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"Birds fly, fish swim, humans run"

Emil Zátopek, Czech
long-distance runner and Olympic champion

Editor Jakob Tiebel

FOREWORD

Wake up and move!

Dear Readers,

Early mobilisation within the first 72 hours following an acute event that restricts movement (e.g. heart attack) or prescribed bed rest (e.g. operation) is becoming more important. Immobilisation as a form of therapy in intensive care medicine is no longer blindly accepted. The reason for this lies in the not insignificant side effects on patients.

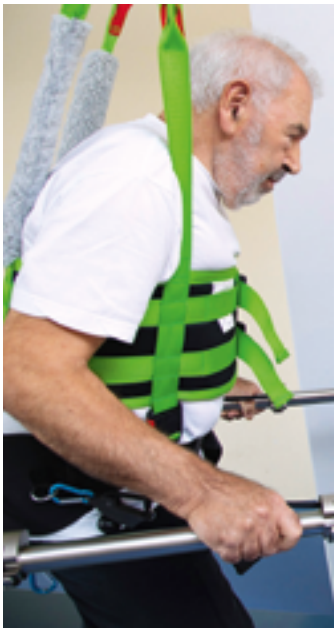
But if one questions the dogma that the intensive care patient is immobile, one quickly comes to an exciting finding: the idea of early mobilisation is by no means new. In a 2017 publication by Ely (PMID: 28098628), I came across a black and white photo taken in 1970 at San Francisco General Hospital. The photo shows a mobilised and intubated patient with a walking apparatus. The caption reads: Mobilizing an intubated ICU patient with primitive equipment. After this period of early mobilization in the ICU, there was a progressive move away from awake and ambulatory patients while on the ventilator towards heavily sedated and restrained patients for days on end to help prevent awareness and reduce memories of ICU stay.

Numerous studies have shown that these memories are far worse if patients are not mobilised early – the outcome worsens significantly and leads to far more complications for patients. So our slogan is Wake up and move! A good reason to make it the main topic of this edition.

Happy reading!

Jakob Tiebel
Contact the editorial team at: therapy@thera-trainer.de
(Tell us what you think!)

The brain cells are reminded how to walk.



Standing on both feet

Early rehabilitation – training critically ill patients in intensive care units begins early

Cover story: Early mobilisation

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Technology and development

Sections

SCIENCE

Roundup of the Third Congress on Neuro-Rehabilitation and Neural Repair

The 3rd Congress on Neuro-Rehabilitation and Neural Repair took place between 22 – 24 May 2019 in Maastricht. Headed by health experts Professor Gert Kwakkel, Professor Gaëtan Stoquart, Professor Jan Mehrholz and Professor Jane Burridge, an interesting and varied programme was guaranteed.

Ann-Kathrin Miller

In his opening presentation, Professor Kwakkel examined the changing research and therapy approaches in stroke rehabilitation with a focus on the upper extremity. This was also the main theme of this year's congress. In his presentation, Professor Kwakkel analysed the most important components of upper extremity rehabilitation: barriers that prevent a specific treatment, such as shoulder pain or depression, firstly need to be dealt with and eliminated. Secondly, the treatment team must have the specialist knowledge of how the patient's impairment affects not only structures and functions but also patient participation. Patient-specific goals based on this then need to be developed to increase patient activity at home. This should be done with many repetitions in order to improve the movement quality and movement control for everyday activities. Promoting self-efficacy is also essential. In rehabilitation, patients must be given the knowledge, skills/methods and motivation to continue with their rehabilitation. This multi-layered approach to treatment is important because current research results repeatedly highlight shortcomings in therapy. For example, 45% of stroke survivors still feel that they lack support after they have been discharged from hospital. In addition, a 2015 study by K. Hayward found that patients in rehabilitation are still inactive and alone. And despite the wide range of options now available in modern stroke rehabilitation. In order to turn this situation around, research is needed so we can identify which therapy provides optimal help for patients.

However, this seemingly simple question presents research challenges, as revealed in the content of published studies. Dr Louise Connell and Dr Liz Lynch demonstrated this in their presentation "Is it any wonder no one ever implements evidence-based practice?". According to them, 65% of all therapy studies were non-intervention studies, 25% knowledge inquiry, 8% knowledge synthesis and only 2.5% of the studies dealt with the implementation of therapy methods. Of course, it is elementary evidence-based to demonstrate the effectiveness of a therapy method, but the implementation is at least as important for successful implementation in everyday clinical practice. And this is still not happening enough. This is perhaps one reason why translating clinical research into clinical practice takes 17 years on average. A drastic reduction in this time span for implementing an evidence-based therapy method would be welcome in the future.

Another important topic that was regularly addressed in the presentations related to daily life of neuropatients after hospital discharge, including the presentation "Managing daily life: evidence and implications for practice in neurorehabilitation" by D. Kos and Dr. T. Satink. In order to organise daily life as a patient, more resources are required than is generally assumed. Patients need to take responsibility not only for their emotional situation but their health situation as well. In addition, they also have to take care of everyday tasks such as shopping and eating. In order to manage daily life, patients should not rely solely on their own ability to function, but must be able to recognise when they need help, when they should ask for help and accept it. This correlates closely with a patient's quality of life. According to Kos and Satink, managing everyday life is not about carrying out activities, but is rather about feeling and thinking about these activities. This is what gives the patient a 'sense of purpose'. In summary, they came to the conclusion that managing everyday life in neuro-rehabilitation is about more than treating a chronic condition. It means taking responsibility and finding a new meaning in life. It is a dynamic process with several phases.

In summary, the Third Congress on Neuro-Rehabilitation and Neural Repair discussed every relevant issue in neuro-rehabilitation and there was something for every visitor, including the latest research findings, the application and implementation of new therapy methods and patient participation. It will be exciting to see what changes will occur in neuro-rehabilitation in the years ahead.

Lyra audio feedback

Audio feedback and the application of acoustic stimuli are considered effective for neurological rehabilitation in stroke patients. A usability test series examines the potential acceptance of the procedure by healthcare professionals.

Stefanie Ruh-Saxer

Background

The literature shows that gait parameters such as speed, symmetry and step length can be changed in response to acoustic feedback. However, existing studies have only included patients without cognitive or neuro-psychological dysfunctions and who were able to understand instructions. Furthermore, these studies focused on stimulation or cueing, but not on real-time feedback. Therefore, the effect of auditory feedback in cognitively and neuro-physiologically impaired stroke patients is currently unknown.

Objective

Healthcare professionals tested a total of three audio feedback scenarios for their user-friendliness, applicability and acceptance in rehabilitation. An analysis was carried out to determine whether the audio feedback scenarios are self-explanatory and can be understood without instruction. Further observation was made to establish whether healthcare professionals can adapt gait behaviour in response to the audio feedback. The experts also evaluated the applicability and potential acceptance of the feedback scenarios for rehabilitation.

Methodology

The healthcare professionals were asked to test the audio feedback scenarios developed as part of this CTI project by first walking without a gait trainer and later with the lyra gait trainer. They were given instructions beforehand on how to behave and respond to the audio feedback. The test persons were observed and asked for their feedback. The three audio feedback scenarios tested were Airplane, Piano and Cracking Wheel. Open questions and standardised questionnaires for each feedback scenario, field notes and tape recordings were produced. The test persons were asked to test each audio feedback before and after instruction for a maximum of 5 minutes.

At the end of each round, participants were asked to rate the audio feedback on a Lickert scale from 1 "poor, unsuitable" to 5 "very good, very well adapted", and to name positive and negative aspects experienced during the test. Feedback for each scenario was graphically summarised in bar charts. Feedback on open questions was condensed through content analysis and presented as statements.

DOI: 10.6084/m9.figshare.7756622

Results

The tests were carried out on 19 July 2016 at Rehab Basel in Switzerland. Five healthcare professionals tested the three audio feedback scenarios in the same order. On average, the participants rated the lyra audio feedback as "good and well adapted". Clear feedback was consistently given on the individual scenarios. The three audio feedback scenarios were found to be useful for correcting specific gait disorders, i.e. shifting body weight when standing and walking, and striking the heel in the initial contact phase.

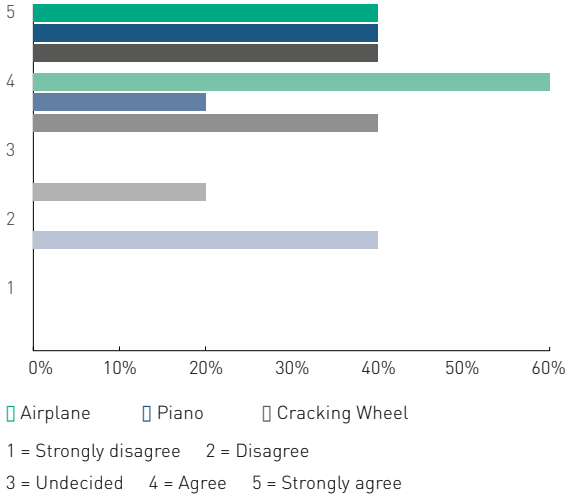

Fig. 1: Results of the audio feedback.

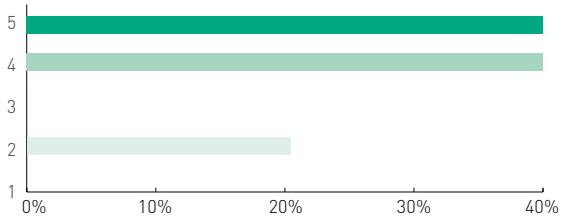

Fig. 2: The Airplane feedback motivates weight-shifting training left – right forward – backward.

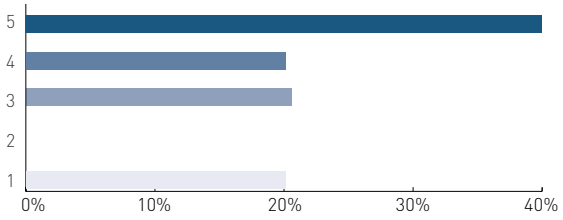

Fig. 3: The Piano feedback motivates weight-shifting training.

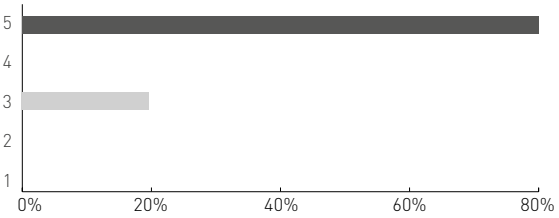

Fig. 4: The Cracking Wheel feedback motivates initial contact gait phase training and subsequent weight distribution on one leg.

Discussion

In general, the tested audio feedback system had good acceptance among the test persons. Positive statements included "motivating", "supporting" or "entertaining". The most positive effects were observed for the Cracking Wheel and the Airplane. The audio feedback was positively received and even monotonous or sad tones such as the piano sound were not rated negatively, as patients with severe impairments would not be overwhelmed by this type of feedback. The audio feedback can therefore lead to a more specific form of training. Since some patients may not be able to understand verbal instructions, a self-explanatory audio feedback feature may be an option for correct patient guidance. In contrast, negative statements included that the audio feedback scenarios were not in real time and that some patients could be distracted or overwhelmed. Instruction was essential to make training more effective. The use of headphones can be disruptive for some patients and make them feel enclosed. Furthermore, observations of the test subjects showed that it was difficult to impossible to detect the intention of the specific audio feedback without prior instruction. In summary, the audio feedback via headphones was positively evaluated and is suitable as an adjunct to gait rehabilitation with the lyra. The focus of further developments should be improvements in terms of self-explanation and real time feedback.

Standing on both feet

A misdiagnosis in hospital would have left Friedrich Huber within an inch of being bedridden for life. But thanks to the courage and determination of his wife Hanni, he was transferred to Passauer Wolf Rehabilitation Centre where he regained his independence. With the new lyra end effector gait trainer, he learned how to walk again. And how to laugh.

Friedrich Huber

Friedrich was completely unprepared. Although he had been diagnosed with Parkinson's disease seven years ago and was already facing a number of restrictions, the fact that he was getting progressively weaker worried him a great deal. Small, everyday tasks progressively required more energy and he would break out in a sweat after just a few steps on the stairs. "One day, in September 2018, I collapsed while gardening. All of sudden, I couldn't walk or stand!"

He was then rushed to the nearest hospital, his wife Hanni constantly by his side. This sentence will appear frequently in this article. In the end, it was down to the courage and energy of Friedrich's wife that saved his life, so to speak. At least the kind of life that for Friedrich is worth living.

Four men with hats in the corner

Friedrich Huber: "I was a district manager for 40 years in the insurance industry and had private health insurance. This entitled me to treatment from a senior consultant. 'He must be right', I thought when I was diagnosed with a slipped disc." Friedrich spent two weeks in hospital, but his condition didn't improve. "It was like being permanently bedridden. I couldn't do anything, I couldn't go to the toilet, nothing. One day, fate took another turn on my rapidly deteriorating health when I started to have horrific visions."

Friedrich Huber exercising on the end effector gait trainer with physiotherapists Ms Eder and Mr el Fahem-Krummradt. He can manage up to 1,000 steps in 15 minutes of training.

After weeks in bed, Friedrich Huber quickly got into a wheelchair at the end of 2018. He learned how to walk again with the help of his wife Hanni (above) and therapy using the lyra end effector gait trainer.

Friedrich suddenly had the feeling that the ceiling was coming towards him. Four men with hats in the corner of the room were sitting at a table in a threatening silence. “It was awful”, Friedrich recalls. “But I couldn’t turn round and I could barely speak. Sometimes I was freezing and other times I was sweating. And I didn’t want to keep ringing for the night nurse. And then these visions.” And again his wife Hanni was at his side. When Friedrich’s condition continued to deteriorate, Hanni had a bed put in the hospital room and helped her immobile husband with his nightly attacks of fear and pain. When she moved into the hospital with him, his mental state improved.

Wrong diagnosis with consequences

Friedrich Huber: “Hanni didn’t let the matter rest. Nor did my daughter. Both wanted to know exactly why someone with a slipped disc should be delusional. Hanni repeatedly discussed the matter with the consultant, asking him to check me out again more thoroughly.” Hanni remembers: “Then the scales fell from my eyes. Perhaps it was a tick bite? We live at the edge of a forest. Ever since my husband’s been taking medication for Parkinson’s, the ticks seem to find him particularly irresistible. Not a week goes by without him coming home with

a couple of ticks on his body." After she'd explained this to the doctors, her husband was finally examined for tick-borne diseases.

Endless bad news

The diagnoses: Lyme borreliosis and tick-borne encephalitis (TBE), two diseases transmitted by ticks. "TBE caused the delusions. And Friedrich suffered from this viral disease despite the TBE vaccine." His course of therapy was changed straight-away and after two weeks he was improving.

"You get antibiotics for Lyme borreliosis. I had a very high level of inflammation. But the body has to deal with TBE on its own. And I dealt with it," Friedrich recalls. "Perhaps being bedridden for a long time and a lack of independence had made me overly sensitive, but I was terrified of being put out to grass at the age of 74," he explains. "The next plan that the doctors had was that I should be transferred to the hospital's geriatric department. Perhaps I had all the wrong ideas about it, but I was frightened I'd end up bedridden for the rest of my life." Once again, his wife Hanni was at his side.

Rehabilitation not deterioration

"I was determined to get my husband into a rehabilitation clinic. I got on everyone's nerves in the hospital for three days because the papers that would transfer him to the geriatric department had been completed. I wanted Friedrich to go to Passauer Wolf because I'd heard so many good things about it. Only two months earlier, he'd been busy in our garden and we'd celebrated our 50th wedding anniversary. This man was a classic case for rehabilitation." The referring doctor finally changed the documents: transfer to Passauer Wolf Rehabilitation Centre in Bad Gögging. That was in October 2018. "Things were now looking up."

Learning to speak and walk again

Hanni Huber: "All the staff from the senior physician to the cleaning lady were very friendly and welcoming from the word go. It's just fantastic. When I asked if I could move in, Dr Wächter, the Head of Neurology, was very keen on the idea. He's

Friedrich and Hanni Huber at Passauer Wolf. After eleven weeks, Friedrich was discharged.

of the opinion that rehabilitation patients have better recovery outcomes if loved ones are present. That made us happy." Friedrich was firstly lifted out of bed using a lifting device, dressed and then seated in a wheelchair so he could engage with the world again.

What's more, Friedrich was the first patient to be treated with the newly acquired lyra end effector gait trainer. A state-of-the-art device that mimics natural step movements and helps patients learn to walk again. Friedrich spent eleven weeks at Passauer Wolf.

He learned to speak clearly again with his speech therapist Ms Schatz, and underwent psychotherapy and sports therapy.

He also met Mr el Fahem-Krummradt and Ms Eder who work with patients using the lyra gait trainer. Friedrich Huber: "At first I walked using a walker. Each day I was able to take an extra step without assistance. Now I can walk independently again. Slowly but surely. Next up is the stairs. I want to do that on my own again. That'll be for next time at Passauer Wolf."

"We can help patients a lot more with the end effector gait trainer." Priv.-Doz. Dr. med. Tobias Wächter, Head of Neurology, Bad Gögging

You were the driving force in choosing the walking robot. Why did you choose the lyra? "The lyra can be adapted very quickly to each individual patient. No valuable therapy time is lost. Other robot systems can take much longer. Since it's easy for patients to get on and off a wheelchair, we can train lots of patients and those patients who would actually have difficulty walking can do over 1,000 steps a day. In addition, movement comes from the foot. The step movement is precisely mimicked. This reminds the brain cells how walking actually works. Rehabilitation is improved significantly."

Do you treat patients in the lyra from the start? "It depends on the individual case. But we've found that the cardiovascular system in people who have been lying down for eight weeks can't manage long periods of standing and walking. Now we don't let it get that far and we mobilise patients as early as possible in the gait robot."

"The lyra provides some real sporty training." Robert el Fahem-Krummradt, Therapy Lead at Passauer Wolf Bad Gögging

Apart from its user-friendliness, what other advantages does the lyra have? "We used to be able to do 30 steps a day on a treadmill with two physiotherapists per patient. With the walking robot, people now do 1,000 steps a day. And at up to 4 km/h. So they learn ambitious walking and can get across pedestrian crossings quickly."

And how do you rate the lyra as a physiotherapist? "I'm a convert. Only the feet are clamped and moved. The rest of the body can move freely. The belt around the abdomen relieves the walker – 20 kilos in the case of Mr Huber. And we can reach the patient from all sides."

Impact of early rehabilitation on the rehabilitation process

A timely start to early rehabilitation has a positive effect on the entire rehabilitation process.

Optimal early rehabilitation in the intensive care unit (ICU) has a big impact on the entire rehabilitation process. An Italian study retrospectively compared the prospective data of a new interdisciplinary care pathway (152 patients) in accordance with the guidelines of the National Institute for Health and Care Excellence (NICE) with those of the conventional care pathway (133 patients). The patients had lung failure, brain injuries or operations.

What was special about the new care pathway was closer cooperation between the professions involved and goal-oriented rehabilitation with daily functional testing, continuous care and coordinated discharge management. A specialist in physical medicine and rehabilitation (PM&R) examined the patients promptly and, with the help of the interdisciplinary team and defined criteria, planned and coordinated early, tailor-made rehabilitation, which was regularly adjusted so that exercise complexity and duration increased, from passive mobilisation and breathing therapy to stabilisation exercises in sitting and standing positions and strengthening exercises.

Both care pathways were analysed in terms of the following points:

- Number of patients who received an interdisciplinary rehabilitation evaluation and physiotherapy in ICU
- Duration until start of rehabilitation diagnosis/therapy after transfer to ICU
- ICU/hospital length of stay
- Ventilator-free days (VFDs) after ICU

The newly introduced early interdisciplinary rehabilitation performed significantly better in all points: More patients received rehabilitation examinations/rehabilitation in ICU, with shorter time to examinations and earlier start of rehabilitation. ICU/hospital stays and period of ventilation were shorter. The entire subsequent rehabilitation process was positively impacted; furthermore, there were no serious complications or deaths. The results show how important it is to start early structured rehabilitation in the intensive care unit.

ORIGINAL ARTICLE

[1] Chiarici A et al. (2019). An early tailored approach is the key to effective rehabilitation in the intensive care unit. Arch. Phys. Med. Rehabil. Feb 20.

DOI: 10.1016/j.apmr.2019.01.015

THERAPY & PRACTICE

Update: Early and gait rehabilitation

At the 9th THERA-Trainer Symposium in September 2019, the megatrends of demographic transition and digitalisation came into contact. The event focused on the use of robotics in modern gait rehabilitation and the associated digital transformation of working environments.

Jakob Tiebel

Will modern treatment robots replace therapists in the future? What influence does the digital transformation have on the working environments of therapists? What will change and what will remain the same for a long time to come?

The digital transformation has now encompassed all aspects of daily life. An increasing trend in the use of modern technologies is also evident in the field of rehabilitation. The use of therapy equipment is now an integral part

of everyday therapeutic practice. There is good evidence for robot-assisted gait therapy, which is now recommended by almost every professional association in both national and international guidelines.

Yet despite its usefulness, technology still cannot replace the relationship between therapist and patient. On the one hand because therapy remains a complex activity that cannot be replaced with technologies. And on the other because the personal relationship with the patient has been proven to be one of the determining factors for successful treatment. Development companies should therefore focus less on the idea of substitution. They should think about how therapists can spend more time with their patients in the future through the digital transformation of their working environments.

It is still the case that therapists spend up to 40 percent of their working time away from patients. They are overburdened with paperwork. Likewise, 40 percent still use pen and paper for their correspondence, for example in case management. 34 percent of all healthcare facilities still work with paper records. In contrast and after some initial scepticism, 90 percent of healthcare employees now agree that digitalisation provides an opportunity for improved patient care.

Participants at the symposium were able to experience the potential of state-of-the-art technologies for rehabilitation as part of the event. The venue was Medical Park Bad Rodach, one of the most modern neurological rehabilitation centres in Germany.

Gunter Hölig, Head of Therapy at the Medical Park, presented the range of services offered by the clinic and in the technical part of his presentation he particularly addressed the economic aspects of device-based therapies. Personalised therapies in a group within modern therapy worlds enable the clinic to offer the highest medical and therapeutic standards while taking into account efficiency and use of resources.

Tobias Giebler then discussed the possibilities of device-based therapy in early rehabilitation in intensive care units. He is a physiotherapist at Tübingen University Hospital specialising in the treatment of ICU patients. His conclusion: "If rehabilitation doesn't start early, it will be expensive!" This is why guidelines have explicitly called for early mobilisation of critically ill patients. Using algorithm-based procedures, Giebler has proven that early mobilisation is "safe, feasible and effective". Taking into account current evidence, the young physiotherapist particularly pointed out the use of technical support systems such as the bed bike.

Christian Zange, Head of Physiotherapy at the Vamed Klinik in Pulsnitz, made clinical decision-making the subject of his presentation. There are now increasing numbers of therapy robots. But how are they used for the greatest benefit to patients? Patient motivation is a key yet often neglected attribute. According to the neurorehabilitation specialist, the art of using modern therapy devices is "to enable patients to experience movement in a positive and targeted way in order to encourage pleasure in learning". To this end, Zange firstly

presented some basic scientific studies on device-supported gait training and, based on these, gave the audience numerous practical recommendations for everyday use.

The focus in the afternoon on the first day of the event was treatment practice. In alternating workshops, the participants gained a deeper insight into the treatment processes in the clinic and learned about different robotic systems in everyday clinical practice.

Dr Carsten Clewig opened the second day of the congress. The Head of MEDIAN Saale Klinik Bad Kösen discussed setting up device-based group therapies in a geriatric setting, where care management is particularly complex and generally ill-defined on a diagnostic level. As part of his presentation, the experienced neurologist gave a differentiated meaning to the term multimorbidity and explained: "Gait rehabilitation in geriatrics only works if it is clear where the disorder is coming from." This is where doctor and therapist at the specialist clinic in Bad Kösen work closely together to design an effective dual care approach.

Sabine Lamprecht then pointed out that therapists must see themselves more in the role of a coach during the treatment process. "Patients themselves are the key to success," according to Lamprecht. The experienced physiotherapist and Master of Science in Neurorehabilitation with her own practice near the city of Stuttgart made it unmistakeably clear that modern physiotherapy must move away from "measures to integrate the pelvis" and go over to "practising walking under participatory aspects". She referred, among other

things, to the ICF framework and said: "The implementation of guidelines in everyday practice is possible if we deal with it!"

Gabriele Buchstein then bridged the gap between evidence and empiricism. The lead physiotherapist at Sauerlandklinik Hachen and her team specialise in the treatment of patients with multiple sclerosis. The therapists there combine traditional treatment approaches with modern procedures using gait trainers. Movement analysis systems are used to examine different gait qualities. The results are used for continuous adjustment and therapy optimisation.

Dr Christian concluded the presentations. He highlighted new potential in the treatment of stroke patients in neurological rehabilitation, while taking into account the guideline on Rehabilitation of Mobility after Stroke (ReMoS). The ReMoS guideline was first published in 2015 and forms the basis for an evidence-based design of motor therapies to improve walking ability, walking speed, walking distance and balance in post-stroke patients.

Unfortunately, the recommendations in the guideline are not always used systematically in practice. A digitisation project, officially launched in early 2019 by the authors' group, intends to make the recommendations accessible via a "smart" app and at the same time serve as a framework for continuous updating to make it a living guideline.

SCIENCE

Bed trainer customer survey

How do product features and characteristics of the THERA-Trainer bemo affect the customer satisfaction of potential target customers? A mixed methods market research study.

J. Tiebel, O. Bahrs, T. Oppacher, A. Mertgens, J. Puhlmann, E. Wehlan, O. Kayser, M. Fassbender, B. Heinze

Background

The empirical determination of the performance and enthusiasm factors of a product are an essential part of market research for product development. In methodological terms, subjective methods based on the perceptions and wishes of the target groups have proven their worth in this context. Feature-based procedures also enable us to determine those product features that lead to particularly high customer satisfaction.

DOI: 10.6084/m9.figshare.11310449

Objective

This market research study investigates the measurement and analysis of customer satisfaction with regard to a new cycling medical product of medica Medizintechnik GmbH, the THERA-Trainer bemo. To date, there has been no detailed investigation – and consequently no precise information on the relationships between customer satisfaction and various performance criteria that customers can experience and assess with this new product. Therefore, the question investigated asks which performance criteria lead to a high level of product and customer satisfaction, which interdependencies exist between individual satisfaction dimensions and whether product performance can be identified, which may possibly be important in explaining customer satisfaction in terms of other products.

Methodology

The investigation is based on a partially standardised written survey. In order to identify favoured product features and associated customer satisfaction, a mixed methods design survey was conducted among potential target customers during initial product presentations using an adapted form of the Quebec User Evaluation of Satisfaction with assistive Technology questionnaire (QUEST). The QUEST questionnaire is an instrument that has been specially developed to assess customer satisfaction with the use of a technical tool [1]. The qualitative survey in the context of the mixed methods design was carried out corresponding to the individual items and scales of QUEST.

Results

In total, the data from 81 questionnaires, which was collected during 52 customer visits, was included in the evaluation. The quantitative analysis shows that 1) usability, 2) regulation and 3) safety are by far the most important performance factors of the product (Fig. 1).

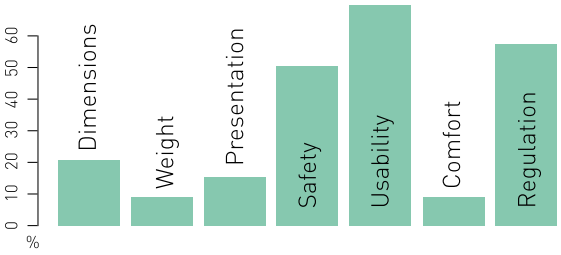

Fig. 1: Frequency of individual performance factors in the histogram: usability, regulation and safety are the most important performance factors of the THERA-Trainer bemo according to the quantitative analysis.

Usability and regulation also describe the second and third highest enthusiasm factor from the customer's point of view with 92% and 91% respectively. Safety also scores positively at 85% taking all scales into account, but is ranked only six out of eight in the overall assessment (Figs. 2 and 3).

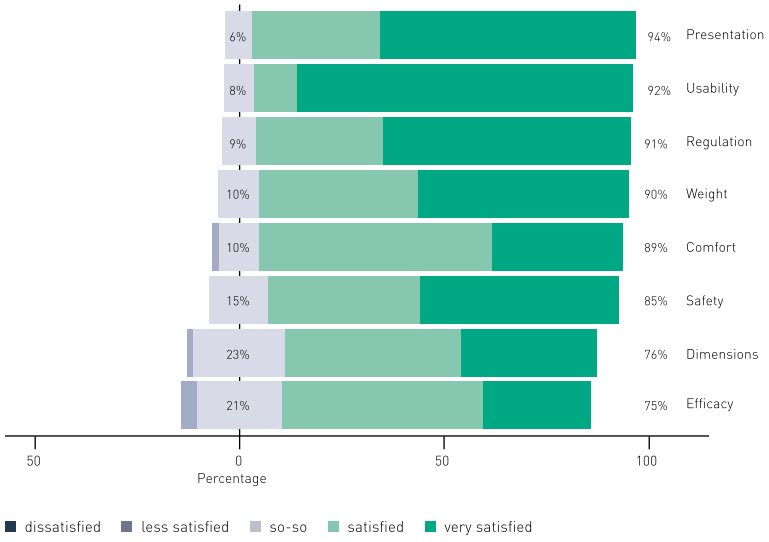

Fig. 2: Satisfaction based on QUEST enthusiasm factors as described. The subjects rated each factor using a four-point Likert scale (1 = dissatisfied, 5 = very satisfied). The corresponding cumulative scores are given in percent.

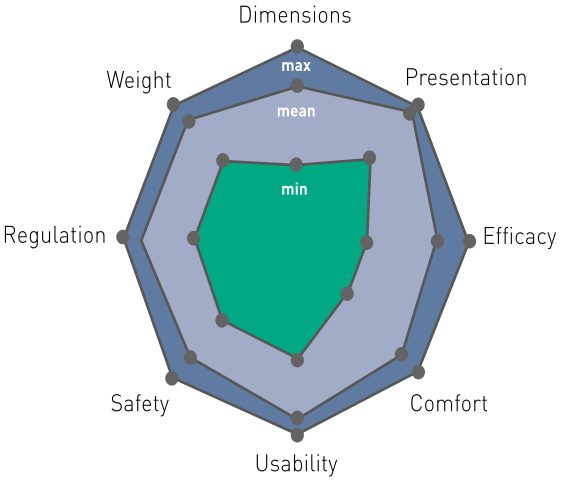

Fig. 3: Network diagram with information on minimum (green) and maximum (dark blue) values of individual dimensions and the median (light blue).

The results of the qualitative analysis show frequent criticism of the product dimensions. When considering the enthusiasm factors, this characteristic comes in second to last place, although it should be noted here that 76% of those surveyed rated the dimensions of the product as "satisfactory" with a median of 4 (min = 2, max = 5) out of 5 points. The quantitative results coincide with the qualitative statements of the respondents and complete the overall picture accordingly (Fig. 4)

- "Easy settings"
- "Very easy to handle"
- "Short setup time"
- "High level of safety features"
- "Super easy to disinfect"
- "Same accessories as the tigo"
- "Super easy to change accessories – high variability"
- "Very nice design"
- "Very easy to transport (also fits into small spaces and over ICU beds with a frame)"
- "T.assist is a good USP to attract attention"
- "Compatible with Thekla mobilisation and wheelchair"

Fig. 4: Selection of qualitative statements of the respondents

Conclusion

The THERA-Trainer bemo is considered to be of high quality after initial presentation to customers before market launch. Customers are particularly interested in safety, regulation and usability. It should also be noted that all dimensions score at least "good" overall. Despite existing criticism of the device's dimensions, the qualitative feedback reflects "ease of transport" and the possibility of using the device even when space is limited.

Thank you!

The authors would like to thank all survey participants for their open and honest feedback.

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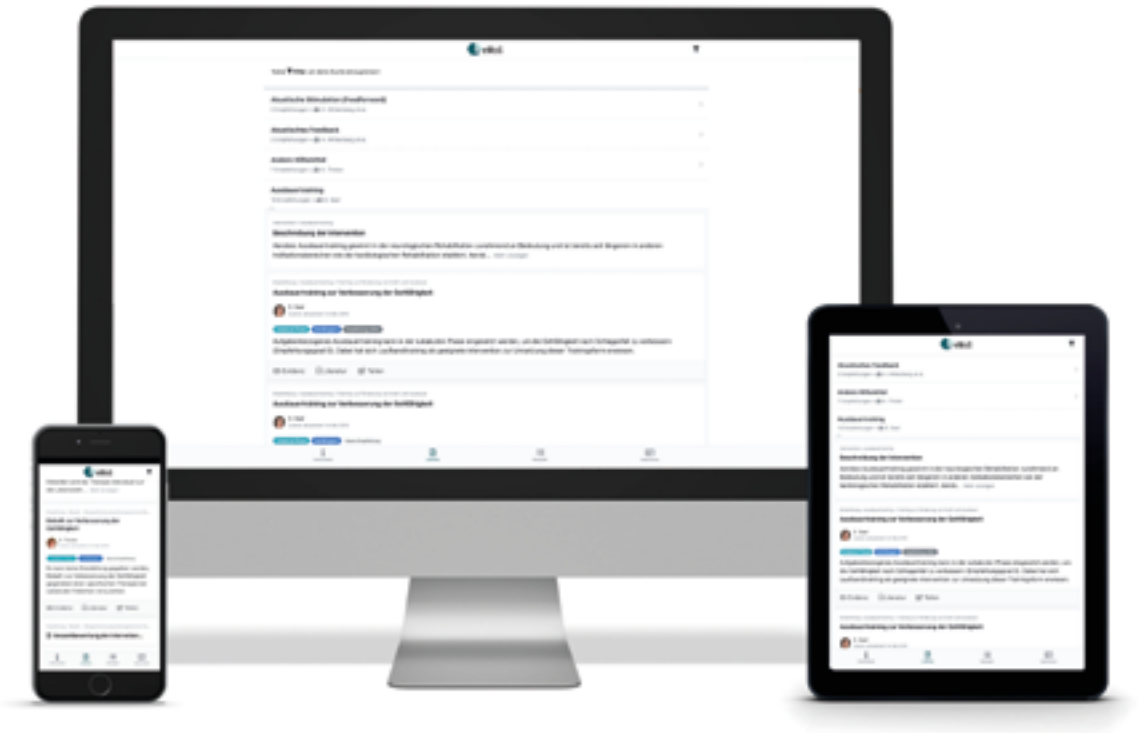

SCIENCE

Guidelines in app format

Jakob Tiebel

Distributing the contents of a guideline is a challenge. Although the guideline on Rehabilitation of Mobility after Stroke (ReMoS) was published four years ago, not many practitioners are aware of its contents. Its rigid format and length are discussed as barriers. For practitioners, it is difficult to extract core statements relating to practical application from 150 pages of text with over 280 recommendations. There is increasing demand for a digital, mobile format so that the guideline can be used flexibly on difference devices.

The Deutsche Gesellschaft für neurologische Rehabilitation (German Society for Neurological Rehabilitation) will in future offer the ReMoS guidelines as a web application with additional features for personalised use. Users will be able to access the relevant guideline information that concisely summarises the body of research and can be used to support everyday clinical decision making within seconds.

The ReMoS app provides therapists with quick access to the guideline contents. In addition, the latest version of the recommendations can be added, which means that the digital format corresponds to the model of a "Living Guideline".

remos.dgnr.de

eMoS
Empfehlungen für die Therapie
Rehabilitation der Mobilität nach Schlaganfall

Early rehabilitation – training critically ill patients in intensive care units begins early

For faster regeneration in intensive care units, it is essential that critically ill patients are mobilised as soon as possible. The current guideline on "Positioning therapy and early mobilisation for the prophylaxis or therapy of pulmonary dysfunctions" of the German Society of Anaesthesiology and Intensive Care Medicine [1] recommends that patient mobilisation should begin within the first three days after admission to the intensive care unit and should be carried out twice a day for at least 20 minutes using an algorithm.

Tobias Giebler

Why is it essential for therapy to start quickly?

Immobility, the result of a lack of early mobilisation, has plenty of negative effects on the body. For the cardiovascular system, it means that the resting heart rate increases, the vascular system loses the ability to react adequately to changes in position (orthostatic hypotension) and the risk of developing thrombosis also increases. The musculoskeletal system quickly starts to atrophy. In addition to muscle atrophy, the bones also lose stability, the joint cartilage is under-supplied and the capsular ligaments shrink. The consequences are long-term restricted movement and painful changes in the joints. In terms of the lungs, immobility means reduced ventilation, usually in the lowest areas. The consequences can be a blockage of the secretory duct, the formation of atelectasis and dystelectasis, and ultimately the development of pneumonia. The central nervous system also atrophies if it is not required.

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Psychological stress also occurs; the incidence of depression, fear, anxiety disorders and delirium increases. PTSD (post-traumatic stress disorder) is often a late complication. Immobility also has negative effects on other organ systems such as the metabolism, the endocrine system, the kidneys and the gastrointestinal tract.

The German guideline has formulated its objectives accordingly. This states that mobility should be promoted in order to prevent the negative effects of immobilisation with the aim of improving the long-term outcome [1].

Early mobilisation can therefore be considered as a multi-potential concomitant therapy in intensive care units with an extremely attractive correlation between positive effects and benefits, as well as the costs.

Evidence-based effects are reductions in:

- Delirium, a neuro-psychiatric syndrome with states of confusion affecting 80% of intubated patients. In addition, one-year mortality per day of delirium increases by 10% [6]
- ICUAW (Intensive care unit acquired weakness), a neuromuscular organ failure with muscle weakness extending to plegia and a mortality of up to 60% [6]
- Ventilation time [6]
- ICU length of stay [5]
- Mortality [5]

In addition, the long-term outcome and retention of motor skills and functional strength can be improved. This creates the option for patients to return to an independent and autonomous life. [6]

At the cellular level, pro-inflammatory cytokines are inhibited when anti-inflammatory messengers are simultaneously activated (e.g. IL 10). Glucose uptake into muscle cells is also facilitated. [6]

According to Morris [5], a study with 330 patients who were intubated for more than 24 hours compared to standard therapy showed the following effect of protocol-supported early mobilisation during the daily sedation breaks:

	Inspection	Intervention
Stay in ICU (d)	6.9	5.5
Stay in hospital (d)	14.5	11.2
Mortality (%)	18	12

Concerns about patient safety are repeatedly raised as arguments against early mobilisation. However, a systematic review with meta-analysis [7] showed that early mobilisation is safe to carry out. In 23,000 mobilisations, there were only 2.6% adverse events such as decreased oxygen saturation, of which only 0.3% resulted in an increase in blood pressure increasing medication.

Early mobilisation guideline

The risk from early mobilisation can therefore be considered negligible, but in any case the opportunities outweigh the risks. So how can it be implemented?

The ABCDEF bundle [4] is an evidence-based guide for clinicians with the aim of specifying organisational changes conducive to improved recovery and outcomes for intensive care patients. It explicitly refers to mobilisation.

The letters stand for the following:
A = Assess, prevent, and manage pain
B = Both spontaneous awakening & breathing trials
C = Choice of medication management
D = Delirium
E = Early mobilisation & exercise
F = Family engagement and empowerment

At a glance

Summarised

1. Critically ill patients should be mobilised promptly – if possible within the first three days. Bed bicycles can be useful aids and make work easier for therapists.

2. Early mobilisation, even in intensive care units, has many positive effects – among others, it reduces ventilation time, length of stay in intensive care units and mortality rates. The probability of returning to an independent life increases.

3. A lack of exercise leads to a higher resting pulse and an increased risk of thrombosis and has negative effects on bone stability and metabolism. Overall, immobility can lead to movement restrictions in the long term.

The main focus here is early mobilisation. It quickly becomes clear, however, that all other points cannot be excluded. For example, an optimal pain and ventilation situation is essential for mobilisation and often has to be adjusted during the process. Within this broader approach, it also becomes clear that early mobilisation is an interdisciplinary task.

It requires close consultation, a shared will and goal, as well as interdisciplinary evaluation, in order to successfully support the critically ill patient in an optimal way. The patient is also part of the treatment team and should be involved in this process as soon as vigilance allows.

A systematic approach to planning mobilisation is recommended [1]. This is where checklists are used, rather like in the aviation industry. Cancellation criteria are defined at the same time and the current mobilisation stage is determined from the checklist evaluation.

In terms of practical implementation with the patient, early mobilisation [1] is subdivided into three groups:

1. Passive mobilisation
2. Active-assisted mobilisation
3. Active mobilisation

Determining which subgroup the patient should be assigned to is done through the evaluation process in preparation for mobilisation. Vigilance and the checklist result are critical here. The stage can then be expressed in the ICU Mobility Scale [6]. A practical example: A post-operative cardiac patient who is responsive and with no exclusion criteria for early mobilisation is assigned to active-assisted mobilisation and an ICU Mobility Scale of > 3 (at least sitting over edge of bed).

The Borg Scale, for example, is suitable for controlling exertion and breathing effort [8]. A value of 4 – 7 BS is a proven target range.

Focal points of passive mobilisation

- Passive movement in functional patterns
- Promotion of sensory perception with various stimuli and senses (thermal, mechanical, acoustic, vestibular)
- Respiratory therapy in various positions; secretolysis if present, thoracic mobilisation, improvement of ventilation in poorly ventilated areas
- Bed bicycle passive

Focal points of active-assisted mobilisation

- Promoting the beginning of independent activity and using therapeutically
- Assistive movement – if possible, with meaningful actions, e.g. bringing small sticks with water to the mouth
- Developing movement transitions, using the patient's potential
- Mobilisation in the assisted seat
- Developing core stability, a prerequisite for all higher starting positions.
- Verticalisation, initiation of standing
- Promotion of sensory perception and cognitive training
- Respiratory therapy

Focal points of active mobilisation

- Resistive exercises – according to personal preferences (fun as motivation)
- Practising active movement transitions → Independence
- Bed bicycle active
- Standing and gait training
- Any form of handling can be used → Training aspect

According to guideline [1], the bed bicycle should be used in all stages of mobilisation, because it combines many positive effects for the patient. Mobility is maintained and promoted, the cardiovascular system is stimulated, oxidative stress can be reduced and the lymphatic system is stimulated. In a study by Burtin [2], standard mobilisation was compared with standard mobilisation and 20 minutes of bed bicycle daily. The 6-minute walk test at discharge showed a clear difference in the patients' walking ability: 143 m vs. 196 m, so the walking distance could be increased by 37%. This method of early mobilisation can be used as a good supplement, for example for a second training session a day, as the time required for installation is minimal.

The patient in focus

In summary, early mobilisation is a challenging team task that requires a high level of motivation of all involved and aims to enable the patient to return to an independent life. Only when all the disciplines involved evaluate and plan together and have a common goal can this task be optimally solved. This requires a systematic approach, good planning and consistent, attentive implementation.

Here, the focus must be on the patient, they must always feel safe, well looked after and involved. The surrounding atmosphere plays a decisive role, especially for patients who are not yet fully oriented. The patient needs clear, short instructions. Since processing is usually slowed down, the time for reaction must be created.

Last but not least, the provision of personnel and technical aids is crucial. If it is possible to perform the most essential tasks, such as medication administration and monitoring with intervention, early mobilisation as an additional task may not be reasonable for intensive care staff. Well planned and cleverly introduced, early mobilisation can also be positively received. The time of mobilisation can be connected, for example, with personal hygiene or the positioning of the critically ill patient. This is an immediate relief of work for the nursing staff.

However, even the most resourceful staff cannot replace missing aids such as bed bicycles, suitable mobilisation chairs and transfer possibilities.

The topic of early mobilisation has developed considerably in recent years, but still offers much more potential. The data situation regarding the positive aspects of early mobilisation is clear, it saves considerable resources in everyday hospital life over the long term and, above all, enables each individual patient to lead an independent life in the long term. In the interests of economic efficiency and patient well-being, it would therefore be welcome if the topic were taken seriously and the technical equipment improved with appropriate aids.

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Tobias Giebler graduated as a physiotherapist at the University Hospital of Freiburg in 2013. Due to his several years of working as a paramedic in the emergency services, he already brought knowledge in dealing with ICU patients into his physiotherapeutic training.

He has been working on the topic of early mobilisation in intensive care units at the University Hospital of Tübingen for 6 years.

Part 1
of the expert report

THERAPY & PRACTICE

Expert report on postural control

We all live with gravity – usually without thinking that we might fall. This is prevented by an integrated posture control mechanism. The first part of our expert report deals with two of four concepts of postural control: Alignment and orientation.

Marc Michielsen

Postural control is defined as "the ability to control the body position in space for stability and orientation" [13]. We often take this for granted, because we usually do not have to think about it at all. We only realise it when we see the risk of losing it.

The processing mechanism of postural control must solve two fundamental problems: Orientation and balance of the supporting apparatus. We must continuously control the movement of our body via a more or less stable supporting surface. The task of postural balance involves the coordination of movement strategies in order to stabilise the centre of body mass during self-induced and externally triggered disturbances of balance.

Postural orientation involves the active alignment of the back and head in relation to gravity, support surfaces on which the person stands, the visual environment and internal references. The visual environment is involved to

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maintain balance and the body is stimulated to perform tasks more efficiently through memories. If the postural orientation is missing, the body would move like a puppet with too much leeway. Therefore the postural orientation controls the movement using precise sensor information. For it to be successful, senses that are distributed over the entire body are integrated.

After a stroke or similar illness, the underlying neurophysiological system that controls posture is impaired. Knowledge of these systems helps therapists to improve their patients' balance and mobility, thus preventing falls and laying the foundations for certain efficient activities.

The systems approach of Bernstein (1967) was expanded by Shumway-Cook and Woollacott (2007), who emphasised that human motor behaviour is based on continuous interaction between the individual, the task at hand, and the environment. Postural control is located at the intersection of these three domains (Fig. 1).

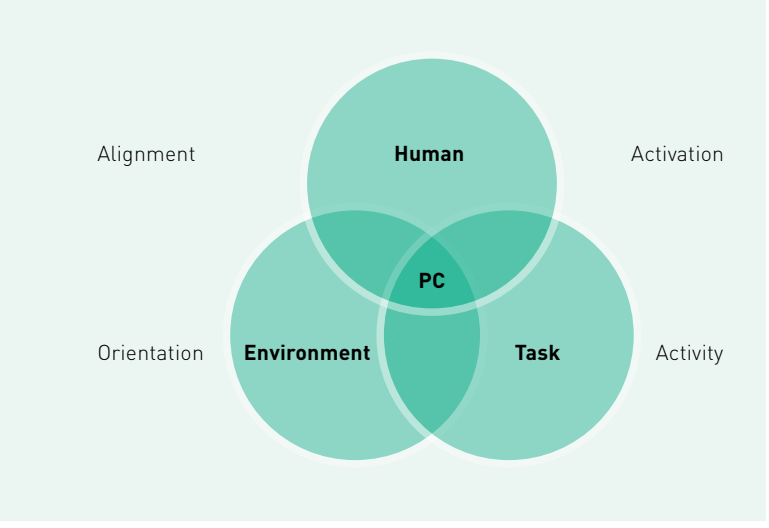


Fig. 1: In order to structure the assessment of postural control and movement, the concepts of alignment, orientation, activation and activity can be helpful.

In order to structure the assessment of postural control and movement, it is helpful to look at the alignment of individual body parts, sensory orientation, postural activation and functional activity sequentially. We use these concepts to provide guidance for the assessment and treatment of patients with acquired brain damage.

At a glance

Summarised

1. Postural control is concerned with orientation and balance of the supporting apparatus. The movement of the body must be continuously controlled by precise sensor information.
2. To structure the assessment of postural control and movement, the concepts of alignment, orientation, activation and functional activity can be helpful. Knowledge of these systems helps therapists to improve the balance and mobility of their patients.
3. The sensory orientation should be trained in order to be able to perform more precise movements. By analysing the postural alignment, the therapist can assess how a patient will move after therapy.

Alignment

The analysis of postural orientation is an important element in the clinical evaluation of stroke patients. The alignment of body parts contains information about symmetry, verticality and willingness to move. In this way, the therapist can measure how the patient's posture counteracts gravity, how they have moved before and how they will move. These hypotheses can only be made if the proprioceptive interaction with the environment and within the task is taken into account.

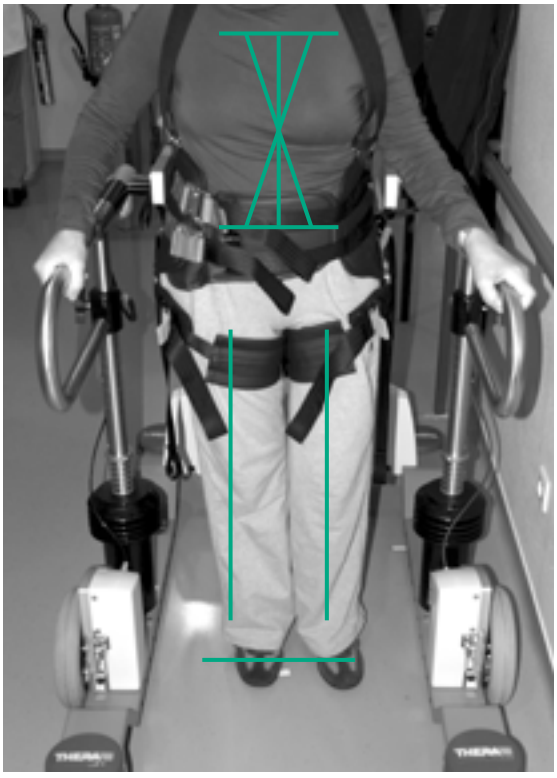


Fig. 2: THERA-Trainer e-go and alignment

The importance of appropriate alignment is evident in the biomechanical properties, neurophysiological organisation and cardiorespiratory endurance.

The postural muscles should be able to work under low energy input to maintain postural control over a longer period of time and adapt to changing support surfaces. Through the appropriate alignment of the body parts, the postural musculature is biomechanically moved into the right area to work with minimal effort.

From a neurophysiological point of view, it is known that motor neurons do not "know" muscles, but instead recognise the movement pattern. Due to the nature of this neuronal organisation, relearning movement patterns is a more important goal than relearning individual muscle contractions. Cortical neurons change the initial value of the fire rate while waiting for a certain movement to occur. Creating a postural set (see Box 1), i.e. aligning body parts in a certain posture, thus increases the probability of neural fire.

Cardiovascular or cardiorespiratory endurance refers to the ability of the body to perform endurance dynamic exercises involving large muscles at moderate intensity. In stroke patients, maintaining an active posture over a longer period of time is a cardiovascular challenge. Patients in a stroke rehabilitation clinic spend 74% of their "active" day sitting or lying down [14]. They spend long periods of time in unsuitable positions [3]. A certain level of fitness is required to participate in the basic activities of everyday life. People who suffer from a disability after a stroke have to spend more energy on many physical activities [7]. During the acute stage of a stroke, postural activities are real challenges. Since the energy required for this is limited, it leads to misalignment and impairment of postural preparation. This in turn leads to poor postural control and restriction of functional activities.

Sensory orientation

In order to understand postural control as an ability, it is important to examine the task and its requirements on a moving body. The body is brought into a vertical position against gravity and correctly aligned with the aid of the support surface and according to the task. For reasons of efficiency, the brain uses a network of various sensory impressions.

Body schema

The body schema is composed of various sensory information and is updated accordingly. In therapy, an important goal is to update the patient's internal reference system by providing precise, goal-oriented input. An updated body schema improves the efficiency of movement and increases the patient's ability to interact with their environment and carefully select specific tasks.

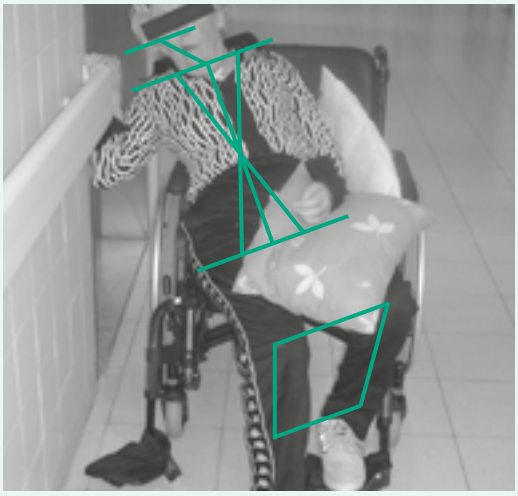
In the more recent literature, the body schema is described as an internal model, which is considered

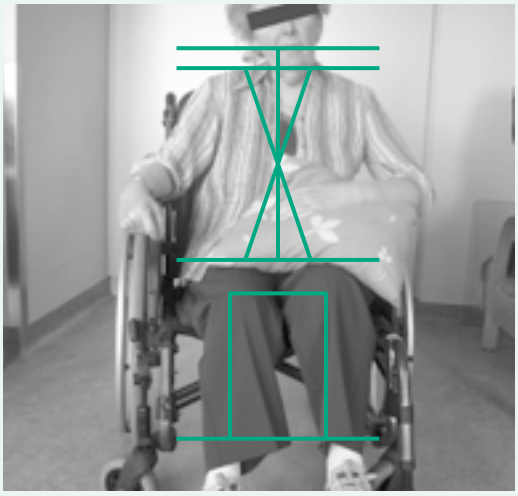
a general neural process. It links information from sensory sources and combines incoming and outgoing information. [11] Thus it has the characteristics of a processor. The advantage of an internal model is that it can predict the future, so to speak. The brain can use the body schema to make calculations to develop plans for the future. In doing so, it is dependent on information that it receives continuously. An updated body schema improves the efficiency of movement and increases the patient's ability to perform a task in a stimulus-enhanced environment. The loss of sensory information, for example in stroke patients, prevents the continuous updating of the body schema and leads to an interruption of postural control.

Box 1: Postural set

A Bobath therapist analyses posture and movement and pays attention to the most important points in relation to each other and in relation to a particular environment. Important control points are areas of the body from which a movement can be effectively controlled [5].

The active alignment of important points within a posture are called postural sets. Examples of postural sets are active lying, sitting, standing, etc.





The postural orientation provides information about the willingness to move. Consider in which of the two situations it is easier to switch from sitting to standing.

Sensory processes

Each sensor generates input (receptor activity) about position and movement of the body. This multisensory input is processed by the brain and thus becomes information. The perception process informs the brain about the position and activity of the body relative to the environmental conditions. Based on previous experience and the purpose of the intended movement, the brain chooses efficient strategies for postural control.

Sensory receptors and systems that are considered in connection with postural control are shown in Figure 3.

Visual system

In our everyday life we are surrounded by numerous horizontal and vertical references such as windows, tables or chairs. The subjective vertical view (SVV) gives an indication of verticality. Healthy people can perceive vertical lines very precisely thanks to their visual abilities.

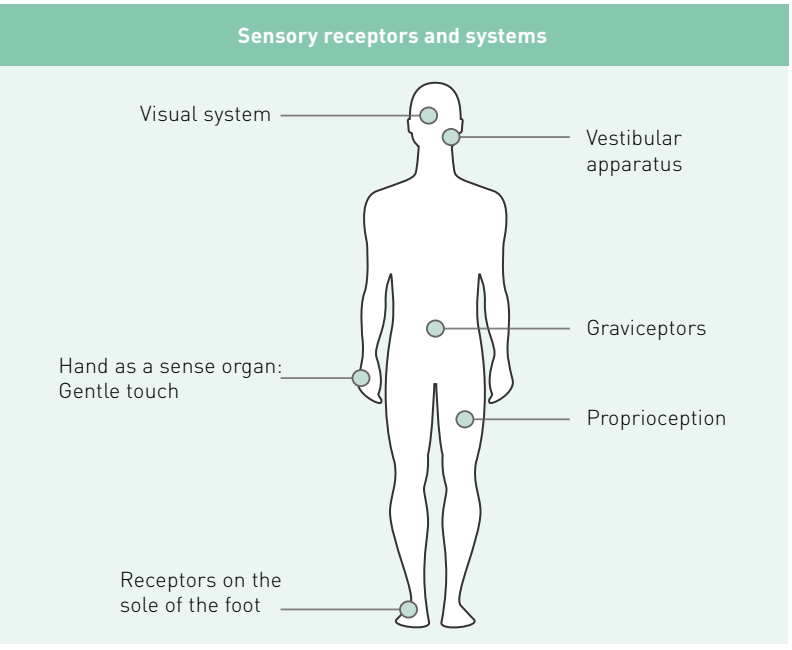


Fig. 3: Sensory receptors and systems associated with postural control

Another important contribution to the visual input for postural control is the optical flow. This refers to the perceived movement of the field of vision, which results from the movement of a person in their environment. On the one hand, the optical flow contains information about postural control by perceiving the faint movements resulting from body sway. On the other hand, it contains information about the organisation of the environment and indicates that closer objects move faster than those further away. By integrating different sensory systems, the body is informed whether it is moving relative to the environment or whether the environment is moving relative to the body.

Box 2: Core stability plays an important role in the accuracy of graviception.

The stability of the back depends on the correct combination and intensity of muscle activation and the generation of intra-abdominal pressure. Core stability is given by the activation of muscle groups in combination with abdominal reinforcement. Certain training methods that aim to strengthen the spinal stabilising muscles (trunk) must be taken into account in the movement sequences in everyday life, in sports injuries and in the rehabilitation of lower back pain. [1]

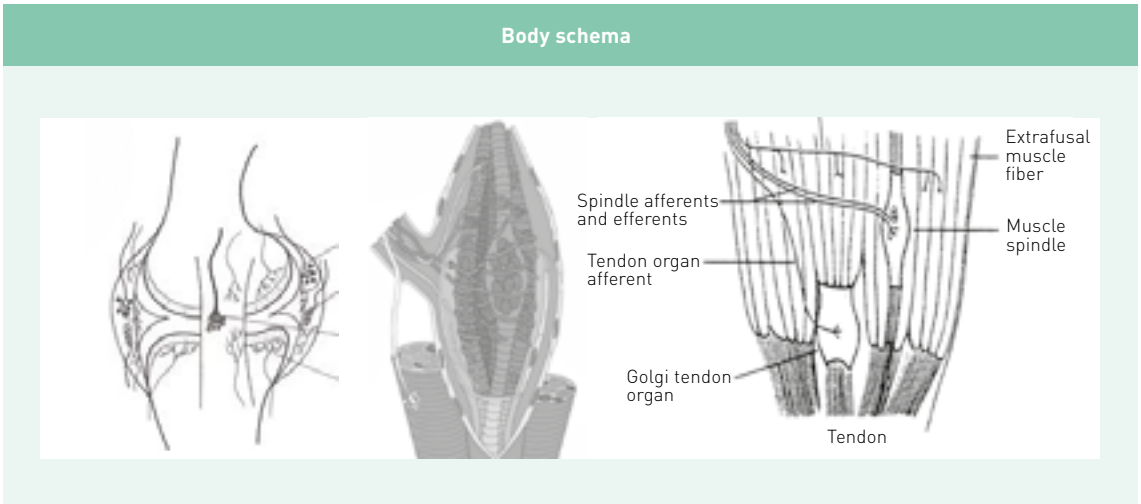


Fig. 4: Information from joint receptors, muscle spindles and the Golgi tendon organs together form the body schema.

Vestibular apparatus

Although there are no overtly conscious sensations from the vestibular organs, their signals contribute to an astonishingly large proportion of brain functions. [2] In a far more conscious way, the vestibular apparatus passes on information about egocentric and exocentric movements.

The main task of the saccule and utricle is to keep the head in a vertical orientation with respect to gravity. When the head and body tilt, the vestibular apparatus automatically steers against it with the correct postural adjustment. The vestibular information is strongly combined with visual input, eye muscle and neck proprioception.

Graviceptors

Somatic graviceptors are mediated by two clearly defined inputs. [10] The exact function of these inputs has yet to be clarified. Mittelstaedt describes that bilateral nephrectomy influences the perception of gravity in paraplegic patients. This means that receptors in the kidney can influence the perception of verticality. One hypothesis is that the second input comes from receptors in the large abdominal vessels. Gravity information can result from the inertia of the blood mass in these vessels.

A strong, efficient back can increase the efficiency of the input to the graviceptors. In stroke patients, a lack of trunk stability can lead to a decrease in the efferent dynamics of the medial descending nerve tracts and influence the accuracy of the graviceptors, resulting in a reduced perception of gravity.

Gentle touch as a supporting aid

Lightly touching a firm surface with the hand provides orientation or reference that enhances control of upright posture by increasing axial tone [6, 12]. Kouzaki (2008) points out that the reduced postural swaying when standing still while lightly touching a firm surface is due to the tactile feedback of the fingers and not to mechanical support. These findings support the importance of activating the hand as a sensory organ. The concept of light touch cannot be stressed enough. If a patient can support their weight with their upper limbs, postural reactions include the extensor muscles of the arm and not those of the legs. [9] In other words, in the latter case the arm is used as a leg, so to speak. If, however, the hand is not part of contact-based therapy, patients miss an opportunity to orient themselves in relation to their surroundings. A "wake-up call" to activate the receptors in the hand

and a well-chosen object from the surroundings can improve sensory perception.

Proprioception

Information from connected receptors, muscle spindles and the Golgi tendon organs are of utmost importance for constructing and updating the body schema.

Most of the joint receptors fire at the end of the joint movement. Muscle spindles provide proprioception information on the length and rate of muscle length change. This information is transmitted to the spinal cord, the cerebellum and the cortex. They provide information on muscle tension. Golgi tendon organs have a low stimulation threshold (and therefore high responsiveness) to trigger an active muscle contraction and a high threshold (or no response) to stretch the muscle.

An important condition for these receptors to work properly is the contraction of the muscle. Paresis or paralysis of a muscle has a negative effect on the function of the Golgi tendon organ, whereby muscle spindles prevent or slow down the updating of the body schema. In stroke patients, it is important to activate the muscles to regain the efficiency of the proprioceptive input and thus update the body schema. The concept is based on the method "Use it or lose it".

Receptors on the sole of the foot

The main receptors responsible for stress are the Golgi tendon organs and the cutaneous receptors on the sole of the foot. [4]

There are over 104 different cutaneous mechanoreceptors on the smooth skin of the sole of the foot. These mechanoreceptors play an important role in balance and movement control. The tactile afferences of the feet provide the CNS with information about the body position with respect to the vertical axis, which determines the posture in space and the ground on which the feet stand. Tactile sensitivity can be understood as an exteroceptive modality. With regard to postural control, tactile inputs from the sole of the foot have a proprioceptive function that contributes directly to the body's representation. Kavounnoudias (2001) concludes that the regulation of small amplitude fluctuations of the body is mainly due to tactile inputs from the sole of the foot.

Box 3: Summary

Therapists can "add" information through special treatments of important areas. These specific grips aim to reach the receptor threshold by temporal or spatial summation. For example, stimulation to maintain abdominal reinforcement and deep proximal ischiocrural muscles leads to improved hip stability.

Box 4: Treatment of structural problems of the foot

The treatment of structural problems such as stiffness and swelling affects the availability of high-quality proprioceptive information. Mobilisation of the foot, care of foot swellings, sensory stimulation and active loading of the foot are treatment measures that aim to maintain the foot as part of the body schema so that it does not lose its important role in postural control.

Read more about activating the postural control mechanism in the next issue.

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Marc Michielsen studied physiotherapy at the University of Leuven, Belgium, and is also an advanced Bobath instructor. His speciality is neurological rehabilitation, especially after a stroke. After several positions as a senior physiotherapist at various hospitals, he has been working as head of the emergency service at the rehabilitation centre of Jessa Hospital since 2008. Michielsen has already published several articles, abstracts and other scientific publications in renowned scientific journals.

Learn more about activating the postural control mechanism in the next issue.

Are you interested in postural control? Read more about balance disturbances and therapy in issue 1/2019.

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Part 2
Parkinson's disease

THERAPY & PRACTICE

Training in neurology and geriatrics

Using various neurological and geriatric clinical pictures, we want to show how effective training can be designed. In this instalment we will deal with Parkinson's disease (idiopathic Parkinson's disease), a very common neurological clinical picture worldwide. Neurological diseases are now the most common causes of disability.

Sabine and Hans Lamprecht

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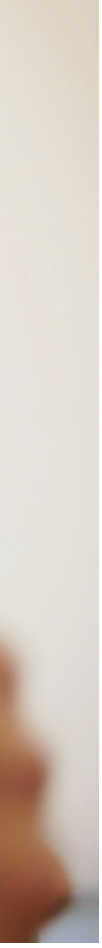

Parkinson's disease is the disease that is increasing most in the population, more so than Alzheimer's dementia and others. From 1990 to 2015, the prevalence and thus the number of people with Parkinson's disease more than doubled. [3] The number of people with Parkinson's disease will also increase from 6.9 million to 14.6 million between 2015 and 2040. [2]

James Parkinson, the first person to describe Parkinson's patients, described in his essay "An Essay on the Shaking Palsy" in 1817 that patients had involuntary, trembling movements combined with reduced muscle strength. [5]

The prevalence of Parkinson's disease is strongly age-related. Most patients fall ill between the ages of 58 and 62. The prevalence among over 65-year-olds is 1,800/100,000 persons with an increase of 0.6% per year up to a prevalence of 2,600/100,000 among persons between 85 and 89 years of age. There are no gender-specific deviations. [1]

Parkinson's disease therapy must be interdisciplinary

The clinical picture has very different symptoms and courses. Drug therapy is fundamental; an interdisciplinary approach is essential. This includes activating physiotherapy and occupational therapy, specialised speech and swallowing therapy and much more. Physiotherapy with emphasis on gait training, balance exercises, strength and stretching exercises as well as fall prevention receives the highest recommendation level in the guidelines of the German Neurological Society and in the European physiotherapy guidelines. People with Parkinson's disease need a specific approach to physiotherapy and occupational therapy, which should be based on evidence-based knowledge, independent of concepts. The above-mentioned guidelines help us to do this.

Development and therapy in phases

The symptoms of Parkinson's disease are caused by a disturbance in the extrapyramidal system and the basal ganglia. Dopaminergic cells die in the substantia nigra, resulting in a lack of dopamine and an excess of acetylcholine in the striatum.

At a glance

Summarised

1. The number of people suffering from Parkinson's disease is currently increasing and will continue to do so in the coming years. In spite of different symptoms and courses, the DGN guideline always recommends gait training, balance, strength and stretching exercises as well as fall prevention.
2. The training should be adapted to the stages of the disease and should sensibly take place with the support of therapy equipment such as gait, balance and movement exercisers.
3. Both gait and movement training should take place at the highest possible step frequency or number of revolutions.

Hypokinesia, bradykinesia and akinesia are the main symptoms of Parkinson's disease. Cardinal symptoms are rigor, tremor and the disruption of postural control.

Therapy and training should take place in the on-phase [4] and be adapted to the stages of the disease. Non-medical therapy – physiotherapy, occupational therapy, speech therapy – should focus on the symptoms that cannot be influenced by medication or DBS (deep brain stimulation) or cannot be influenced sufficiently. These symptoms are speech disorders, balance disorders, and complex gait and posture disorders.

In the early phase (Hoehn & Yahr 1 to 2) the patient has only minor disabilities and the therapy focus should be in the area of avoiding inactivity and lack of movement, avoiding fear of movement and falling, and improving or maintaining physical performance (condition, muscle strength, voice volume, dexterity). A high-intensity treadmill training with a load of about 80% of the maximum heart rate has shown that the ability to walk,

measured in the UPDRS (Unified Parkinson's Disease Rating Scale) motor evaluation, could be stabilised within 6 months. [7]

In the middle phase (H & Y 3 to 4) patients increasingly notice disabilities and balance problems. Walking is affected and the risk of falling increases. In this phase, the therapy focus is on maintaining and improving everyday activities. Furthermore, the improvement of posture and fine motor skills is important. Speaking and swallowing should be treated by speech therapy, and walking and balance, especially reactive balance, must be trained intensively.

In the late phase (H & Y 5), patients are increasingly dependent on outside help, mobility is more and more restricted and patients are dependent on a wheelchair or bedridden. [6] The focus of therapy is now concentrated on training transfers; fall and injury prophylaxis are becoming more and more important, and communication possibilities must also be practised. Important aspects are of course also the avoidance of aspiration and contractures, the prevention of bed sores and, if necessary, palliative measures.

Gait training for Parkinson's disease patients

Gait training with a treadmill for Parkinson's patients is indispensable to train gait speed and dual tasking. Gait endurance can also be ideally trained by using a treadmill. With the gait trainer lyra from THERA-Trainer, walking speed, stride length, balance and dual task as well as endurance can be trained. When it comes to walking speed, it is important that you can reach speeds of over 3.0 km/h in the gait trainer. Of course this has to be adapted individually. However, only by demanding higher speeds can you achieve a targeted speed training with an improvement in walking speed. If you want to train more endurance, you should also walk as fast as possible, but the focus is on gait endurance. Here, interval training has proven to be very effective, where you take short breaks and then continue. The patients take a break in the lyra by simply placing a stool in the device to allow them to sit. During balance training it is essential that patients do not hold on to anything – not even to the training device itself. TheraBands, which the patient can hold on to, help in this process. These make it possible for the patient not to hold on permanently while walking. Now dual-task training can be done as an improvement by asking the patient to find things in the room, to calculate, to count backwards or to report fluently about events.

Regular standing and movement training

With a movement exerciser, training should be done with little resistance and the highest number of revolutions. It is important here to do regular training, preferably three times a day at least three times a week.

In the standing frame balo, even severely affected patients can practise reactive balance and lunges in secured positions. In addition, postural difficulties can be specifically trained or the muscles can be stretched as actively as possible in the balo in a secure position. When stretching, it is important that the patients stretch as much as possible, for example the pectoralis and the entire flexor chain of the upper extremity and hands, similar to the BIG exercises. Likewise, ischiocrural or calf muscles can be actively stretched in the balo. The shifting can be used, for example, to stretch the calf even more intensively in a step position or the hip flexors of the other leg. Active stretching in severely affected patients is very possible in the balo. In addition, swallowing or speech therapy can also be done in the standing trainer, as the upright body position supports this. Of course, for severely affected Parkinson's patients, as for other severely affected patients, standing is an essential therapy

approach that should be carried out daily and in which many prophylactic measures are cumulative. The same applies here: daily standing of one hour is recommended.

Gait, movement and standing frames such as lyra, tigo and balo can be used individually, specifically and sensibly for Parkinson's disease patients, depending on the phase of the disease.

LITERATURE

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Sabine Lamprecht completed her physiotherapy exam in Berlin in 1982. Since then, she has completed various further training programmes. In 2006 she obtained her Master of Science degree 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.

Hans Lamprecht has also been working as a physiotherapist since 1982. He founded the Kirchheim regional group in the Baden-Württemberg Association of Physiotherapists.

In 1987, Sabine and Hans Lamprecht opened their own practice together.

TECHNOLOGY AND DEVELOPMENT

Win-win in the rehabilitation market

Increasing cost pressure is forcing stakeholders in the rehabilitation market to focus on core competencies. Not only hospitals are affected, but also medical technology. Partnerships between hospitals and industry can help both sides. Jakob Tiebel explains in an interview how not only industry but also the hospital market can benefit from co-operations.

Interview: Melanie Grom | Photos: Charlotte Spieß

Grom: The increasing focus of hospitals and rehabilitation facilities on core competencies and strategically important fields of business, together with increased competition and cost pressure, has intensified the search for cross-sector partnerships and co-operation. The focus is not only on the adjacent care areas, referring doctors and cost bearers, but for some years now also increasingly on medical technology. How does this development come about?

Tiebel: Keeping pace with medical-technological progress and the associated financing risks provide the necessary incentives for this. The anchor point for cooperation is usually partnership development projects, which aim to develop advanced solutions for innovative therapies. Hospitals can thus underpin their image and position themselves as highly innovative. The experience and support of the industry helps to optimise and technologically support internal hospital processes. In return, medical technology companies gain insight into the structures and processes of a hospital and can optimally adapt their products and services to the needs of their customers. In this way, the joint recognition and promotion of innovations results in an incentive-contribution balance that leads to a win-win situation.

Grom: In a win-win situation, as a rule, all parties involved achieve a relevant benefit. This means that, as a rule, a positive balance of interests can be found for both sides. In the healthcare system, this often even has to take into account the effects on third parties. It is obvious that medical technology benefits from such cooperations. What are the advantages for hospitals?

Tiebel: First of all, the strategy must be geared towards sustainable success and long-term co-operation rather than short-term profit. Respect for the co-operation partner is the key and means listening carefully to the interests of the other party, understanding them and taking them sufficiently into account. A win-win situation can only be achieved if it is possible to articulate one's own interests. If such an exchange works on the level of interests, then medical technology even becomes an important link for hospitals, within the entire care network. If the advantages of co-operation are optimally exploited, hospitals will at best increase their strategic fit with referring doctors and cost bearers, and increasing process quality through innovation will ideally lead to a reduction in costs and an increase in the number of cases by exploiting economies of scale.

Grom: Does this mean that a rethink in medical technology is necessary?

Tiebel: Of course! In marketing, the focus has long since shifted from the product to the promise of performance and the relationship with the customer. Strategic partnerships thus also become the starting point for modern marketing considerations. In this context, medical technology in the healthcare sector will redefine itself in the future. The traditional view from inside the company to the outside must be supplemented by a view from outside to inside. Only in this way can performance promises be precisely aligned with the needs of customers and passed on accordingly.

Grom: This sounds as if the sale of the product is no longer the main focus. I can't imagine that for the life of me...

Tiebel: That's not true either. Of course, for a manufacturer, sales are the main focus. The question is whether an investment really makes sense for a customer. The seller's market situation that used to dominate the healthcare market in the past has long since been overcome. Service offers that are reduced exclusively to a simple sales proposal are at a disadvantage. It is about highlighting a unique value proposition for the customer, which they can at best pass on to their customers. This creates customer value chains which extend throughout the entire process of providing services and which are characterised by the interlocking of the stakeholders with each other and the exchange between them.

Grom: This means that when developing new products, the focus is not only on the hospital as a customer, but also on the patient and other entities?

Tiebel: That's right! For the development and also for marketing within such a value-added system, it means that in addition to hospitals as primary addressees, patients and their relatives, referring doctors, cost bearers and other stakeholders involved in the care process must also be considered as indirect addressees. Let's take a look at the range of services offered by the THERA-Trainer complete solution for gait rehabilitation: The hospital will be equipped with a modern, device-based therapy concept, which will result in an improved range of therapies for training walking ability, e.g. after a stroke, in a targeted manner. This is of interest to many rehabilitation facilities because the concept ensures an economic output and at the same time corresponds to the current state of science. However, this is of little interest to the patient and their relatives. In particular, they want to be guaranteed that everything possible is being done to restore the patient's independence and quality of life. It is interesting that the needs and value propositions are by no means contradictory. However, in order to implement this value transfer successfully, it is crucial to work closely with the customer within the framework of such projects in order to generate and make meaningful use of the knowledge regarding the value propositions of individual addressees. Then investments are worthwhile and potential can be optimally exploited. So it's a win-win.

SCIENCE

Mobilising elderly patients

Elderly and very elderly patients often have to give up their independence when an acute illness leads to hospital admission. This is by no means always the fault of the disease itself, but often the lack of mobilisation and the associated muscle loss. Spanish researchers have now shown in a study that these patients could benefit greatly from a targeted physiotherapy programme. Two days a week, the scientists carried out 20-minute arm and leg training twice a day, as well as balance and walking exercises with the patients. Their average age was 87 years. On discharge, this group of patients was significantly more independent and less dependent on external support than patients who did not participate in training. Another side effect: The group of patients with their own training programme also appeared to be noticeably fresher mentally.

SOURCE

Stiftung Deutsche Schlaganfall-Hilfe [German Stroke Foundation] (2019). Thala 1/2019, The health magazine of the German Stroke Foundation, p. 8.

Equipment-based balance training after knee TEP surgery: Influence on functional activity

Although the number of knee TEP operations has increased in recent years, there are still many unanswered questions regarding postoperative physiotherapeutic rehabilitation. This is a controversial topic. The effect of proprioceptive training in particular is still under-explored.

Luisa Grießbaum

Objective

This case study investigates the question of whether equipment-based, proprioceptive balance training after knee TEP surgery is effective in terms of functional activity in addition to conventional physiotherapeutic measures. The question therefore is whether the test persons' ability to balance improves, mobility increases and fall-related self-efficacy increases after balance training.

Methodology

Three patients were included in the analysis. The participants had all received a knee TEP implantation within the last 14 days. During their three-week rehabilitation period they received physiotherapy twice a week as standard. In addition, they trained on the THERA-Trainer coro once in the first week and three times each in the following two weeks. Before and after the

Badminton game with a balloon

Exercise with the balance board

intervention period, assessments were carried out with the participants in order to record the changes on a functional level. The assessments included the Functional Reach Test, the Timed Up and Go Test and the Falls Efficacy Scale – International Version.

Results

All test persons showed an improvement in the areas of balance ability, mobility and fall-related self-efficacy after the equipment-based balance training with the THERA-Trainer coro. Only in the balance tests with closed eyes was no improvement found. The training can also be described as safe and harmless, as no complications have arisen during the performance. The exact results are shown in the following tables:

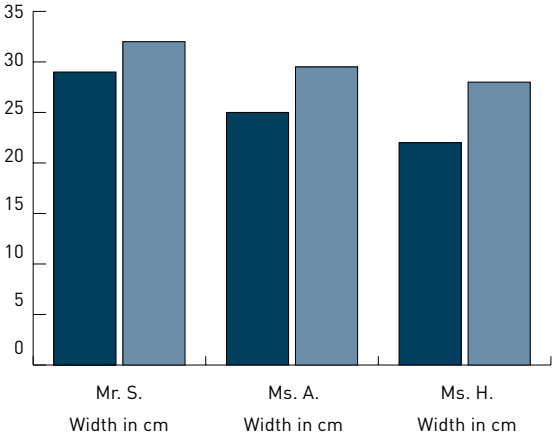

Fig. 1: Functional Reach Test

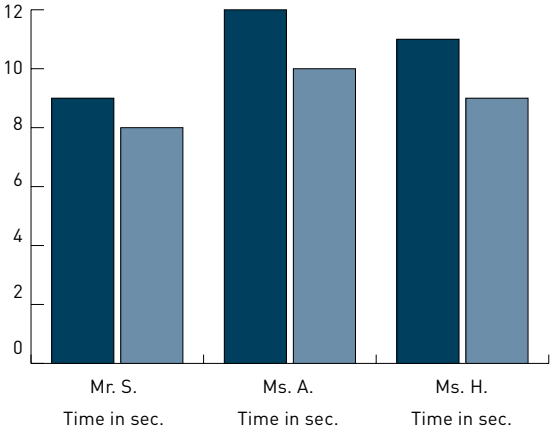

Fig. 2: Timed Up and Go Test

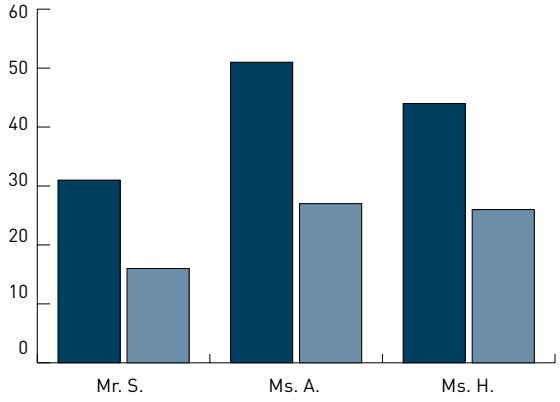

Fig. 3: Falls Efficacy Scale – International Version

Start End

Discussion

The standardised use of the equipment-based balance training can be implemented as an effective additional training method. Therapists thus succeed in maintaining and even improving proprioception and functional activity. However, in order to be able to make an evidence-based statement on the effect of proprioceptive equipment-based balance training, further larger studies are required.

DID YOU KNOW?

According to Forbes, physical therapy is one of the top 10 "happiest jobs" in America.

If our brain were a hard disk, it would have a capacity of about 4 TB to store information.

In the middle of the 19th century, the Swede Gustav Zander developed a system of gymnastics and massage equipment: medico-mechanical therapy. In Germany, the training devices were used in prevention and therapy; followed by further enhancements, imitations and simpler movement devices.

Too little sleep is bad for our memory.

Many physiotherapy procedures have their origins far back in the past. According to archaeological findings, thermal and mineral springs were already being used in prehistoric times. Various forms of massage and medical baths were already used in China about 4000 years ago.

Our brain consists of over 80 billion nerve cells.

Physiotherapy began as a purely women's profession during the First World War, as it was necessary to care for injured soldiers. The first physiotherapists during the First World War were called "reconstruction aides".

Probably many of the techniques and methods used today go back to the famous Greek philosopher Hippocrates. He was an advocate of the use of massage and hydrotherapy dating back to 460 BC.

Our brain cannot distinguish between reality and fantasy. So you can experience a film as if the action really happened. You feel everything as you would feel in real life.

In Germany the Berlin physician Albert C. Neumann established "Swedish remedial gymnastics" and in 1853 opened the first remedial gymnastics school.

You can concentrate better with a clenched right fist.

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Wake up and move

Mobilisation in early rehabilitation and in the intensive care unit

THERA-Trainer bemo

- reduce complications in intensive care
- improve functional outcome
- stabilise pulmonary functions
- easy hygiene

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