.5 (1-4)	2.5 (1-4)	0.782#
Postural Assessment Scale for Stroke (PASS)	30.5 (29-33)	30.5 (26-31)	0.312#
Tinetti POMA (TT)	16.5 (11-18)	17.5 (15-18)	0.130#
6 Minutes Walking Test (6MWT) (m)	110.80 ± 64.2	123.70 ± 90.2	0.938†
Time Up and Go (TUG) Test (s)	39.95 ± 19.6	48.95 ± 38.2	0.675†
10 Meters Walking Test (10MWT) (s)	32.25 ± 16.4	44.85 ± 34.2	0.134†
Locomotor impairments, n (moderate/severe)	7/13	7/13	
Stroke condition, n (subacute/chronic)*	4/16	5/15	0.705
Time since stroke (weeks)	28.7 ± 13	29.4 ± 12	0.853†
Achilles tenotomy, n	8	3	0.077
Triceps surae botulinum toxin injection, n	5	5	

Tinetti POMA: Tinetti Performance Oriented Mobility Assessment.
Data are presented as mean ± SD for age, 6MWT, TUGT and 10MWT.
Data are presented as median (q1-q3) for BI, FAC, PASS, and Tinetti POMA.

* Subacute defined ≤ 3 months after stroke and chronic defined > 3 months after stroke.
† P value derived from paired t test.
# P value derived from Wilcoxon signed rank test.
P value derived from x2 test.

"Patients who are unable to walk after stroke should receive robotic-assisted gait training in a multimodal therapy setting."

Results

Significant improvements were observed in both the haemorrhagic and ischemic groups of stroke patients in the Functional Ambulation Categories (P < 0.001 and P = 0.008), the 6-minute walking test (P = 0.003 and P = 0.015), and the 10-metre walking test (P = 0.001 and P = 0.024). There were also significant improvements in the timed Up and Go test in the group of ischemic stroke patients.

Conclusion

Overall, both groups demonstrated similar functional improvements. This led the authors to conclude in their publication that both groups benefit equally from the gait rehabilitation programme. The use of intensive care plans, which combine top-down physiotherapy and bottom-up robotic approaches, seems promising for poststroke rehabilitation – irrespective of the etiology of the insult.

	Hemorrhagic (HG)					Ischemic (IG)				
	Baseline (IN)	**After (OUT)**	**W/t**	**P**	**dz**	**Baseline (IN)**	**After (OUT)**	**W/t**	**P**	**dz**
FAC	3.5 (1-4)	4 (3.5-5)	120.0	**<0.001**		2.5 (1.4)	4 (1.5-4)	36.0	**0.008**	
PASS	30.5 (29-33)	33.0 832-34)	120.0	**<0.001**		30.5 (26-31)	31.5 /27-33)	89.0	**0.003**	
TT	16.5 (11-18)	17.5 (14-18)	24.0	**0.164**		17.5 (15-18)	15.5 (14-18)	-29.0	**0.160**	
6MWT (m)	110.80 ± 64.2	129.80 ± 53.8	-3.35	**0.003**	0.32	154.10 ± 85.1	154.10 ± 85.1	-2.68	**0.015**	0.35
TUG (s)	39.95 ± 19.6	36.50 ± 17.9	1.53	**0.1433**	0.18	39.90 ± 32.1	39.90 ± 32.1	3.22	**0.005**	0.25
10MWT (s)	32.25 ± 16.4	27.10 ± 15.0	3.77	**0.001**	0.33	36.40 ± 33.0	36.40 ± 33.0	2.45	**0.024**	0.25

FAC: Functional Ambulation Category.
PASS: Postural Assessment Scale for Stroke.
TT: Tinetti Performance Oriented Mobility Assessment.
6MWT: 6 Minutes Walking Test.
TUG: Time Up and Go Test.
10MWT: 10 meters Walking Test.
Significant values are in bold; W value of Wilcoxon signed rank test; t value of paired t-test.
dz: effect size.

	Hemorrhagic	**Ischemic**	**t**	**P**	**dz**
FAC	55.7 ± 37%	26.1 ± 36%	2.46	**0.019**	0.81
PASS	36.5 ± 30%	21.1 ± 22%	1.82	0.077	0.58
TT	9.1 ± 28%	-6.4 ± 18%	2.04	**0.048**	0.66
6MWT	19.05 ± 25.4 m	30.40 ± 50.8 m	0.80	0.377	0.28
TUG	3.45 ± 10.1 s	9.05 ± 12.6 s	2.41	0.129	0.49
10MWT	5.15 ± 6.1 s	8.45 ± 15.4 s	0.79	0.379	0.28

FAC: Functional Ambulation Category
PASS: Postural Assessment Scale for Stroke
TT: Tinetti Performance Oriented Mobility Assessment
6MWT: 6 Minutes Walking Test
TUG: Time Up and Go Test
10MWT: 10 Meters Walking Test
Significant values are in bold; t value of unpaired t-test
dz: effect size

Rather, it seems to be the functional deficits that determine the outcome of rehabilitation after stroke.

Comments

Patients who are unable to walk after stroke, whatever the cause of their illness, should receive robotic-assisted gait training in a multimodal therapy setting. The use of a gait trainer can minimise the risk of a gait disorder, and even prevent persistent impaired mobility.

Jakob Tiebel

ORIGINAL ARTICLE

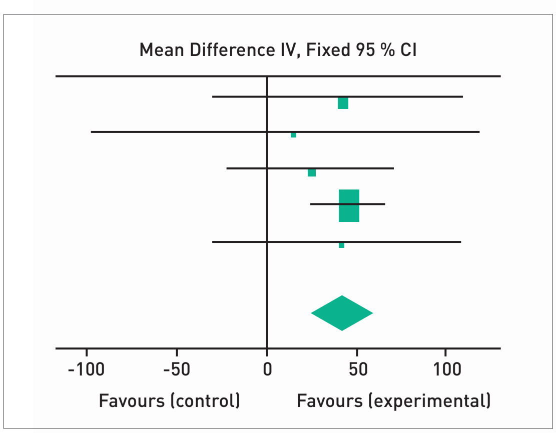
Dierick F, Dehas M, Isambert J-L, Injeyan S, Bouché A-F, Bleyenheuft Y et al. (2017) Hemorrhagic versus ischemic stroke: Who can best benefit from blended conventional physiotherapy with robotic-assisted gait therapy? PLoS ONE 12(6): e0178636.

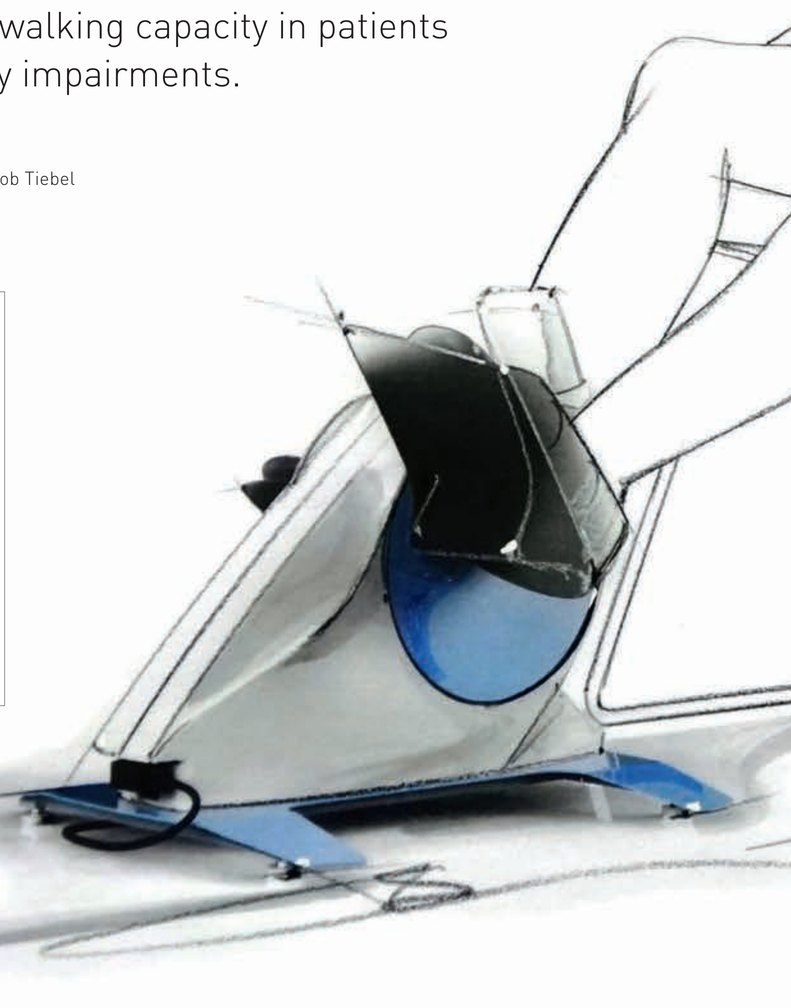
SCIENCE

Cycling for walking after stroke

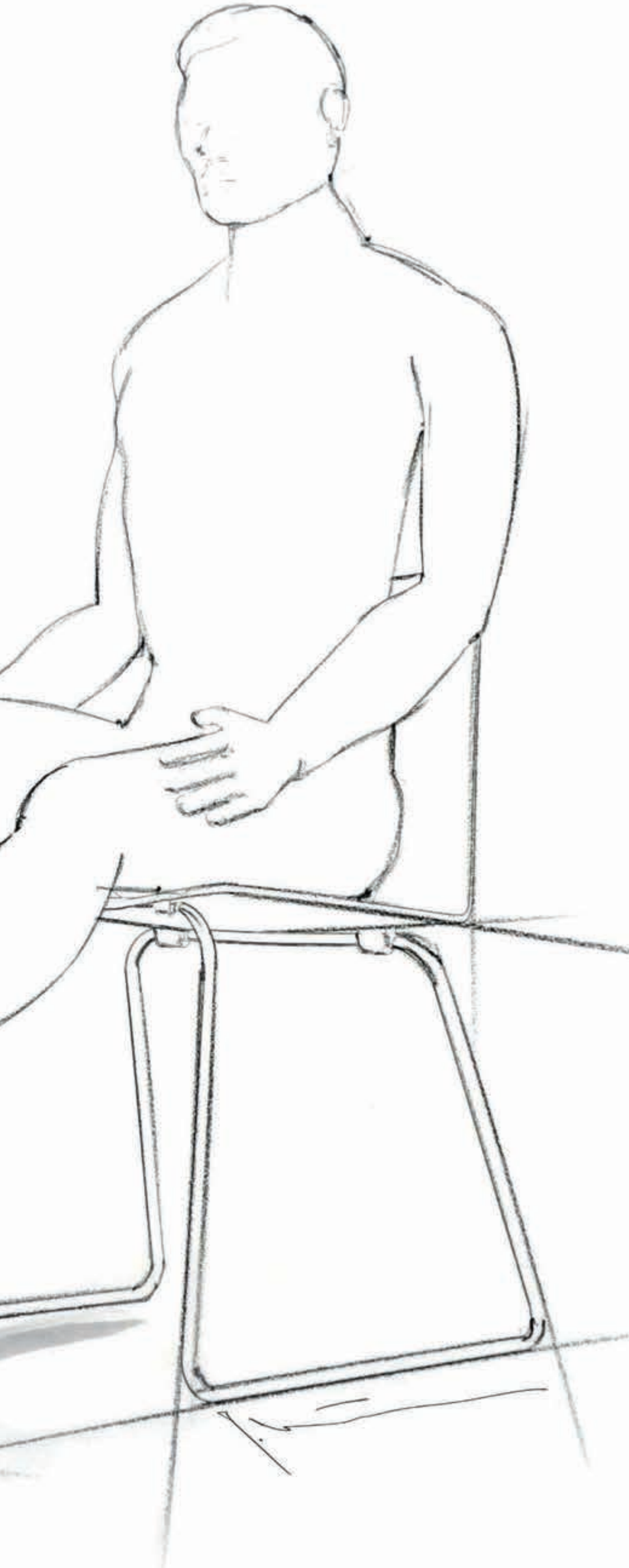
Aim of this rapid meta analysis was to find out, whether additional lower limb cyclic movement therapy has an effect on walking capacity in patients with mobility impairments.

Jakob Tiebel





DOI: 10.6084/m9.figshare.6016043



Abstract

Background: Regaining the ability to walk is a very important goal for people with mobility impairments. For this reason, recovery of walking capacity is a major objective in the rehabilitation of patients with motor impairments of the lower extremities. Because of similarities with walking, cycling leg exercise might be a beneficial motor function rehabilitation method in sense of an add-on therapy intervention next to intensive task oriented walking practice.

Objectives: To examine potential benefits of a lower limb cyclic movement therapy on walking capacity in patients with mobility impairments.

Methods: Relevant publications were identified by searching the electronic databases PubMed, EMBASE and PEDro. Selection criteria: (1) study sample analysed consisted exclusively of patients with mobility impairments aged 18 years or over; (2) study was designed as an CT or RCT (3) the experimental intervention delivered fitted the domain of lower limb cyclic movement therapy with the aim to improve walking capacity; (4) comparator was usual care, another intervention, the same intervention with a different dose, or no intervention; (5) outcomes were measured post intervention and belonged to the domain of walking capacity (6) full-text publication was written in English or in German.

Analysis: The outcomes had to be measured post intervention and belonged to the domain of walking capacity.

Results: Walking capacity (metres walked in six minutes) was measured at study end. The pooled mean difference (fixed-effects model) for walking capacity was 41.71 metres walked in six minutes (95%CI -23.86 to 59.56; P = <0.00001; level of heterogeneity $I^2 = 0\%$).

Discussion: In this meta-analysis we included 5 trials with a total number of 161 participants and found evidence that the use of a cyclic movement trainer device may be a beneficial adjunct to physiotherapy in rehabilitation settings to improve walking capacity in patients with mobility impairments.

	Experimental			Control				Mean Difference	
Study or Subgroup	**Mean**	**SD**	**Total**	**Mean**	**SD**	**Total**	**Weight**	**IV, Fixed, 95 % CI**	**Year**
Kamps	237.8	115.7	16	195.3	88.3	15	6.1 %	42.50 [-29.69, 114.69]	2005
Lee	261.5	162.7	12	247.2	148.8	12	2.0 %	14.30 [-110.45, 139.05]	2008
Diehl	284.7	70.2	15	259.9	60.6	15	14.5 %	24.80 [-22.13, 71.73]	2008
Tang	334.2	33.1	23	288.4	38.9	22	71.3 %	45.80 [24.65, 66.95]	2009
Dobke	237.8	115.7	16	195.3	88.3	15	6.1 %	42.50 [-29.69, 114.69]	2010
Total (95 % CI)			**82**			**79**	**100.0 %**	**41.71 [23.86, 59.56]**	

Heterogeneity: Chi2 = 0.83, df = 4 (P = 0.93); I2 = 0%

Test for overall effect: Z = 4.58 (P < 0.00001)

Background

Regaining the ability to walk is a very important goal for people with mobility impairments. Especially a reduced walking capacity often results in dependency of others in activities of daily living. For this reason, recovery of walking capacity is a major objective in the rehabilitation of patients with motor impairments of the lower extremities [1].

It's a high intensity of practice that proves to be an important aspect of effective therapy interventions in this context. Research findings suggest, that intensity is a key factor of meaningful training interventions. The more practice is better and the intensive more is even the best [10].

A difficulty is, that patients often are not able to perform specific exercise for rehabilitation of walking in sufficiently high intensity. On the one hand patients do not receive enough therapy in total and on the other hand patient's muscle force often is too weak. A reduced aerobic endurance affects the performance in task practice. Therefore, there is a demand for additional rehabilitation methods oriented on the recovery of strength and endurance, which positively influence walking capacity [1, 2, 3].

Because of similarities with walking, cycling leg exercise might be a beneficial motor function rehabilitation method in sense of an add-on therapy intervention next to intensive task oriented walking practice [1, 8].

Objective

The aim of this meta-analysis is to examine potential benefits of a lower limb cyclic movement therapy on walking capacity in patients with mobility impairments.

Methods

Relevant publications were identified by searching the electronic databases PubMed (last searched December 2017), EMBASE (last searched November 2017) and the Physiotherapy Evidence Database (PEDro, last searched December 2017).

The databases were searched by indexing terms and free-text terms used with synonyms and related terms in the title or abstract. We searched for "cyclic" and "movement therapy", and "cycling" or "pedalling" and "exercise", and "assistive" and "movement therapy".

Additional searches were performed, based on initial findings; we manually searched relevant literature, checked reference lists and compared the results of our search with references from other relevant studies and reviews we found.

Studies were included if they met the following inclusion criteria: (1) the study sample analysed consisted exclusively of patients with mobility impairments aged 18 years or over; (2) the study was designed as an CT or RCT including those with a two-group parallel, multi-arm parallel, crossover or cluster design and with a level of evidence IIb or higher; (3) the experimental intervention delivered fitted the domain of lower limb cyclic movement therapy with the aim to improve walking capacity; (4) the comparator was usual care, another intervention, the same intervention with a different dose, or no intervention; (5) the outcomes were measured post intervention and belonged to the domain of walking capacity (6) the full-text publication was written in English or in German.

To classify the outcome measures we used the ICF Framework into the following domain: walking [d450] (distance, independence, falls).

A review protocol was not published before. An ethics statement was not required for this work.

Analysis

Meta-analysis were performed if at least two trails with comparable outcomes were identified. Based on post intervention outcomes (Means and SDs), the individual effect sizes with their 95% confidence intervals (CI) were calculated.

The I-Square statistic was used to determine statistical consistency (between-study variation). An I-Square of 50.0% was considered to reflect substantial heterogeneity and in that case a random-effects model was applied, while a fixed-effect model was applied in case of statistical homogeneity.

A significant positive effect indicates that the experimental intervention is beneficial for patients, compared to the comparator. A significant negative effect indicates that the intervention has unfavourable effects for patients, compared to the comparator.

Results

In this meta-analysis we included 5 trails with a total of 161 participants [4, 5, 6, 7, 9].

Walking capacity (meters walked in six minutes) was measured at study end. The pooled mean difference (fixed- effects model) for walking capacity was 41.71 meters walked in six minutes (95%CI -23.86 to 59.56; P = <0.00001; level of heterogeneity I^2 = 0%) (Analysis 1).

Discussion

The aim of this meta-analysis was to evaluate the effects of a lower limb cyclic movement therapy on walking capacity in patients with mobility impairments.

In this meta-analysis we included 5 trials with a total number of 161 participants and found evidence that the use of a cyclic movement trainer may be a beneficial adjunct to physiotherapy in rehabilitation settings to improve walking capacity in patients with mobility impairments.

Implications

This meta-analysis provides evidence that the use of cyclic movement trainer therapy in combination with physiotherapy increases walking capacity in people with mobility impairments.

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Pilot study at REHAB Basel

Influence of device-supported end-effector therapy on the walking ability of patients with incomplete paraplegia compared to conventional gait therapy

Melanie Grom

Introduction

Gait rehabilitation plays an important role in restoring the ability of patients with incomplete paraplegia to stand and walk. REHAB Basel, a clinic for neurorehabilitation and paraplegiology, has been using the THERA-Trainer lyra intensively since 2015 to treat and improve patient walking ability. REHAB Basel is increasingly using the end-effector gait trainer as part of a training concept in combination with other devices, particularly for inpatient therapy. In 2016, patients completed almost 500 training sessions.

Study structure and methodology

In a pilot study at REHAB Basel, the effects of device-supported end-effector therapy on patients with incomplete paraplegia are currently being investigated and compared to the outcomes of conventional rehabilitation methods. The physiotherapy department has been using a THERA-Trainer lyra for this since January 2017. It is assumed that both forms of therapy lead to an improvement in walking ability and the aids needed, with device-based therapy expected to have greater success in improving walking speed. Another important point of the study is the evaluation of the feasibility of systematic gait training in a clinical setting.

Representative results of the study are expected by September 2018.

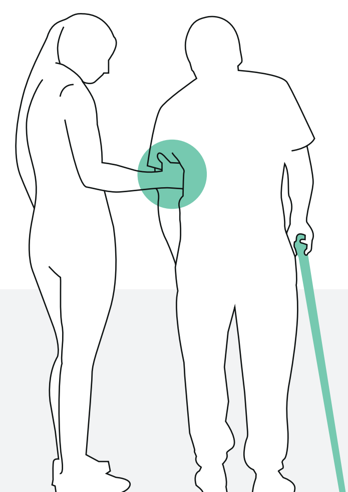
DOI: 10.6084/m9.figshare.6016076


546
10:29

Down with setup times!

Therapy begins when
the patient is actively training!

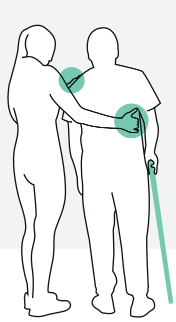
Jakob Tiebel



For more information, please visit
https://www.youtube.com/user/THERAtrainer
THERA-Trainer lyra – the revolutionary gait trainer for physiotherapists

In short – Functional Ambulation Categories (FAC) provide information about how much support a patient needs when walking

FAC0 – The patient cannot walk or needs the assistance of two or more people.
The walking distance – if walking is indeed realistic – is clearly and visibly less than 15 metres.



FAC1 – The patient relies on continuous support of a person who helps to bear the weight and to maintain balance.
An assistant provides support the whole time. This can be illustrated by a video recording, for example. Body contact is clearly visible at least once. The assistant clearly prevents the patient from falling. The assistant's hand can be clearly seen supporting the leg or helping to bear the weight.

FAC2 – The patient relies on continuous or intermittent assistance of a person for support with balance and coordination.
No upper body contact or any support of body weight can be seen from the assistant. The assistant or physiotherapist places their hand or foot at least once on the patient's leg. The assistant uses only hand contact to guard the patient.

DOI: 10.6084/m9.figshare.6016079

Background

Locomotion therapy is a key element of poststroke mobility rehabilitation. Intensive task-based gait training using an electromechanical gait trainer, such as the THERA-Trainer lyra, is at the forefront for patients unable to walk in the subacute phase. Electromechanical-assisted gait therapy has developed steadily over the past 20 years and is well documented.

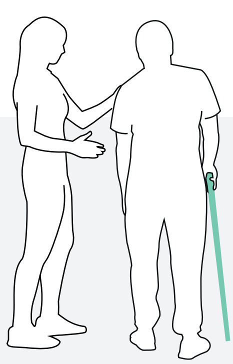
Despite a largely similar structure and functional principle to the gait trainer systems available on the market, they are not directly comparable. For example, the technical complexity and the underlying operating concept determine the initial effort required for setup and transfer. Here, the use of modern gait robots is often both a curse and a blessing: against the backdrop of scarce resources and an average therapy time of around 30 minutes per gait therapy session, preparation and follow-up should be as fast as possible so that patients can practise as many steps as possible. That is, after all, the main objective. According to current recommendations, patients who are unable to walk should complete 800 to 1,000 steps per day. At least 20 minutes of active training time should be available for this purpose.

Objective

The THERA-Trainer lyra comes with a very simple operating concept and short setup times, in line with its basic principle of being simple, effective and affordable. The aim of this task was to quantify this product promise as part of post-market clinical follow-up surveillance.

Methodology and approach

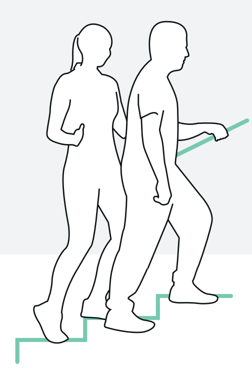
In order to measure the mean setup times before and after a gait trainer session, the set-up times of a total of 33 sessions were recorded and evaluated in several neurological rehabilitation facilities in Germany in 2017.



FAC3 - The patient relies on verbal support or assistance from one person, but direct physical help is not required.
The assistant or physiotherapist does not make any hand or foot contact with the patient's leg. No "hand contact" of any kind to guard the patient is allowed. But hands can be on standby.

FAC4 - The patient walks independently on level surfaces with minimal help in the case of stairs or on difficult ground or surfaces, for example.
There is no identifiable contact or readiness by the assistant to intervene. It is possible for the patient to turn or rotate without assistance. On stairs and outdoors, however, walking is only possible with an assistant.

FAC5 – The patient can walk independently in all contexts.
This includes stairs and outdoor walking without an assistant.



The setup procedures were firstly standardised: 1) set up the safety belt; 2) place the patient in the lift system; 3) secure the feet in the foot plates; 4) lift the patient; 5) set body weight support; 6) set step length.

Depending on the patient's degree of mobility, it was possible to set up the safety belt either for sitting or standing. This decision was made by the physiotherapist. Time recording always started at safety belt setup and ended at start of training.

After training, the patient was transferred from the gait trainer back to the wheelchair (the process described above in reverse). Here, time recording started when training stopped and ended when the patient was out of the safety belt.

Assessments

Functional Ambulation Categories (FAC) were used to determine the patient's walking ability. The FACs are six different categories (0 to 5) that differentiate how much assistance a patient needs for walking, irrespective of the aids used. Category 0 refers to a patient who is completely unable to walk and category 5 refers to a patient who can independently handle all paths in the clinic, including stairs.

In addition to the FACs, the starting position (SP) was also documented for the subgroup analysis of the safety belt setup (subgroup: SP Sitting and SP Standing).

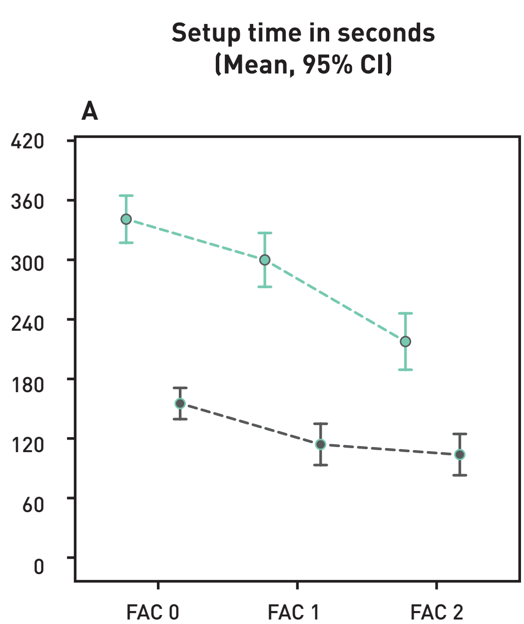


Figure A shows the mean setup times with their confidence intervals (Whisker) in the FAC groups (green before therapy, grey after therapy).

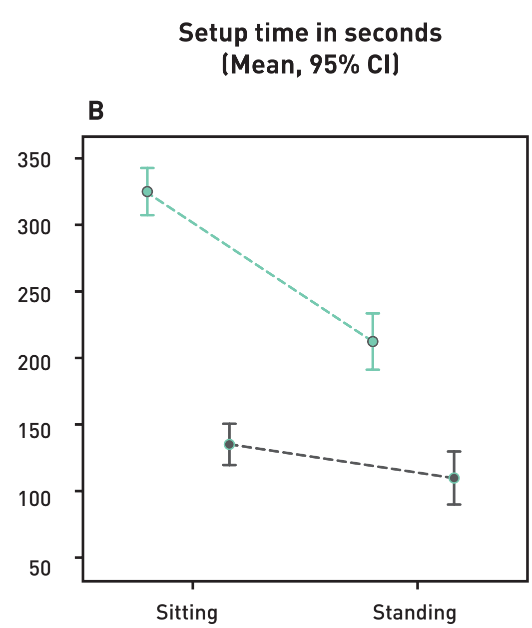


Figure B shows the mean setup times with their confidence intervals (Whisker), sub-grouped according to SP at safety belt setup (green before therapy, and grey after therapy).

Setup time after training

Subgroup	N	Subgroup	M		SE		CI 95 %		Min		Max	
			Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.	Sec.	Min.
Overall	33		283	04:43	12	00:12	260 - 306	04:20 - 05:07	162	02:42	398	06:38
FAC	11	FAC 0	340	05:40	11	00:11	317 - 363	05:17 - 06:03	287	04:47	398	06:38
	10	FAC 1	300	05:00	13	00:13	271 - 392	04:31 - 05:29	256	04:16	379	06:19
	12	FAC 2	217	03:37	13	00:13	188 - 246	03:08 - 04:06	162	02:42	323	05:23
ASTE	21	Sitting	325	05:25	8	00:08	307 - 342	05:07 - 05:42	269	04:29	398	06:38
	12	Standing	211	03:31	10	00:10	190 - 232	03:10 - 03:52	162	02:42	269	04:29

Setup time after training

Subgroup	N	Subgroup	M		SE		CI 95 %		Min		Max	
			Sec	Min	Sec	Min	Sec	Min	Sec	Min	Sec	Min
Overall	33		124	02:04	6	00:06	111 - 137	01:51 - 02:17	53	00:53	192	03:12
FAC	11	FAC 0	155	02:35	7	00:07	139 - 171	02:19 - 02:51	111	01:51	192	03:12
	10	FAC 1	114	01:54	9	00:09	94 - 134	01:34 - 02:14	69	01:09	170	02:50
	12	FAC 2	104	01:44	10	00:10	82 - 125	01:22 - 02:05	53	00:53	174	02:54
ASTE	21	Sitting	133	02:13	8	00:08	116 - 150	01:56 - 02:30	64	01:04	192	03:12
	12	Standing	108	01:48	8	00:08	89 - 128	01:29 - 02:08	53	00:53	174	02:54

The table shows the mean values of all measured setup times before and after therapy, including the subgroup analyses by FAC and SP at safety belt setup. (Sec = seconds; Min = minutes; M = mean; SE = standard error of the mean; CI = confidence interval; min = smallest measured value; max = largest measured value)

Patients

Patients were recruited on the basis of the severity of mobility impairment and independently of the etiology of the underlying disease.

The inclusion criteria required patients to have an underlying neurological disease and be aged 18 to 79 years. Patients had to be able to sit with their feet on the ground but not be able to walk independently: either not at all (FAC-0), with the help of two physiotherapists (FAC-1) or with the help of one physiotherapist (FAC-2). In addition, all patients had to have previously completed at least three training sessions.

The exclusion criteria were: acute confusion, acute medical need for treatment, subjective indication of circulatory overload in the assisted standing test, activated arthrosis of the large leg joints, severe spasticity of the large leg joints with an extension deficit for knee and hip > 30°, open areas in the area of padding or belt supports.

Every effort was made to include all eligible patients in the study period. The inclusion of at least 30 patients was planned – at least 10 patients in each subgroup of FAC 0-2.

Therapists

All therapists included in the study had to be familiar with the settings and setup procedures, and be able to demonstrate routines in handling the gait trainer.

During measurements, only one therapist was allowed to assist the patient. A maximum of three patient run-throughs were documented per therapist.

Statistics

The mean values, standard errors and 95% confidence intervals of all measurement results were firstly determined. There was also a subgroup analysis, categorised by FAC and SP.

As a preliminary test for inferential statistical analysis, the data was checked for normal distribution with the Shapiro-Wilk test and Kolmogorov-Smirnov test at the selected significance level of $\alpha = 5\%$ ($p = 0.05$). The empirical distribution of the measurement results did not differ significantly from a normal distribution (Shapiro-Wilk: z= .959, .971; p = .242, .508; df = 33 and Kolmogorow-Smirnow: z = .094, .104; p = .200; df = 33). Both tests confirmed the assumption of a normal distribution. Assuming the null hypothesis, the mean values and standard errors of the subdomains could be examined for significant differences using a t-test for independent samples. Here, too, $\alpha = 5\%$ ($p = 0.05$) was defined as the significance level.

The statistical evaluation of the data was carried out with statistics program SPSS® Statistics for Macintosh, version 24.00.00.

Results

A total of 33 patients were recruited during the study period, 11 of whom were assigned to subgroup “FAC 0”, 10 to subgroup “FAC 1” and 12 to subgroup “FAC 2”. 21 of the 33 patients had the safety belt set up in the sitting position. For the remaining 12 patients, the therapist was able to set up the safety belt in the standing position.

The mean setup time before therapy was 4.43 minutes (CI 95 % 4.20 – 5.07 min) and after therapy 2.04 minutes (CI 95 % 1.51 – 2.17 min).

The mean setup time before therapy for patients in patient group “FAC 0” was 5.40 minutes (CI 95 % 5.17 – 6.03 min), in group “FAC 1” 5.00 minutes (CI 95 % 4.31 – 5.29 min), and in group “FAC 2” 3.37 minutes (CI 95 % 3.08 – 4.06 min). The mean setup time after therapy in patient group “FAC 0” was 2.35 minutes (CI 95 % 2.19 – 2.51 min), in group “FAC 1” 1.54 minutes (CI 95 % 1.34 – 2.14 min), and in group “FAC 2” 1.44 minutes (CI 95 % 1.22 – 2.05 min).

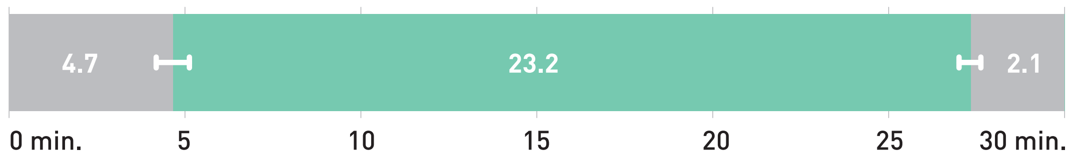
Mean Differences in setup time before training

Analysis	MD		SED		t	p
	Sec	Min	Sec	Min		
FAC 0 - FAC 1	-40	-00:40	-17	-00:17	2,404	0,027
FAC 1 - FAC 2	-83	-01:23	-19	-00:19	4,433	0,001
Sitting-Standing	-114	-01:54	-13	-00:13	8,589	0,001

Mean Differences in setup time after training

Analysis	MD		SED		t	p
	Sec	Min	Sec	Min		
FAC 0 - FAC 1	-41	-00:41	-11	-00:11	3,624	0,002
FAC 1 - FAC 2	-10	-00:10	-13	-00:13	0,761	0,455
Sitting-Standing	-25	-00:25	-13	-00:13	1,954	0,060

The figure shows the mean differences and standard errors in the FAC groups and SP Sitting/Standing groups. (Sec = seconds; Min = minutes; MD = mean difference; SED = standard error of the mean; t = t-value; p = p-value (< 0.05).



The figure shows the setup times before and after therapy (in grey) with their confidence intervals (Whisker) and the remaining time for active training (in green), based on a total therapy time of 30 minutes.

The setup time in the "SP Sitting" group before therapy was 5.25 minutes on average (CI 95 % 5.07 – 5.42 min) and after therapy 2.13 minutes (CI 95 % 1.56 – 2.30 min). The setup time in the "SP Standing" group before therapy was 3.31 minutes on average (CI 95 % 3.10 – 3.52 min) and after therapy 1.48 minutes (CI 95 % 1.29 – 2.08 min).

In the "FAC 1" group, the setup time before therapy was 0.40 minutes (SD 0.17 min; $p = .027$) shorter than the "FAC 0" group, and in the "FAC 2" group it was 1.23 minutes (SD 0.19 min; $p = 0.001$) shorter than the "FAC 1" group.

After therapy, the average setup time in the "FAC 1" group was 0.41 minutes (SD 0.11 min; $p = 0.002$) shorter than the "FAC 2" group, and the "FAC 2" group 0.10 minutes (SD 0.13 min; $p = .455$) shorter than the "FAC 1" group.

The setup time in the "SP Standing" group was on average 1.54 minutes (SD 0.13 min; $p = .001$) shorter before therapy and 0.25 minutes (SD 0.13 min; $p = .06$) shorter after therapy compared to the "SP Sitting" group.

Discussion

The aim of the study was to collect average setup times using the THERA-Trainer lyra as part of locomotion therapy. The results of the study show that the time required for set up and transfer is about 7 minutes on average. Based on the assumption that a gait trainer session takes an average of 30 minutes, this leaves about 23 minutes for active training in the device.

The setup time, particularly before therapy, reduces as the patient's mobility score increases. The starting position when setting up the safety belt appears to have a particularly big impact here. Setting up the belt in the standing position reduces the setup time by about one third. This coincides with the results of qualitative surveys. Therapists confirm that setting up the safety belt in the standing position is simpler and clearly saves time.

Implications for clinical practice

Depending on their motor skills, patients should be actively involved in preparing and following up electromechanical gait therapy. This will create the opportunity to reduce setup times in order to generate more time for active training in the device.

In the case of an average gait training session of 30 minutes using the lyra, approximately 23 minutes are left for active training in the device.

The safety belt should be set up in the standing position, wherever possible, because this can save the most time. Waiting times when directly changing from one patient to the next can be compensated, for example, by using several belt systems and an overlapping schedule.

Robotic-assisted vs conventional gait training in Parkinson’s disease

A. Schmitt, B. Rall, I. Haase, J. Durner, H. Schreiber

Background

Gait disturbance is one of the most important handicaps in everyday life of patients with idiopathic Parkinson’s disease (IPD) and therefore in the focus of activating therapies. The aim of this study was to compare the efficacy of gait training using a newly developed gait robot (THERA-Trainer e-go) with conventional gait training of the same inten- sity and frequency with respect to various representative spatio-temporal gait parameters, general motor skills and quality of life in patients with advanced IPD.

Methods

Sixty-six patients between 52 and 86 years of age with moderate to advanced IPD (Hoehn and Yahr, stages 3 and 4) were randomized en bloc to an intervention group and a control group according to age, sex, and disease stage. All patients received 15 treatment units of 30 minutes duration each for three consecutive weeks. Out of 52 evaluable patients, 23 patients received gait training with the THERA trainer e-go, and 29 patients had conventional gait training with a physiotherapist. The patients were examined prior to and after the special therapy phase. Primary outcome variables were the summary score of the Unified Parkinson’s Disease Rating Scale (UPDRS), part III, and the time needed for the 10 meter walk test (10-MWT). Secondary outcome variables were the Parkinson’s Disease Questionnaire (PDQ-39), a variation of the 10-MWT, where the patient walks 3 meters, turns around and walks back, the modified Romberg test, the slalom parcours, the functional reach test, the timed “up & go” test and the tandem walk.

Results

Both gait training with the "THERA trainer e-go" and conventional gait training resulted in clinically relevant and statistically significant improvements in the primary outcome variables: UPDRS –16.61 vs. –16.41 points (each $p < 0.001$)), 10-MWT + 0.14 m/s vs. + 0.17 m/s (each $p < 0.05$). No statistically significant differences were found between the treatment regimens. With respect to secondary outcome variables, patients in the "THERA-Trainer e-go" group had improvements in 5 of 7 subtests, i. e., clearly more than patients with conventional gait training.

Conclusion

The study shows that robot-assisted gait training is a promising new tool in neurological rehabilitation in patients with IPD for improving their general motor function, various spatio-temporal gait parameters and disease-related quality of life. Thus, it represents a supplement to the cur- rent therapeutic spectrum, especially in advanced Parkinson's syndromes.

Keywords

neurodegeneration, idiopathic Parkinson's disease, gait training, gait robot, locomotion, activating therapies

ORIGINAL WORK

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Part 2

Fatigue, Uhthoff's phenomenon and spasticity in multiple sclerosis

THERAPY & PRACTICE

Motor therapy for multiple sclerosis

The first part of the expert report by physiotherapist and neurorehabilitation expert Sabine Lamprecht deals with paresis in multiple sclerosis (MS), while the second part deals primarily with fatigue and Uhthoff's phenomenon, as well as therapy for spasticity in MS.

Sabine Lamprecht

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"Fatigue is unexplained tiredness that affects more than 80% of patients in various ways."

Review

Paresis and MS

Paresis is functionally the most debilitating symptom for people with MS. In combination with exertional motor fatigue and the Uhthoff phenomenon, it is the cause of a widespread error in treatment: exertion is often avoided – and carefully handled if activity is urgently needed. However, rest often means a steady decline in functions for those affected by MS. Training can restore functions that were thought to be lost and lead to amazing functional improvements in terms of strength, endurance and balance. [5] Exertion does not trigger relapses – a temporary worsening of symptoms is an indication of the MS-specific pathophysiology and not a reason to cut down on regular training.

Walking is one of the most basic activities of daily life. The most important qualities of walking are endurance and speed. While targeted interval training improves endurance in MS patients, speed training should be specifically carried out on the treadmill (but without body weight support). If there is no treadmill, patients should repeatedly walk short distances as fast as possible. If there is a gait trainer available, such as the THERA-Trainer e-go, this can be used for training in walking up to the tolerance limit in a fall-safe environment.

In addition, equipment such as dorsal flexors should be used at an early stage, in which it is important that they also support the free leg phase. Dorsal flexors with electrostimulation (FES) can effectively help MS patients. Effective gait rehabilitation also includes targeted training of the affected muscles and targeted balance training.

Fatigue – unexplained tiredness

Besides paresis and spasticity, fatigue is one of the main motor symptoms of MS. Fatigue is unexplained tiredness that affects more than 80% of patients in various ways. However, the precise definition of fatigue and how it is tested is a controversial topic.

It is clear that fatigue can be differentiated into cognitive and motor fatigue:

- Cognitive fatigue manifests itself in reduced concentration, attention and alertness. In 2012, Claros-Salinas demonstrated that there is a link between physical and mental exhaustion [2].

- Motor fatigue can be objectively defined as a reduction in motor endurance.

To assess fatigue, the German Multiple Sclerosis Society in Baden-Württemberg (AMSEL) listed a Fatigue Severity Scale (FSS) in its fatigue manager. The scale consists of nine items or statements for patient self-assessment. Another way to assess fatigue is the WeiMUS test (Würzburg Fatigue Inventory in Multiple Sclerosis).

Motor fatigue should be seen in connection with the specific pathophysiology of MS and the decelerated central transmission of stimuli by demyelination of the axons. If the signals are persistent, this leads to inefficient conduction or conduction block. The typical deterioration in motor performance of MS patients is particularly noticeable in the case of persistent, repetitive motor and fine motor activities (e.g. when walking). This phenomenon of specific motor exhaustion is called motor fatigue.

Clinically, this means that a patient can, for example, climb a maximum of 15 steps at a time, but it is already clear that by the 10th step climbing the stairs is becoming increasingly laboured and the patient may resort to avoidance mechanisms. Under certain circumstances, increased spasticity may also occur. After a short pause (usually one to two minutes) during which the conduction block in the central nervous system breaks down, the patient can resume motor activity and continue climbing the steps. Motor deterioration is therefore merely a symptom due to pathophysiology. After a brief pause, the patient has to some extent regenerated him/herself.

In everyday life, fatigue can lead to patients and therapists shying away from pushing the tolerance limit.

In everyday life, this phenomenon can lead to patients and even therapists shying away from

Uhthoff's phenomenon is an MS-specific problem that occurs when there is a rise in body temperature.

pushing the tolerance limit. This is one of the reasons behind the prevailing misconception that MS patients should be "protected" and that a heavy load will have a negative effect on the progression of the disease. This assertion can still be found today in textbooks and among teaching staff, but it has been proven to be incorrect. Motor fatigue, i.e. endurance and strength, can be significantly improved with appropriate motor endurance training and training stimuli. [3, 7]

Summary of fatigue

The conclusions can be drawn to summarise fatigue:

1. MS patients continually need breaks (roughly 2 to 3 minutes) during active therapy and in their daily activities.

2. A deterioration of motor performance during exertion is only one symptom of the MS-specific pathophysiology and is not damaging! This temporary deterioration does not lead to an episode. Overload cannot cause damage, but at most lead to exhaustion and in the worst case severe exhaustion of the patient. This is also a completely normal reaction at the start of training, even in healthy individuals. Tallner notes that many MS patients no longer know the feeling of positive tiredness after sport and negatively interpret what is a positive feeling for healthy people out of fear of the "overload" myth [6, 8].

3. The importance of activity and exercise for MS patients from many perspectives is demonstrated in relevant studies on this topic [6, 8].

Uhthoff's phenomenon

Uhthoff's phenomenon is an MS-specific problem that occurs when there is a rise in body temperature. Uhthoff's phenomenon occurs in about 80% of MS patients and can be as a result of having a hot bath, a rise in outside temperature, fever and during physical exertion. Besides fatigue, Uhthoff's phenomenon is another reason behind the general assumption that physical exertion leads to relapses or a worsening of the MS patient's condition. However, both fatigue and Uhthoff's phenomenon are not effective damage, but merely symptoms of the existing pathophysiology. [4] Pathophysiologically, the already slower central transmission of stimuli by demyelination is additionally impaired by heat. Clinically, this leads to a worsening of the symptoms or even to new, previously compensated symptoms.

Uhthoff's phenomenon does not occur in all MS patients. Training and exertion are also very important for these patients. Patients with Uhthoff's phenomenon should counteract it during training with cooling vests, cold drinks or cold showers. Temporary symptomatic deterioration can be explained and must not lead to avoidance of physical activity.

Even in warm water, saunas or out in the sun, demyelination can cause a temporary worsening of the symptoms. But sun, saunas and warm water do not mean permanent damage and should not be avoided.

In general, Uhthoff's phenomenon usually disappears again after 20 to 50 minutes.

Summary of fatigue and Uhthoff's phenomenon

The symptom with the biggest functional impact on people with MS is paresis/weaknesses (see issue 01|2018). In combination with motor fatigue occurring with exertion and Uhthoff's phenomenon, paresis and weaknesses are the reason why exertion is often avoided in MS therapy, despite the fact that it is essential. For people with MS, rest often means a steady decline in functions, e.g. walking. Training can, however, restore functions that were thought to be lost and also lead to incredible functional improvement. In this way, targeted training can improve strength, endurance and balance as well. Neither training nor exertion trigger relapses! [5]

MS patients must engage in long-term training with an effective training stimulus and a high number of repetitions in order to strengthen the affected muscles.

In summary, MS patients must engage in targeted and long-term training with an effective training stimulus and a high number of repetitions in order to strengthen the affected muscles. All individuals affected by MS and their therapists should not be afraid of overload and should know that training and/or exertion do not trigger relapses. A temporary deterioration of symptoms is a sign of MS-specific pathophysiology and not a reason to cut down on regular training.

Since MS patients are often relatively young, the cardiovascular issue must be considered differently compared to stroke and Parkinson's patients.

Spasticity

Spasticity plays a secondary role in MS, since paresis often predominates in functional terms, even in severely affected patients. Therefore, the focus of therapy in these patients must also be on strength training.

A conventional assessment for spasticity is the Ashworth Scale. The clonus test can also reveal spastic hypertonia quickly, simply and at a very early stage. Therapists can perform the test quickly and easily.

Therapeutic approaches for spasticity

Therapy that focuses only on reducing or loosening spasticity is not effective. Modern spasticity therapy recommends activity and even strength training, for spastic muscles as well. Pure spasticity reduction should not therefore be the main therapeutic goal when using an active-passive movement exerciser such as the THERA-Trainer tigo. Since the far more effective approach is spasticity reduction with simultaneous functional activation, training should take place simultaneously at least with assistive devices or against resistance.

This can also be practised by standing in a balance trainer (e.g. THERA-Trainer balo). In addition to contracture prophylaxis and cardiovascular activation, muscle activation with simultaneous reduction of spasticity is a primary therapy goal. For patients who are no longer able to walk, a standing workout of one hour per day is essential. Increased spasticity or a shooting spasm can occur as a sign of fatigue when standing too long in the balance trainer. However, this is only a sign of exertion and shows that the patient needs a break.

Plenty of stretching exercises can be done in the THERA-Trainer balo, particularly in the case of severely affected patients. Stretches in the context of neurotension (whole chains in connection with trunk posture) are better than isolated stretches. These interlinked stretches should be carried out more often.

It is important for all MS patients to stretch the calf muscles since distally hyperreflexia is frequently detected early on and therefore restricted mobility of the upper ankle joint quickly occurs. When standing in the THERA-Trainer balo, a wedge can be placed under the foot or forefoot to improve mobility in dorsal extension in a targeted way.

Targeted training of weak muscle groups can also be carried out in the balance trainer. The patient can strengthen the important but often weak or, in the case of wheelchair users, shortened ventral chain against gravity or the spring installed in the device. For this purpose, the centre of gravity is slowly shifted backwards and then against the resistance back to the front. This trains the entire ventral muscles, including dorsal flexors, hip flexors and ventral trunk muscles.

The quadriceps can be exercised with secured squats and the calf in step position or in parallel standing. The patient either steps forwards in the standing frame (with or without spring resistance) or stands securely in the device and tries to press on his or her toes before slowly easing back.

Generally speaking, endurance and strength training improve functional abilities without increasing spasticity. Quite the opposite; spasticity is reduced. The fact that strength training and intensive activation do not result in increased spasticity is also evident from the DGN guidelines and has been proven in many studies dealing with strength training. When activity for muscle spasticity is

Below: an MS patient in the THERA-Trainer balo

Measuring spasticity
Modified Ashworth Scale (MAS)

Score	
0	Normal
1	Slight resistance at end or start (catch)
1+	Slight resistance <50% of range of motion (ROM)
2	Marked resistance >50% of ROM, full ROM
3	Considerable resistance, passive ROM difficult
4	Partial ROM restricted (contracture)

Reliability and validity: somewhat insufficient
Diagnostics: recommended
Progression: not recommended

(Modified according to Schädler, Kool, Lüthi, Marks, Pfeffer, Oesch, Wirz: Assessments in der Neurorehabilitation. [Assessments in neurorehabilitation] Verlag Hans Huber 2006.)

reduced in MS patients, functional possibilities, such as walking, transfer and standing, are very often reduced. Patients need a certain muscle tone for these activities. If the therapist reduces this tone without functional activation, he or she deprives the patient of functional possibilities.

The same problem can occur in MS patients when anti-spasticity medication is prescribed. An additional problem with anti-spasticity treatments is that it does not specifically target the spastic muscles but reduces the overall tone, and also have a soporific effect. This means that therapy using anti-spasticity medication must be carefully considered and the pros and cons weighed up. Overall, however, there is nothing against nocturnal medication for shooting spasms. If necessary, botolinum toxin can also be used to target muscle spasticity.

Summary of spasticity therapy

Training weak muscles should also be at the forefront of spasticity therapy because it can improve function while reducing spasticity. Training of functional activities such as standing, walking, standing up and transfers can be improved without increasing spasticity. Increased activity can actually achieve a sustained reduction in spasticity. Even targeted strengthening exercises of weak muscles that show an increase in tone, such as the calf muscles, do not lead to an increase in spasticity.

In summary, it can be said that endurance and strength training improves functional abilities without increasing spasticity; on the contrary, it usually reduces spasticity. [1]

Preview of the next part

In the third and final part of our series, read about ataxia and somatosensory disorders in MS and about neurorehabilitation for patients with severe MS.

Missed the first part of our expert report and want to catch up? Contact us! We'll be happy to send you the last issue of THERAPY by e-mail.

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Sabine Lamprecht passed her physiotherapy exam in Berlin in 1982. Since then, she has completed various further training programmes. In 2006 she gained her Master of Science in Neurorehabilitation at Danube University Krems, Austria. From 1983 she worked as lead physiotherapist at Neurologische Klinik Christophsbad where she helped to set up the Physiotherapy Department. In 1987 she opened her own practice with her husband. She was a lecturer at the University of Applied Sciences in Heidelberg and is now a lecturer at Dresden International University in Fellbach.

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Rethinking rehabilitation

The 7th THERA-Trainer Symposium takes place in September. Modern gait rehabilitation is the theme of this two-day event on neurorehabilitation. THERA-Trainer is the industry partner of this symposium; scientific and therapeutic leads are physiotherapists Sabine Lamprecht (MSc) and Martin Huber (MSc).

"Our aim is to get things moving together. We look forward to seeing you!"

The healthcare system in recent years has been undergoing constant change. And a lot is happening in neurorehabilitation too. Society is getting older and the number of patients requiring treatment is on the rise. The general conditions in everyday clinical practice are becoming increasingly difficult, with restructuring, intense competition between hospitals and rehabilitation facilities, shortage of specialist staff and cost pressures making a more efficient approach to work unavoidable. New scientific findings and research results in combination with proven therapy methods enable the development of best practice solutions and new therapeutic approaches. Yet, this development also presents a major challenge to everyday clinical practice.

The THERA-Trainer Symposium is an opportunity for you to join in a lively debate with experts and innovators from industry and clinical practice. Well-known speakers from the industry will deliver presentations on a range of concepts and developments. The event is for anyone who wants to see how their own experiences match up with current developments in science and research. Current requirements for neurological rehabilitation will also be discussed, as well as options for quality assurance. Various contributions on innovative gait training and robotic-assisted therapy will be the main topic.

Participants will also get an insight into the everyday world of THERA-Trainer and find out how new products are developed and sold based on requirements stemming from clinical practice.

“Well-known speakers will deliver presentations on a range of concepts and developments.”

Abstracts

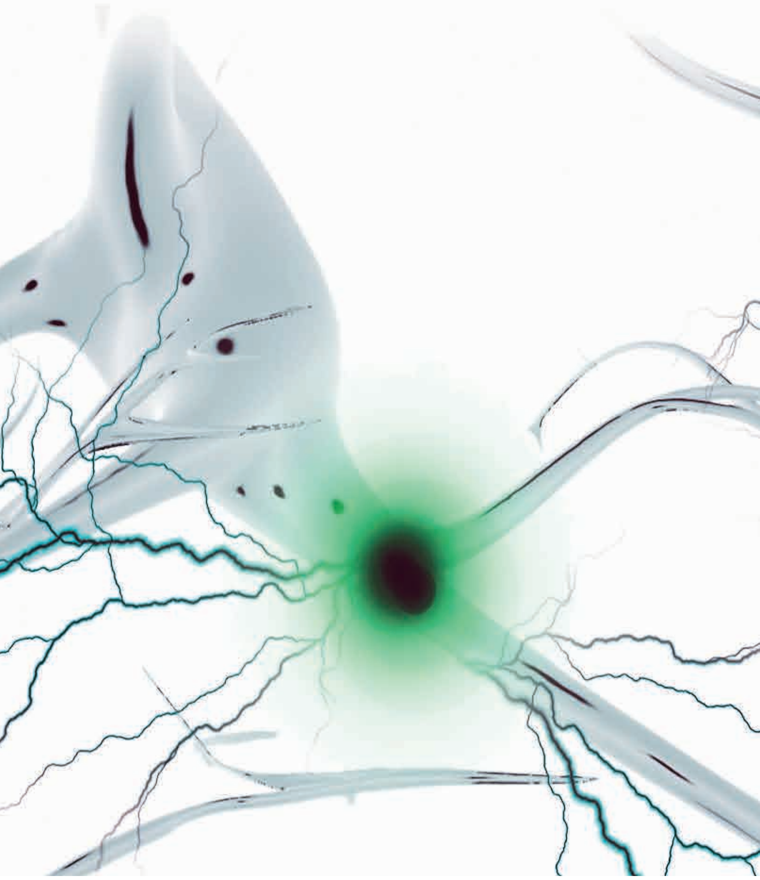
7th THERA-Trainer Symposium
13-15 September 2018

Requirements and reality of evidence-based neurorehabilitation
Dr Werner Nickels, Senior Consultant in Neurology, Ruland Waldklinik Dobel

The restructuring that has taken place in the German healthcare system in recent years is leading to intense competition between hospitals and rehabilitation facilities. In order to ensure a high quality of care despite difficult financial conditions, evidence-based quality assurance measures are discussed in order to reconcile “values” and “value” from both a therapeutic and economic perspective.

Requirements for treatment concepts in stroke patients from an inpatient perspective – conditions and strategies for efficient patient care
Gunter Hölig, qualified sports instructor, therapy lead, Medical Park Bad Rodach

Medical Park provides therapeutic care for its patients – from medical findings to transfer to a home training programme throughout the entire recovery process – according to evidence-based and specific therapy concepts. All aids and devices for the best therapy outcomes are available, while the unique training worlds and therapeutic equipment are all state-of-the-art.



Human-machine substitution in neurological rehabilitation – benefits of device-based circuit therapy in gait rehabilitation

Ann-Kathrin Miller (BA Health Economics), physiotherapist, medica Medizintechnik GmbH

Service providers face a major challenge in implementing guideline recommendations for gait rehabilitation. A new approach using device-based circuit therapy increases frequency and intensity, thus enabling the physiotherapist to look after several patients at the same time. The discussion will centre on whether the medical benefit of this type of therapy in conjunction with reduced individual physiotherapy improves quality and outcome, and the extent to which this results in economic potential for rehabilitation facilities.

Integrated, practice-oriented electromechanical-assisted gait training in subacute stroke patients – effects of gait trainer therapy under near-everyday conditions in stroke patients

Doris Bolt (MSc), physiotherapist, Zürcher Reha Zentrum Wald

A research project by Zürcher RehaZentrum Wald tests the effectiveness of early and intensive gait therapy using the THERA-Trainer lyra in stroke patients. The research team is investigating the effect of training compared to conventional physiotherapy on muscle condition, walking ability, everyday independence and quality of life.

THERA-Trainer Complete Solution: Mapping physical activity in stroke rehabilitation – environmental enrichment increases activity in stroke patients

Jakob Tiebel, occupational therapist, Head of Product Management, medica Medizintechnik GmbH

An essential feature of innovative gait therapy concepts is exercise intensity, which, according to research, is often too low. Current therapies do not correspond to an enriched environment that is conducive to more intensive training. It is therefore essential to create rehabilitation environments that meet the requirements for the dose-effect relationship in the ReMoS Guidelines. The question arises as to what kind of utopia, aspirational vision and permanent reality will be and will remain.

The gait laboratory – innovative gait rehabilitation for stroke

Anne Boese (BSc in Therapeutic Sciences), lead occupational therapist, and Kristin Rogg (BSc in Therapeutic Sciences), lead physiotherapist, Aatalklinik Wünnenberg

The device-based gait lab at Aatalklinik Wünnenberg provides patients with acquired brain injury an effective level of evidence-based gait rehabilitation in addition to conventional physiotherapy. A treatment algorithm synthesises suitable training programmes; the participants are categorised on an assessment-led basis and undertake targeted training in small groups. The gait lab generates in a resource-efficient way a significant qualitative and quantitative intensification of gait rehabilitation, through which therapy intensity is greatly increased.

Active patients – what role do responsibility, autonomy, motivation and variety play in motor learning?

Martin Huber (MSc Neurorehabilitation) physiotherapist, lecturer at ZHAW, Winterthur

Motor learning is critical in neurological rehabilitation. Responsibility, autonomy, motivation and variety are of crucial importance for successful motor learning and overall therapy success. The THERA-Trainer Complete Solution for gait rehabilitation offers innovative possibilities to promote motor learning and self-efficacy. The question arises as to how these aspects can be implemented as part of the overall solution.

“Current requirements for neurological rehabilitation will also be discussed, as well as options for quality assurance.”

Measures to establish clinical treatment pathways: quality assurance instruments in neurological rehabilitation

Helmut Krause, qualified occupational therapist, CEO AMBUTHERA GmbH, Herdecke

Treatment pathways should regulate the course of treatment, should be an accompanying documentation instrument, and should enable commenting on standard deviations with the objective of continuous evaluation and improvement of patient care. Multiprofessionality in neurological rehabilitation represents a major challenge when it comes to converting established structural and conceptual therapeutic approaches to changed organisational models.

What happens after discharge from the rehabilitation clinic?

Sabine Lamprecht (MSc Neurorehabilitation), physiotherapist, Praxis HSH Lamprecht

The high-dose combination of conventional and technology-based therapy procedures promises greater effects on mobility, independence and quality of life than standard care for people with chronic impairments in outpatient neurological late rehabilitation. Effectiveness and efficiency of healthcare concepts such as these are high. For this reason, a broader range of therapies, widespread use of specialised outpatient rehabilitation and better reintegration aids for people with neurological diseases are needed.

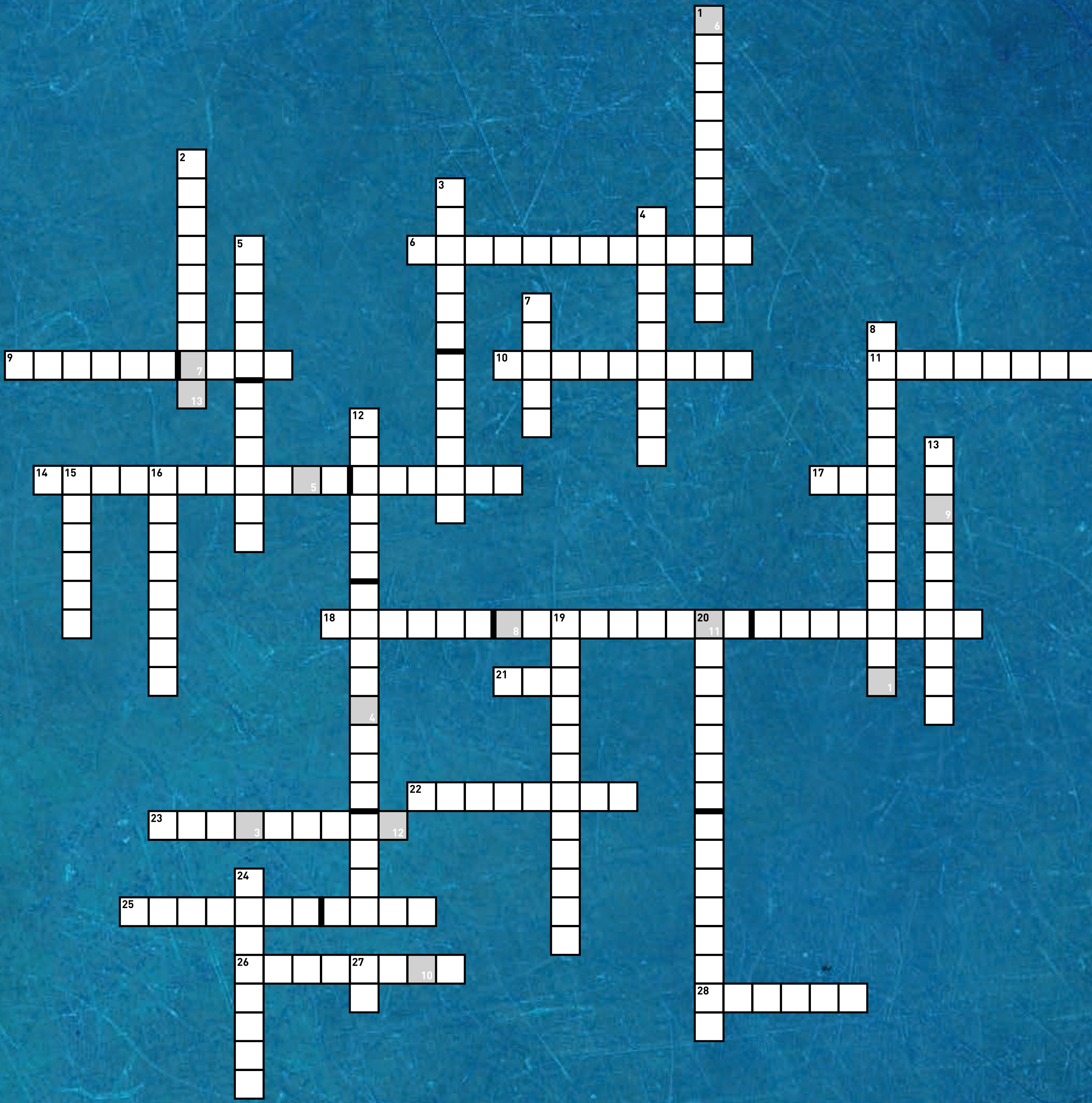
Outside the box

Horizontal

6. Summary of primary examinations | **9.** Part of the CNS located in the vertebral canal
10. Condition of permanent attention/alertness | **11.** Protein complex bonding signalling molecules
14. Part of the brain that is not dedicated to primary projection fields | **17.** Assessment of walking ability
18. Provider of health services | **21.** Diagnosis-related case groups | **22.** Ability to pose in different ways
23. Resistance against fatigue | **25.** Safety device for gait training | **26.** Brain chemical
28. Nerve cell of the brain

Vertical

1. Malalignment of the shoulder | **2.** Auxiliaries for joint stabilisation | **3.** Wrapping of the neurite
4. Swallowing problems | **5.** Functional system controlling movement | **7.** Algorithm to predict walking ability | **8.** RNA synthesis | **12.** Body of Social Law | **13.** Frequency of a disease
15. English stroke | **16.** Database of systematic reviews | **19.** Exceeding significance level
20. Completing several stations consecutively in one training session | **24.** Projection of a nerve cell
27. Abbr. demyelination disorder



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Answers on reverse side of envelope.

TECHNOLOGY & DEVELOPMENT

Cooperation between business and research

At the end of last year, medica Medizintechnik GmbH provided Reutlingen University with a THERA-Trainer tigo on permanent loan. Otto Höbel, CTO of the company, presented the THERA Trainer at company headquarters in Hochdorf to Prof. Sven Steddin of the Information Technology Faculty at Reutlingen University. Medical IT students now have the opportunity to develop and test new therapy concepts for patients with locomotor impairments or muscle weaknesses. Prof. Steddin also uses the movement exerciser as part of a practical module in device technology.

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6. Cochrane | 17. FAC | 18. Health insurance provider | 19. Significance | 20. Circuit training | 21. DRG | 22. Mobility | 23. Endurance
24. Dendrite | 25. Patient belt | 26. Dopamine | 27. MS | 28. Neuron | Solution word: Neurosciences

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