01 | 2021 VOLUME 5

THERAPY

THE MAGAZINE FROM THERA-TRAINER

Early mobilisation

Physiotherapists demonstrate the impact of their work

THERAPY & PRACTICE
Let's cycle – a win-win situation for patients, therapists and clinics

SCIENCE
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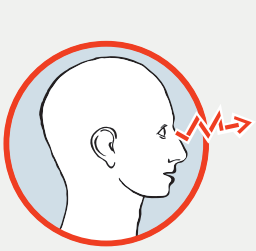

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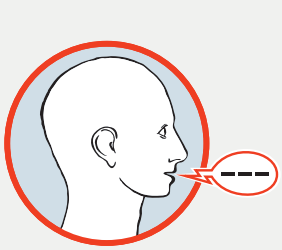
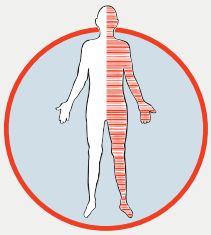


Trouble Speaking



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"Because people are made for many things, but not for loneliness."
Nila Monou

FOREWORD

Fighting the pandemic of loneliness

Dear readers,

Keep a distance of at least one and a half metres and keep personal contact to a minimum. In the past 18 months, we have all moved away from each other significantly. Because one thing is clear: the most effective measure against the spread of the coronavirus is to keep your distance. However, this has considerable side effects, especially for older people and sick people.

What we as a society have experienced so abruptly as a result of the coronavirus pandemic is not necessarily a new experience for patients in hospital and rehabilitation, because they have often experienced loneliness and isolation in the clinic. Most patients spend a large part of the day alone in their room in bed during inpatient hospital stays. But for a long time there has been a lack of awareness and suitable solutions for this problem.

Our experiences of the last few months have helped us to recognise and better empathise with this situation, to develop solutions immediately and under more challenging conditions. Solutions that hopefully will also retain their right to exist post-Covid.

Alongside highlights such as an interview with Prof. Dr. Jan Mehrholz on the topic of gait rehabilitation, the editorial "Bored and alone" sheds light on the problem described above and presents approaches to therapy that rely on social interaction while also adhering to strict hygiene requirements.

I hope you enjoy this edition.

Jakob Tiebel

Contact the editorial team: therapy@thera-trainer.de (tell us what you think!)

The brain cells are reminded how to walk.

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Let's cycle

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Early mobilisation – physiotherapists demonstrate the impact of their work

Robotics makes
the difference

Wake up, get up
and get out

Cover story: Early mobilisation

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Creative exercise in residential facilities for senior citizens

Immediately after the lockdown was declared in March 2020, the Haus Tabea senior residential centre in Horgen, Switzerland, decided to offer its residents two mobile training stations that would allow them to visit another country and reminisce in a unique and motivating way. In this interview, Centre Manager Markus Buck explains how the residents felt during this time and why this type of training was very welcome.

According to Markus Buck, there was uncertainty and exhaustion among the residents in March 2020 as a result of the restrictions. He is convinced that they are benefitting from the facility's new offering – a combination of cycling and video routes – as the previous exercise options have been significantly reduced.

Mr Buck, what was the general mood among the elderly residents at Haus Tabea during the restrictions?

From conversations with the residents, it was clear that there was uncertainty, especially with regard to the new arrangements. A big factor was also that there was no way of changing or predicting the situation. Some of the residents seemed exhausted and troubled by the restrictions, even though they mostly understood that they were necessary. For this reason, every possibility to get moving at Haus Tabea was welcome and in great demand.

Did you see an opportunity for residents to do something, especially when Covid was imposing restrictions, for example because no visits, trips or walks were possible?

The medical exercise bike proved to be very useful in these difficult moments of total or partial isolation and lack of opportunities to meet with family.

How did the residents benefit from the exercise? Did they simply enjoy themselves? Was it more of a meaningful activity for them or did they notice that they improved a bit physically as well? For example, can they walk for longer, are they more mobile?

Regular use of the medical exercise bike proved to be extremely positive, both for the physical and mental state of our residents. Some residents use the equipment at a fixed time, to add activity and structure to their day.

fact that they can travel to any place in the world for a short time, with many also having their personal favourite places. So, for example, it pleases our Italian residents when they can cycle through northern Italy. The residents are big fans of the bikes.

Thank you very much for the interview, Mr Buck.

SOURCE

Dividat AG | November 2020 | www.dividat.com

Many residents like the fact that they can travel to any place in the world for a short time.

The residents who come to the bike are always motivated, no matter how fit they are physically or mentally. Many appreciate the bicycle especially when the weather is not very nice. Also, the residents are always delighted when there is a gap after them and they are allowed to ride for longer (which doesn't happen often, as it's usually pretty booked up). I also received a lot of positive feedback about the images on the screen. Many residents like the

Markus Buck is the general manager of the Haus Tabea senior residential centre. Innovative, service- and performance-oriented, he has over 35 years of leadership and project management experience in the healthcare and financial industries, both domestically and internationally. A business economist with further training in gerontology, he has decades of experience as a leader in senior line management and project management positions. He creates added value in HR and financial management and in the customer- and quality-oriented handling of all support functions. He has many years of experience in the implementation of complex initiatives, integration projects and transformation processes, and has introduced tools for strategic corporate management. When it comes to coaching and conflict management, his values revolve around respectful leadership based on respect, appreciation and mindfulness, always with people at the centre. He has been engaged for many years in voluntary work in various non-profit organisations, including as a member of the board of the "Schweizerischer Dachverband für Mediation SDM" and as a member of the board of trustees of a collective foundation.

Part 3

-

Expert report by Marc Michielsen

SCIENCE

Expert report on postural control

An integrated postural control mechanism in our body prevents us from losing our balance and falling. Postural control can be reactive or predictive, and targeted training can improve motor and sensory strategies to reduce balance disorders. In the third part of our expert report you will learn more about functional activities.

Marc Michielsen

Since 2001, the World Health Organisation's International Classification of Functioning, Disability and Health (ICF) has taken a more modern position on concepts such as "health" and "disability" by recognising that anyone can be affected by a greater or lesser degree of disability during their lifetime due to a change in their health or life circumstances. Functional activities, i.e. tasks or actions to cope with environmental and everyday demands, are different for each individual. In the rehabilitation of stroke patients, there has been a shift in recent years from conventional treatment techniques to task-specific training methods. This functional training as a form of rehabilitation for stroke patients is supported by numerous evidence-based studies. Research shows that patients benefit more from rehabilitation when functional tasks are used. Because they are more likely to continue these exercises in everyday life, these patients also achieve better results during aftercare. The training is highly patient-centred, so the programme must be tailored to the needs of the individual patient. To realise its full potential, each programme must be oriented towards the patient's individual goals and focus on meaningful tasks for managing their daily lives. Therefore, the therapist's clinical reasoning determines the therapy, taking into account the interactions between structure/function, activity

and level of participation according to the ICF biopsychosocial model. Interventions should include task- and context-specific practices in areas that are meaningful for each patient, with the overarching goal always being the patient's functional independence.

> In 2009, Spennewyn conducted a comparative study between functional training methods and training solutions with stationary equipment. The study results showed that the subjects who had participated in functional training derived far greater benefit from the exercises. They achieved a 58% greater increase in strength than the group with stationary training equipment. In the balance exercises, they achieved a 196% better result than the comparison group, with an average reduction in joint pain of 30%.

When choosing interventions, the therapist must consider the three components that make up any functional exercise: patient, task and environment. The direction the treatment takes is determined by weighing up the interdependencies and importance of these aspects. So in a way, the therapist is responsible for the outcome of the rehabilitation.

Enriched environment

An enriched environment is characterised by more stimulation in terms of new stimuli, multiple opportunities for action and reward, and promotes spontaneous biological recovery [2].

Against this background, the study results are alarming, showing that stroke patients in various rehabilitation settings spend most of the day idle and alone. A review of 24 studies in a hospital setting found that stroke patients spend an average of 76% of the day in activities unrelated to therapy

Although it is known that an enriched environment promotes spontaneous recovery, stroke patients are alone and idle most of the day

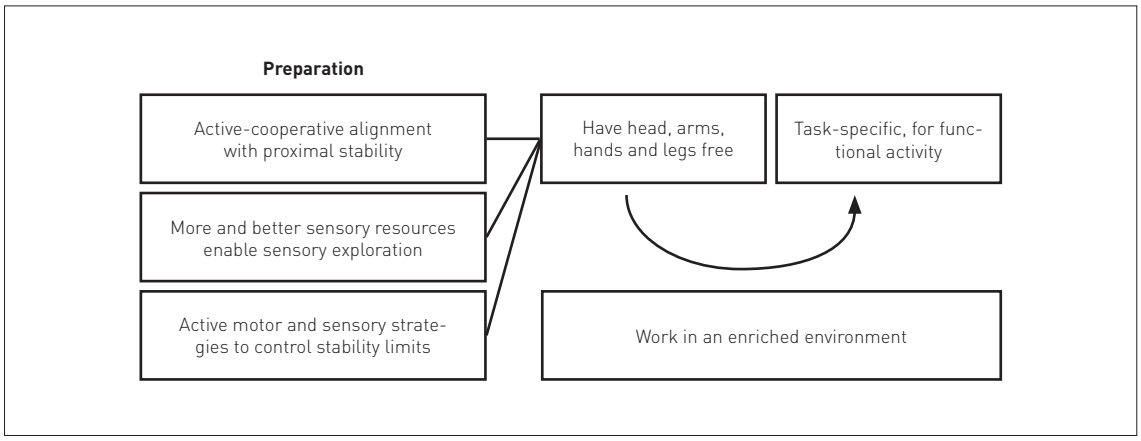
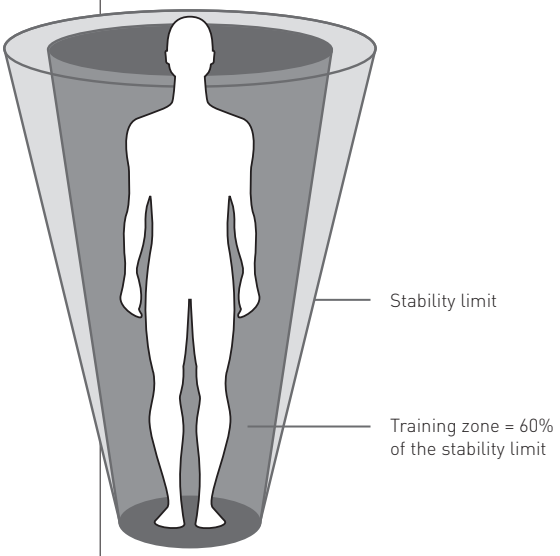


Fig. 1: How to encourage patients to be more efficient.

How large is the available environment?

With the help of the Functional Reach Test, a "virtual funnel" can be determined in a creative way. In order to visualise the stability limits, the patient is asked to extend their arms as far forward and to the sides as possible. They are then asked to stretch their arms up and down as far as possible. The therapy exercises are limited to a range of 60% of the stability limits, known as the training zone. The patient's joint alignment is better coordinated within this range, which allows them to test out their motor and sensory strategies. Do not urge patients to push their stability limits. The goal is not fear, but motivation!



or with little physical activity [4]. Periods of low movement – time spent sitting or lying down – have a negative effect on the ability to balance. Therefore, part of the treatment is also to provide an improved therapy environment. Studies suggest that subjectively and objectively perceived environmental elements can strongly influence physical activity. The question of which locations in a hospital encourage stroke patients to be more physically active therefore proves to be important for enabling additional activities and avoiding longer periods of inactivity [3].

We should always keep in mind that people do not move in a vacuum. They live in a stimulus-enhancing environment (kitchen, bathroom, garden, etc.) where they have many resources at their disposal. Functional activities take place in these rooms.

Environments can promote postural control

Environmental enrichment refers to living environments, such as "enclosed living areas" or exploratory spaces, that help to enhance sensory, cognitive and motor stimuli compared to traditional living environments [1]. Stimulus enhancing objects usually differ in composition, shape, size, surface texture, smell and colour. By changing the environment and adding objects or tools, new sources of information are created. Walls, room corners, chairs and door frames encourage a sense of balance and vertical alignment in the room. We can grow from that.

When moving in a stable environment, we feed our body schema with new information. The body is limited by the solid resistance of the world around us. As soon as we encounter resistance from our environment, the body perceives sensory impressions that the brain registers and stores in the body schema.

Example: A stroke patient with left hemiplegia has problems sitting down at the breakfast table.

If a stroke patient cannot fully concentrate on their balance, this will affect their steadiness.

In the attempt, he bumps his leg against the table several times. Finally, he drops onto the chair, using the edge of the table for support. He fights on. Finally, he manages to reach for a coffee cup.

Only when the enriched environment is stable can it be used as a tool. Holding onto furniture as they move about helps elderly patients to keep their balance and avoid falls. They develop a kind of spatial awareness that serves as an orientation aid within their own four walls. They rely on this "virtual" map of their everyday living environment. This allows them to move independently and safely. When they are tired, the stable wall provides support to relieve "overexerted" legs. Every room has walls and corners. Therapists should teach their patients to use these as therapeutic aids to lightly support them.

Postural control and functional activities: two competing tasks

Postural control combined with selective, goal-oriented locomotion is a dual task that must be coordinated by the brain. Depending on the complexity of the task, this may require our

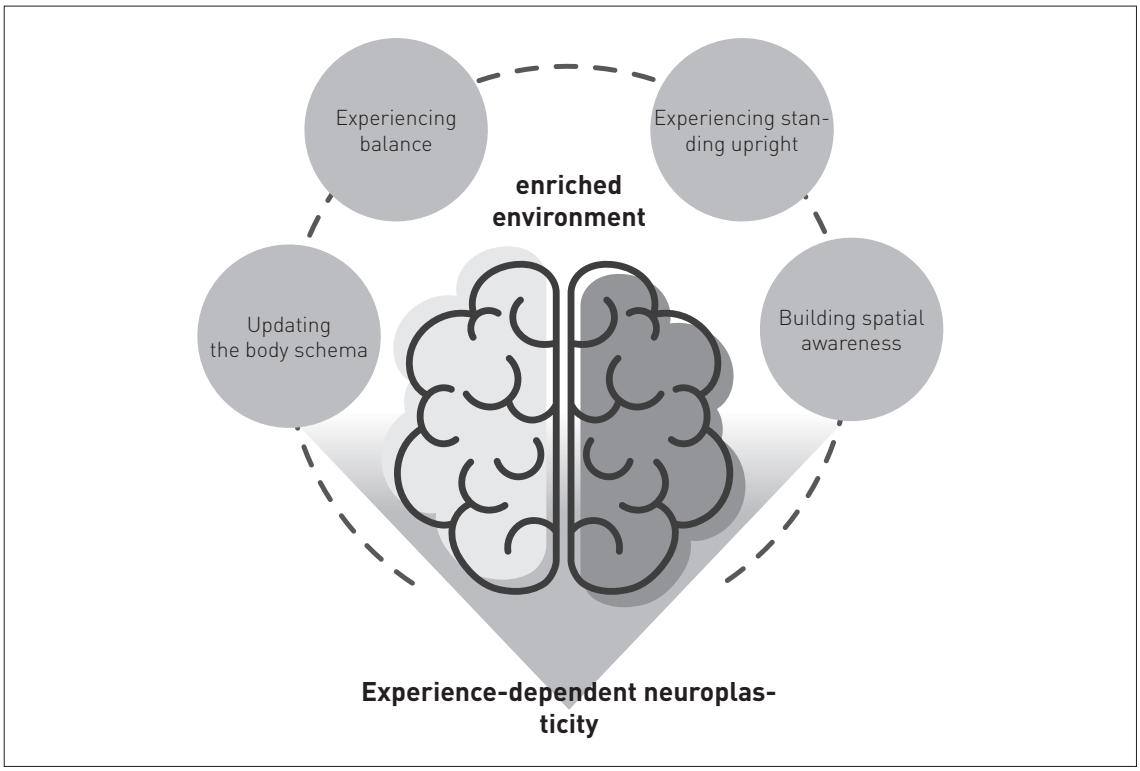


Fig. 2: Neural connections / cortical maps are continuously reshaped by new experiences. Behavioural, cellular and molecular studies show the clear impact of enriched environments on animals and also provide insights into the mechanisms of experience-dependent plasticity, including neurogenesis and synaptic plasticity in adults [1].

attention to be divided. During normal everyday activities, we don't have to worry about our balance. Here, minimal postural adjustments are sufficient to maintain the desired posture. It's easy. The available attention is sufficient to solve the everyday problem in question. But with increasing demands on their attention during more demanding tasks, stroke patients experience balance problems. When attention is diverted, this has an even more negative effect on the ability to balance. This competition for attention is a cause of loss of stability, especially in dual tasks.

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Marc Michielsen studied physiotherapy at the University of Leuven, Belgium, and is also an Advanced Bobath Instructor. He specialises in neurological rehabilitation, particularly after a stroke. After several positions as a senior physiotherapist at various hospitals, he has been working as head of emergency services at the Jessa Hospital rehabilitation centre since 2008. Michielsen has published several articles, abstracts and other scientific publications in renowned scientific journals.

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LIFE IN MOTION

SCIENCE

Robotics makes the difference

More and more robots are being used to teach stroke patients how to walk. But who do they help? And how much? Prof. Dr. Jan Mehrholz has evaluated studies from around the world on the effectiveness of gait robots in neurological rehabilitation. The result is encouraging. In this interview, the expert explains the current study situation and the advantages of the technology.

Interview: Mario Leisle

The current study situation regarding gait robots in neurological rehabilitation after stroke is very good overall. According to our latest 2020 Cochrane Review, one in eight walking impairments after stroke could be prevented by robot-assisted gait training. It also shows that the walking speed of patients after stroke can be improved a little by gait robots, which is new according to our current review.

Various robots are used in neurological rehabilitation. Are there differences in how they work?

There is now a whole range of different types of gait robots, for example stationary exoskeletons or stationary end effectors, but also mobile exoskeletons. For the stationary end-effector and exoskeleton devices used in rehabilitation, there are now a large number of controlled and mostly methodologically well-conducted studies. With regard to regaining the ability to walk, there are no differences between exoskeleton and end effector, even in patients affected with different severities after a stroke. This means that severely affected patients can be treated usefully with both an exoskeleton and an end-effector device.

This concerns the ability to walk. But what about when patients can already take their first steps. Are there differences then?

Yes, in terms of gait parameters such as walking speed and gait endurance, there are significant differences between these two types of devices. In indirect comparisons in meta-studies between exoskeleton and end effector, the end-effector devices perform significantly better than the exoskeletons in terms of improvement in walking

Exoskeletons are robots in which the mechanics move all joints of the lower extremities. The latest development is mobile exoskeletons that walk through the room with their patients. In contrast to this, **end-effector devices** only guide the patient's foot, while the knee and hip joints remain free.


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speed and gait endurance. This means that patients who have suffered a stroke can walk significantly faster and longer after treatment with end-effector devices. Overall, however, there are no direct comparisons in clinical studies between different devices.

You have already mentioned the mobile exoskeletons that can move the patient around the room. They are the latest generation of devices. Are there any findings on them yet?

They have their advantages – I think above all in their role as a walking aid in everyday life. However, there have been few studies on the training effects of mobile exoskeletons and little scientific evidence on the improvement of gait parameters through training with such devices. The few studies that exist do not show a clear improvement through gait training with them. What is more, there is no direct comparison between mobile and stationary exoskeletons.

The Indego belongs to the new generation of mobile exoskeletons. At what stage after a stroke can patients benefit most from gait robots?

In our recent Cochrane Review, we found the greatest effects in the first three months after a stroke. However, there were also very many studies that showed effects at a later stage. Somewhat more significant than the time and phase after the stroke is the severity of the patient. All our analyses indicate that severely affected patients, who cannot walk at all or in some cases cannot even sit, benefit from this technology in particular. On the other hand, patients who can already walk a few metres largely on their own under supervision are unlikely to benefit from this expensive technology.

At present, such gait robots are increasingly found in neurological rehabilitation clinics, but only in very few outpatient practices so far. Will that change?


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It is not yet clear whether the technology is worthwhile for these practices, with regard on the one hand to the extremely high costs and remuneration, and on the other hand to the beneficial effects, since most patients in outpatient practices are ambulatory. A big issue is the remuneration for certain services. Only if such therapies can be prescribed and reimbursed would it be worthwhile for the practices.

Thank you very much for this interview.

SOURCE

Stiftung Deutsche Schlaganfall-Hilfe | thala 2020/03 | www.schlaganfall-hilfe.de | Schulstraß 22 | 33311 Gütersloh, Germany | Mario Leisle

Prof. Dr. Jan Mehrholz has been Professor of Therapeutic Sciences at the SRH University of Applied Health Sciences Gera, Germany, since 2008 and heads the Master's programme in Neurorehabilitation. He also heads the Scientific Institute of the Private Europäische Medizinische Akademie für Rehabilitation at the Klinik Bavaria in Kreischa, Germany. After training as a physiotherapist, he studied health sciences / public health. He then completed his doctorate and habilitation at the TU Dresden. In addition to his work as a reviewer for numerous internationally renowned journals and as editor of the Cochrane Stroke Group, he is the editor of the journal Neuroreha.

A new step towards early rehabilitation

The first THERA-Trainer bemo bedtrainer in Portugal was implemented during the Covid-19 pandemic. Therapists tell how the trainer is used and how it helps patients.

Author: written by Sara Abraão after feedback from the clinic

A new step towards early rehabilitation was taken in a University Hospital in Portugal, in July 2020.

THERA-Trainer bemo was implemented in the ICU, in Covid-19 pandemic phase, and has been a great support in the early mobilization of these patients. Consequently, their physical condition after confinement has revealed great gains in relation to the previous group, which had no support from the equipment.

Bemo has been a great help in the recovery of patients whose mobility is restricted after accidents, operations or by diseases generally affecting the musculoskeletal system. This fulfils the purpose of mobilization (circular passive, assistive or active movement) of the upper and lower extremities.

In general, we can highlight the following benefits

- reduction of time in intensive care
- reduced risk of muscle weakness associated with the confinement period and medication

- support in the regulation of muscle tone
- stimulation of the cardiovascular and metabolic system
- reduction of mechanical ventilation time
- improvement of the patient's physical outcomes

For the health professionals it is a very ergonomic tool, simple to use and configure to the patient (tool-free accessory change). By the accessories, mechanisms and safety sensors THERA-Trainer bemo is a tool that transmits safety to the health professional and patient. This can be a good instrument in early mobilisation, as well as reducing the length of stay in the intensive care unit and significantly improving the long-term prognosis of patients.

Early mobilisation can shorten intensive care and hospital stays – and also reduce treatment costs.

SCIENCE

Early mobilisation – physiotherapists demonstrate the impact of their work

The fear for one's own existence as a physiotherapist in an increasingly dynamic market and a health sector where the focus is on cost-effectiveness is understandable, but not necessarily justified. Some examples show why changes also bring opportunities and how they can be used.

Jakob Tiebel

Patients who are treated in an intensive care unit suffer significant functional losses due to prolonged immobilisation, which can only be compensated for to a limited extent with follow-up rehabilitation. Muscle loss in patients with multiple organ failure can be up to 20% in the first seven days after admission. Therefore, although mortality from critical illness improves, survivors often suffer from persistent weakness and psychological and cognitive impairment.

Fortunately, more and more clinicians share the view that a structured early mobilisation process can significantly improve the functional outcome of ICU survivors and contribute to an enhanced quality of life following hospitalisation. The length of stay both in the intensive care unit and in hospital can be significantly reduced by early mobilisation measures. This not only optimises the entire care process, but also sustainably reduces the treatment costs per patient.

Physiotherapist David McWilliams and his colleagues at the University Hospitals Birmingham played a considerable role in this positive development. In a one-year study, they assessed the impact of early rehabilitation programmes on the long-term morbidity of patients with critical illnesses. Between April 2012 and March 2013, they documented the progress of patients who received a specific rehabilitation programme during their stay in an intensive care unit. They compared the results with data sets from the previous year, when patients did not receive early mobilisation in the intensive care unit.

All patients admitted to the ICU and requiring ventilation for more than five days were included in the analyses. Only patients with severe trauma and brain injuries were excluded. The main contributors to the project were specialist physiotherapist David McWilliams, who was tasked with improving rehabilitation within critical care, and two senior physiotherapists from Queen Elizabeth Hospital Birmingham.

Before the actual implementation of the rehabilitation programme, the main parties involved were first encouraged to undergo training on the safety and effectiveness of structured rehabilitation programmes in the ICU. In addition, specialised practical training was provided for the existing physiotherapy and nursing staff. The training programme was accompanied by the development of algorithms, checklists and safety criteria for mobilisation to support clinical decision-making.

A total of 292 patients met the inclusion criteria of the study during the intervention period. After the preparation phase, patients were examined as usual within 24 hours of admission and received the already established physiotherapy interventions. The patients who were ventilated for more than five days were assigned to a therapist who then carried out an individualised and structured rehabilitation programme. The treatment plan was reviewed in weekly multi-professional team meetings with the doctors, physiotherapists, intensive care nurses and an intensive care nutritionist, and the individual programme for the next seven days was determined.

The team used visualisation to motivate everyone involved. The progressive training plan for each week and the associated rehabilitation goals were written on wall charts as an incentive for the multidisciplinary team. Together with the weekly meetings to review progress and set new goals for the following week, this allowed for a consistent focus on rehabilitation, which was essential for graduated therapy with the aim of continuous improvement.

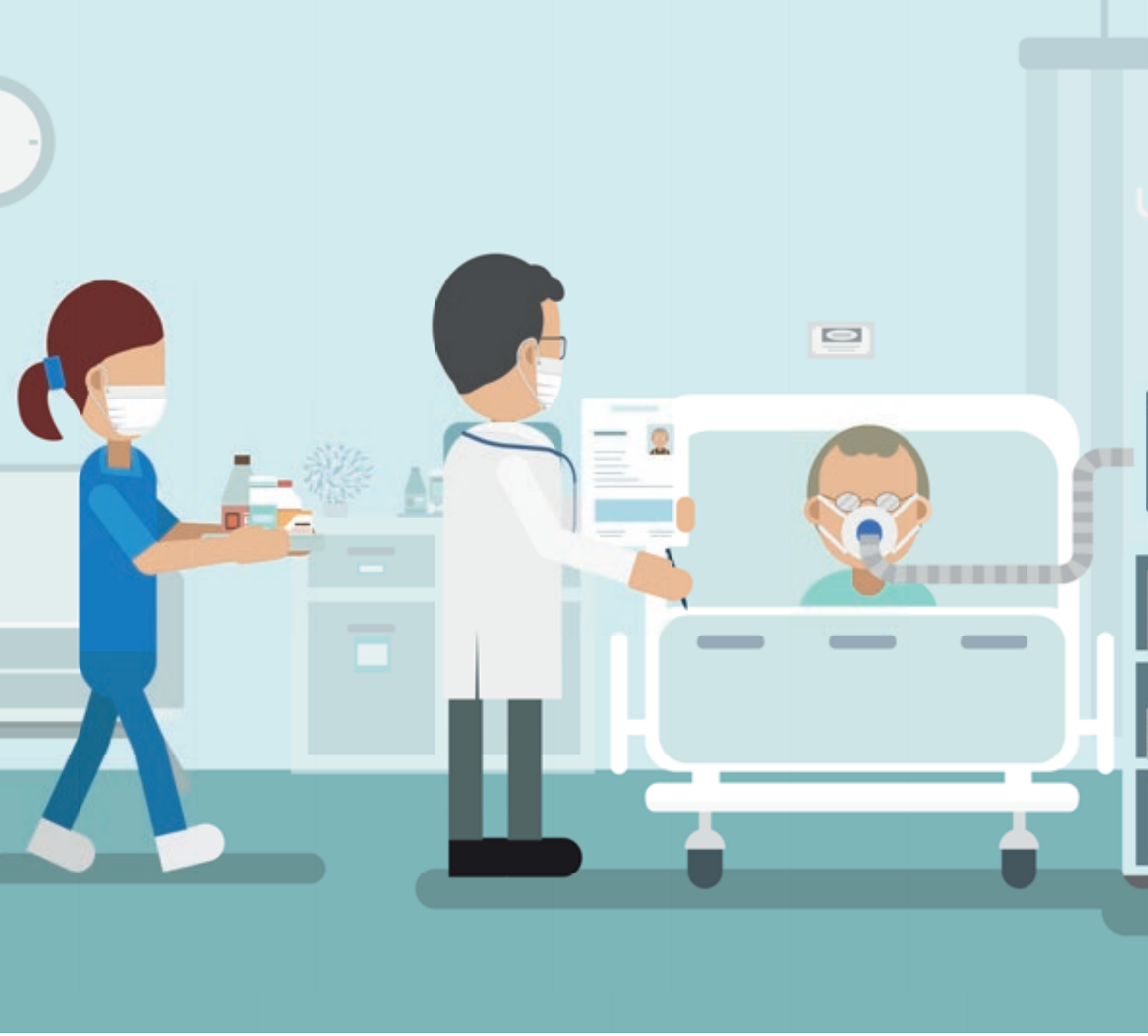
The results of the study are clear. The average length of stay in the intensive care unit was reduced by 2.5 days from 16.9 to 14.4; the average length of stay in hospital was even reduced from 35.3 to 30.1 days. The average duration of invasive ventilation also decreased from 11.7 to 9.3 days.

Loss of function due to prolonged immobilisation in intensive care patients can only be compensated for to a limited extent in follow-up rehabilitation.

In addition to a shorter time for initial mobilisation (9.3 vs. 6.3 days), there was also a higher level of mobility (Manchester Mobility Score 3 vs. 5) at the time of discharge from intensive care.

Although no significant difference was found between the preparatory study and study data in terms of ICU mortality, in-hospital mortality was significantly lower after the introduction of the programme (39% vs. 28%). In addition, the introduction of the early rehabilitation programme in the ICU was associated with a significant reduction in 3-year mortality (81/201 = 40.3% vs. 60/222 = 27%).

The project initially cost the hospital £75,192 to fund two additional physiotherapy posts. However, the reduction in length of stay due to early rehabilitation ultimately equated to a reduction in patient costs of £951,200 for the cohort. In real terms, this was reflected in the saving of bed days and an increased capacity of 3.7 intensive care beds and



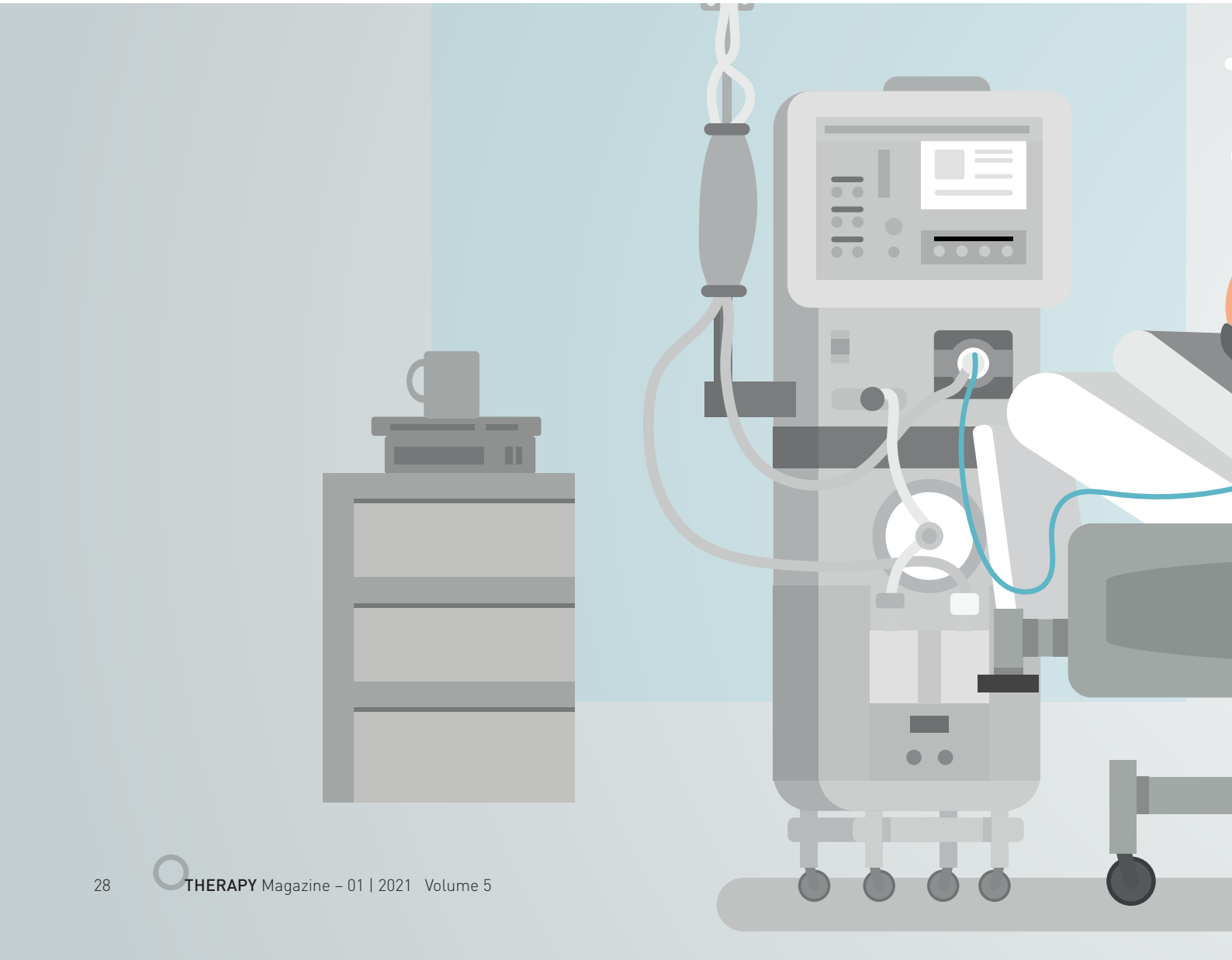
2.5 ward beds. Following the results of the project, the financial resources for the early rehabilitation programme were permanently allocated and the two physiotherapists were taken on to continue the project. The feedback from patients and staff on the project was excellent.

The results of this project show very impressively that early rehabilitation in the intensive care unit has the potential to significantly improve the outcome of patients. Physiotherapists have the opportunity to take a leading role in the implementation process and support more efficient care processes without having to worry about their own livelihood. The project was initiated at a time when funding for physiotherapy was drastically reduced. But instead of a simple cut in jobs, the project has succeeded in demonstrating the crucial value of physiotherapy and even creating entirely new values.

Implementing a new treatment pathway is a challenge. But with perseverance, education and a

clear plan to evaluate the results, much can obviously be achieved. The study highlights the importance of tying objective measures to the structure and outcomes of therapies. The use of assessments and mobility scores in this case was instrumental in demonstrating the added value of introducing an early rehabilitation programme and in illustrating the role of physiotherapy in improving the overall outcome.

Other studies, such as the one by Alice Chiarici and her colleagues, confirm that this finding is not an isolated case. In their study "An Early Tailored Approach Is the Key to Effective Rehabilitation in the Intensive Care Unit", the researchers confirmed that an interdisciplinary team approach that enables early and individualised planning of physiotherapy programmes increases the ventilator-free time of intensive care patients and reduces the overall length of stay in hospital. This is especially true of patients who are being treated in the intensive care unit after general surgery. Moreover, the authors describe that such a rehabilitation path can be generalised for different geopolitical scenarios, as it is feasible, safe and cost-effective. The results were presented at the American Congress of Rehabilitation Medicine in 2019 and published in the journal "Archives of Physical Medicine and Rehabilitation".



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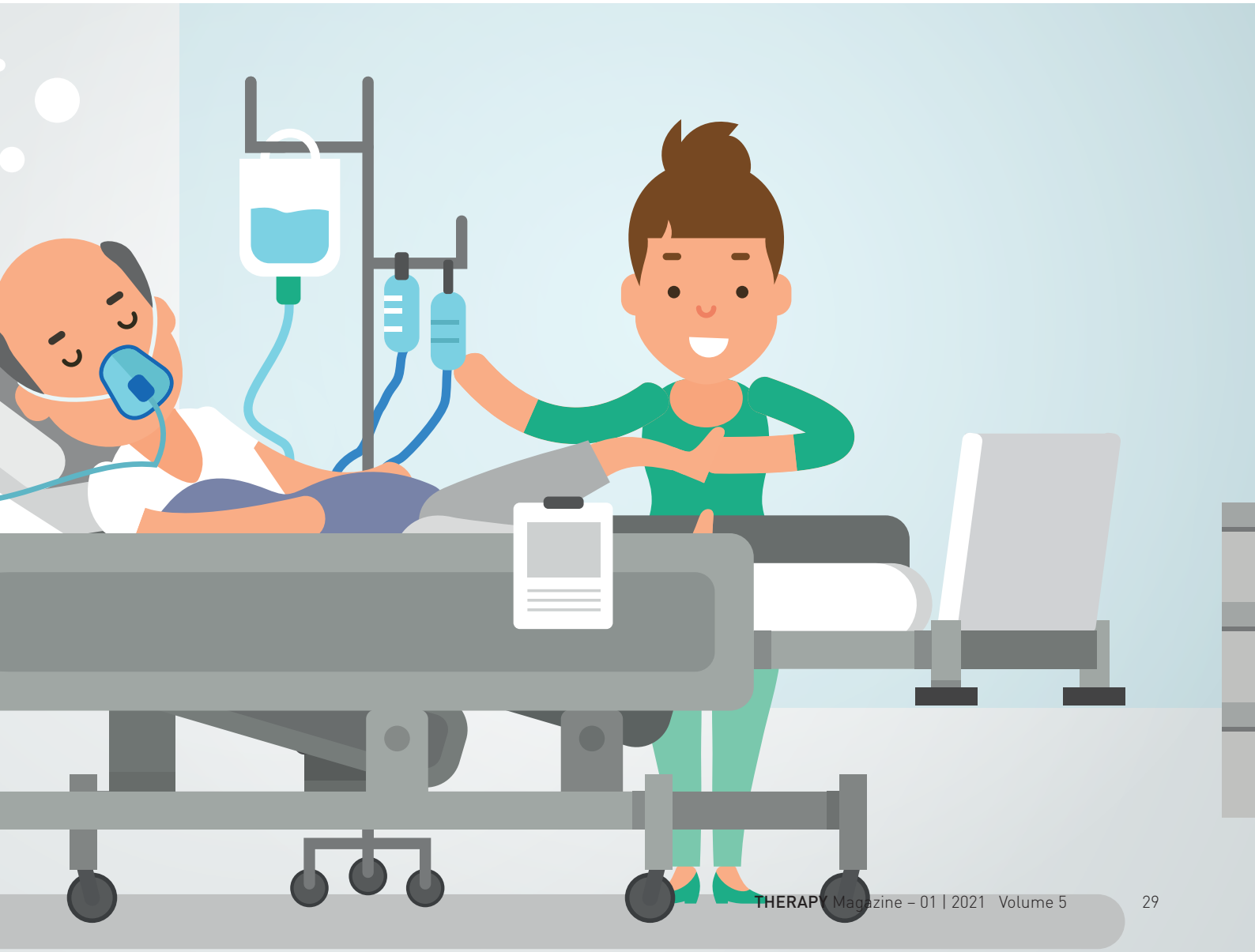
Jakob Tiebel studied applied psychology at the Apollon University of Applied Science in Bremen. His clinical expertise is based on his previous work as an occupational therapist in neurological and neurosurgical early rehabilitation. In 2012, he switched to the medical supply store industry and some time later to medical technology. On behalf of medica Medizintechnik GmbH, he was instrumental in the development of evidence-based robotics-supported therapy concepts as a specialist for clinical applications and head of product management at the interface to marketing, sales and research. Since 2020, he has worked as Marketing and Sales Manager at Visionary AG, one of the largest Swiss companies for internet-based IT solutions and consulting services in the healthcare sector, as well as the developer of the internet-based software docbox.



SCIENCE

Faster walking thanks to end effector?

In a prospective intervention study, Sandro Caminada analysed the effects of gait training with an end-effector gait trainer in people with limited mobility. He examined the gait pattern of geriatric rehabilitation patients after conventional physiotherapy compared to the combination of physiotherapy and additional training with a THERA-Trainer lyra.

Sandro Caminada (Department of Sport, Exercise and Health, University of Basel)

Background

Hospitalisation leads to a decline in functional mobility and independence in elderly people, regardless of the actual reason for hospitalisation. Inactivity during the inpatient period (83% of their time in bed and 12% sitting) leads to deconditioning. The aim of geriatric rehabilitation is to regain mobility and independence in everyday life. The THERA-Trainer lyra was designed for rehabilitation after strokes. This study investigates the effect of lyra training in geriatric rehabilitation patients and anticipates an improvement in walking speed and mobility.

THERA-Trainer lyra

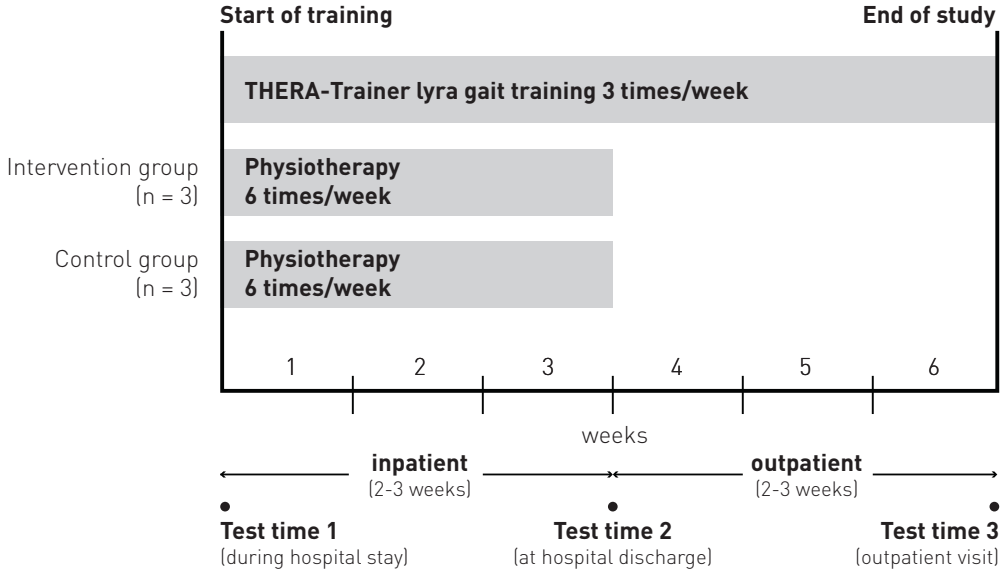
The lyra end-effector gait trainer has a mechanically guided gait pattern and ensures a safe and upright position with its body weight support. The THERA-Trainer lyra trains the intramuscular motor neurons as well as intermuscular coor-

dination. The gait trainer has a mechanical gait pattern that is modelled on the natural gait. Actively shaping the step movement in the upright position trains balance when standing on one leg and promotes strength endurance in the legs and trunk.

Methods

6 patients (≥ 65 years) with muscle weakness and limited functional mobility during independent walking were included in the randomised, active-controlled intervention study. The intervention group (n = 3) trained with the end-effector gait trainer three times a week in addition to conventional therapy, while the control group (n = 3) received only conventional therapy, which consisted mainly of physiotherapy.

The test battery included gait analysis with GAITRite, functional measurements and subjective experiences of the subjects. Measurements were taken during hospitalisation, before discharge from hospital and after an outpatient phase of two to three weeks.



Results

The intervention group improved its walking speed by 10.9%, whereas the control group only gained 5.6% (not significant). There was also a trend in favour of the intervention group in the 6-minute walk test. All other test batteries showed no significant differences.

Discussion

The THERA-Trainer lyra is easy to use and enables even mobility-impaired people to train successfully. Training on the gait trainer is mainly suitable for severely deconditioned patients, as the intensity can be very finely adjusted. Overall, the THERA-Trainer lyra can help increase active time in rehabilitation. Patients report fatiguing thigh and leg muscles. Even at slow walking speeds, there is sufficient training stimulus. Actively helping to shape the gait pattern improves gait-specific coordination, balance and strength endurance.

Conclusion

The THERA-Trainer lyra enables patients with severe muscle weakness in the trunk and legs to do adapted training. The body weight support and the functional support allow longer training sessions and can help to improve mobility in everyday life.

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Sandro Caminada studied sports science at the University of Basel, Switzerland, where he graduated with a Master of Science in 2018. He works as a sports scientist at Universitäre Altersmedizin FELIX PLATTER in Basel, where he mainly deals with gait therapy. During his master's thesis, he was involved in a research project at the Mobility Center and investigated the effects of gait training in mobility-impaired people as part of a prospective intervention study.

THERA-Trainer bemo receivesRed Dot award for high design quality

medica Medizintechnik GmbH has been awarded the "Red Dot" award for "Product Design 2021," in cooperation with the design studio Slogdesign. An international jury awarded the THERA-Trainer bemo the coveted "Red Dot" award, which stands for high design quality.

Red Dot CEO Professor Dr. Peter Zec on the laureates

"The winners of the Red Dot Award: Product Design 2021 were particularly impressive this year. The design of their products is excellent, in terms of both the aesthetic and the functionality. It's not easy to prevail in such a strong field of competitors and to win over our jury. Consequently, I want to congratulate the laureates very sincerely on their success," said Professor Dr. Peter Zec, founder and CEO of Red Dot.

New movement exerciser for intensive care units

Since May 2020, many (Covid-19) patients in intensive care units or isolated bed-bound patients in rehabilitation clinics can benefit from daily training. "Regular activity is very important, especially for the bed-bound patients. With the THERA-Trainer bemo, this can be easily accomplished. In addition to this, motivation and hope can be returned to these patients," Peter Kopf, CEO of medica Medizintechnik, is convinced. Optimal solutions through next-generation technologies and patents

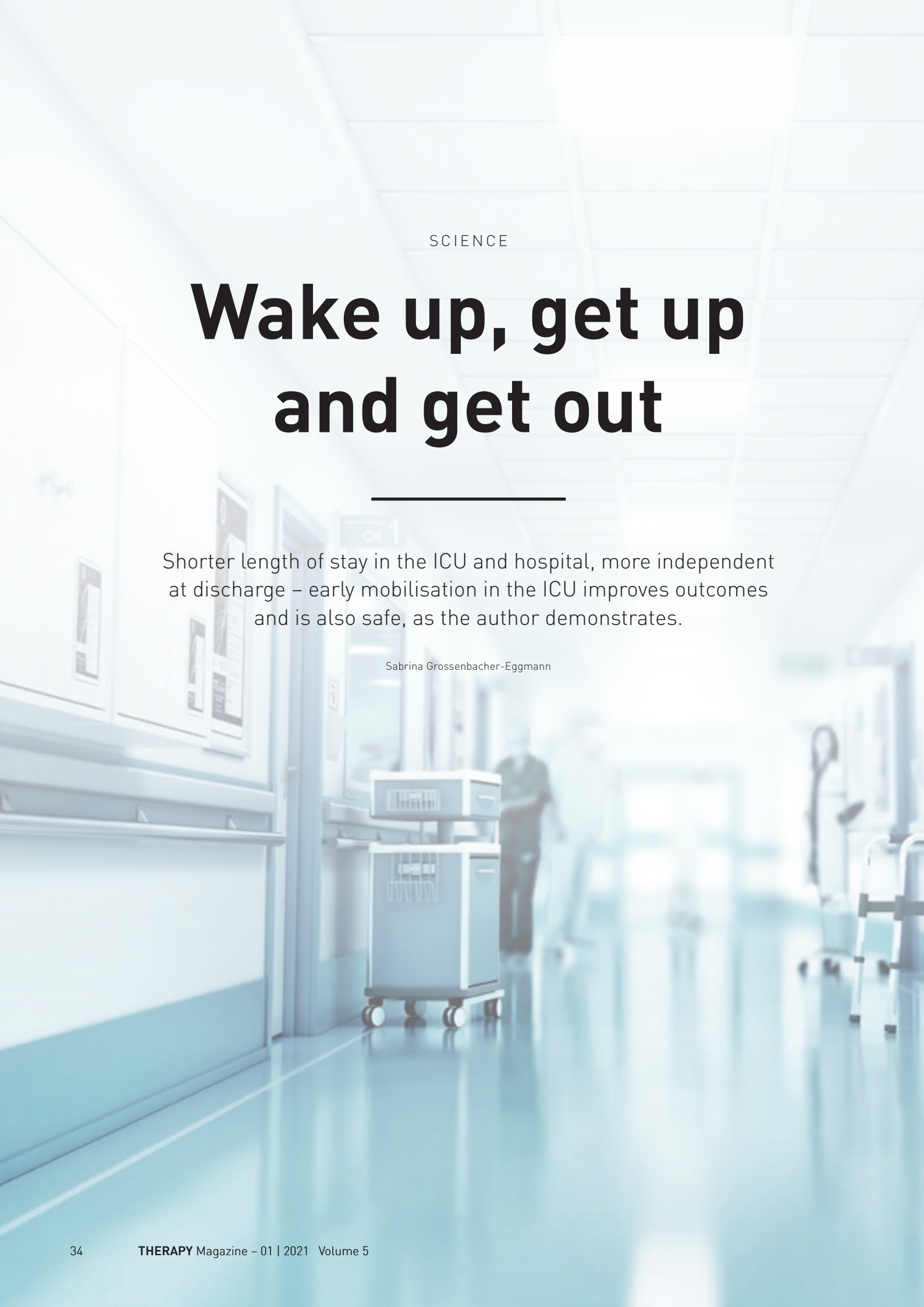
CTO Otto Höbel explains: "This intelligent drive technology, adapted to the needs of the user, the patented portal solution and the high-tech T.assist equipment, which complements the concept with distance sensors and audio-visual signals, make the THERA-Trainer bemo fundamentally different from all other devices on the market. Special thanks, in addition to all internal colleagues from R&D and product management, go to our long-term product design partner Slogdesign for this forward-looking, successful result."

SCIENCE

Wake up, get up and get out

Shorter length of stay in the ICU and hospital, more independent at discharge – early mobilisation in the ICU improves outcomes and is also safe, as the author demonstrates.

Sabrina Grossenbacher-Eggmann



Back in 2014, the author used various studies to show how important early mobilisation is in intensive care. Although recent study findings confirm this, patients are still mobilised too little and too late today.

Muscle loss begins within the first 72 hours of bed rest.

It has been known for many years that (still often) prescribed bed rest has little benefit for many diseases. On the contrary, it can be harmful and prolong the patients' recovery time [1]. Muscle loss begins within the first 72 hours of bed rest, reducing muscle power by 16% in ten days in healthy older adults [5]. In combination with a critical illness, such as sepsis, this muscle loss is even higher [6]. For example, after seven days of mechanical ventilation, 24 to 77% of patients already suffer from generalised muscle weakness, called ICUAW (Intensive Care Unit Acquired Weakness) [6, 12].

"Intensive Care Unit Acquired Weakness" – a generalised, diffuse muscle weakness

ICUAW is a diagnosis of exclusion; except for the critical illness itself, no determinable cause can be found. It describes clinically diagnosed, new-onset, diffuse muscle weakness, with affected ICU patients by definition scoring less than 48 on the Medical Research Council sum score (see table) [12].

On the one hand, the development of ICUAW is aided by the critical illness, with mechanisms such as hypoxia, hypotension, inflammation, glucose dysregulation, catabolism and malnutrition playing an important role. On the other hand, specific intensive care measures, such as mechanical ventilation, sedating drugs or long immobilisation, contribute to its development. This creates a vicious circle with serious consequences, which are summarised under the term "Post-Intensive Care Syndrome" (Figure 1) [8]. For example, one year after their ICU stay, more than half of all survivors suffer from poor functional status. One in four exhibits post-traumatic stress disorder. Quality of life is severely limited and mortality is high. There is therefore an urgent need for action to identify patients at risk of ICUAW in good time and to provide them with adapted therapy.

The ABCDE concept

To overcome the vicious circle between immobility, ventilation and sedation and to reduce post-intensive care syndrome, the evidence-based, interdisciplinary ABCDE concept is recommended (**A**wakening, **B**reathing, **C**oordination, **D**elirium monitoring, **E**xercise/**E**arly Mobilisation). Protocols are used to check and adjust the need for ventilation and sedation on a daily basis. Daily screening is intended to prevent an acute state of confusion (delirium) and immobility is reduced by early mobilisation, daily activities and movement exercises [14].

In order to ensure patient safety at all times and to successfully combine the individual components of the ABCDE concept, implementation requires coordinated interdisciplinary cooperation between physiotherapists, intensive care specialists and doctors.

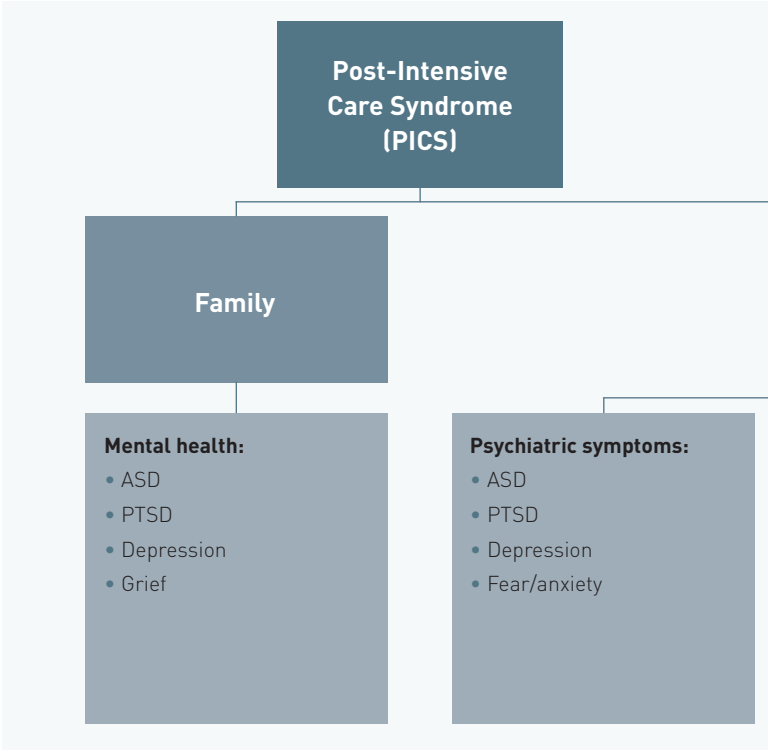


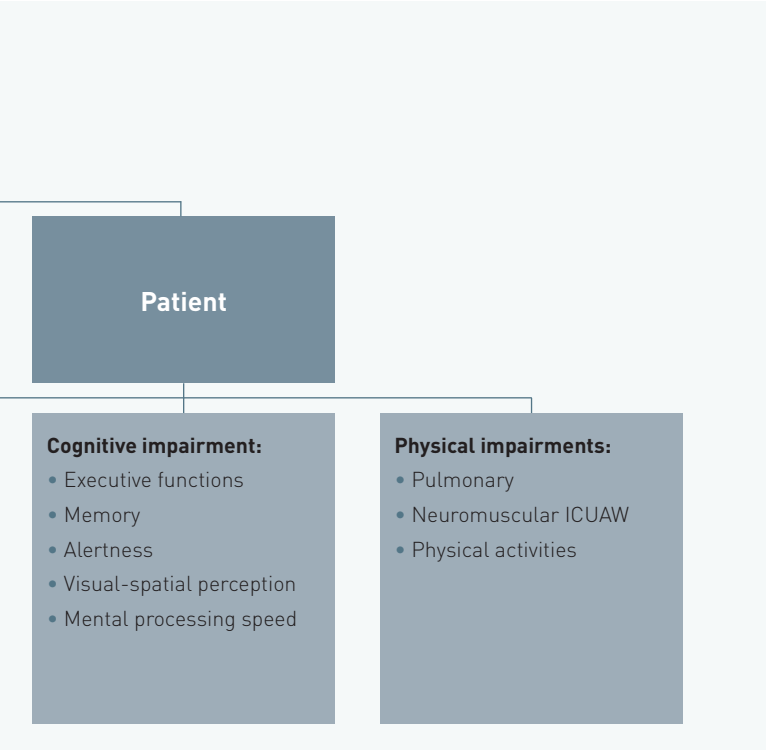
Figure 1: Post-Intensive Care Syndrome: new or increasing psychological, cognitive and mental impairments following a critical illness (ASD = acute stress disorder, PTSD = post-traumatic stress disorder) [5].

Diagnostic criteria of ICUAW
1. Generalised muscle weakness following the onset of critical illness
2. Diffuse weakness (involvement of distal and proximal muscles), symmetrical, flaccid and generally without cranial nerve involvement
3. MRC sum score <48, or respective mean value of the tested muscles <4 at at least two different times (>24 hours apart)
4. Dependence on mechanical ventilation
5. Exclusion of possible other diagnoses

Diagnostic criteria for ICUAW. For diagnosis, at least points 1, 2, 3 or 4 + 5 must be fulfilled. The Medical Research Council (MRC) sum score evaluates muscle power in three muscle groups of all four extremities. Each muscle group is assigned a score between 0 and 5 (M0 = no muscle activity, M5 = normal power), which corresponds to a maximum score of 60 [12].

Early mobilisations are safe

Potential barriers to early mobilisation include the fear of inadvertently removing a vital catheter or causing a deterioration in vital signs in an already unstable patient. However, there is increasingly positive evidence of the safety of early mobilisation. For example, a multicentre prospective observational study investigated the effects of physiotherapeutic interventions in several interdisciplinary intensive care units over a period of three months: It found adverse reactions in only 0.2% of all treatments [15]. Another study observed the safety of physiotherapy and early mobilisation over 30 months. There were adverse events in only 0.6% of all 5,267 treatments. Although the most frequent ones concerned the vital signs, these recovered quickly after therapy was interrupted and no further harm occurred [11].

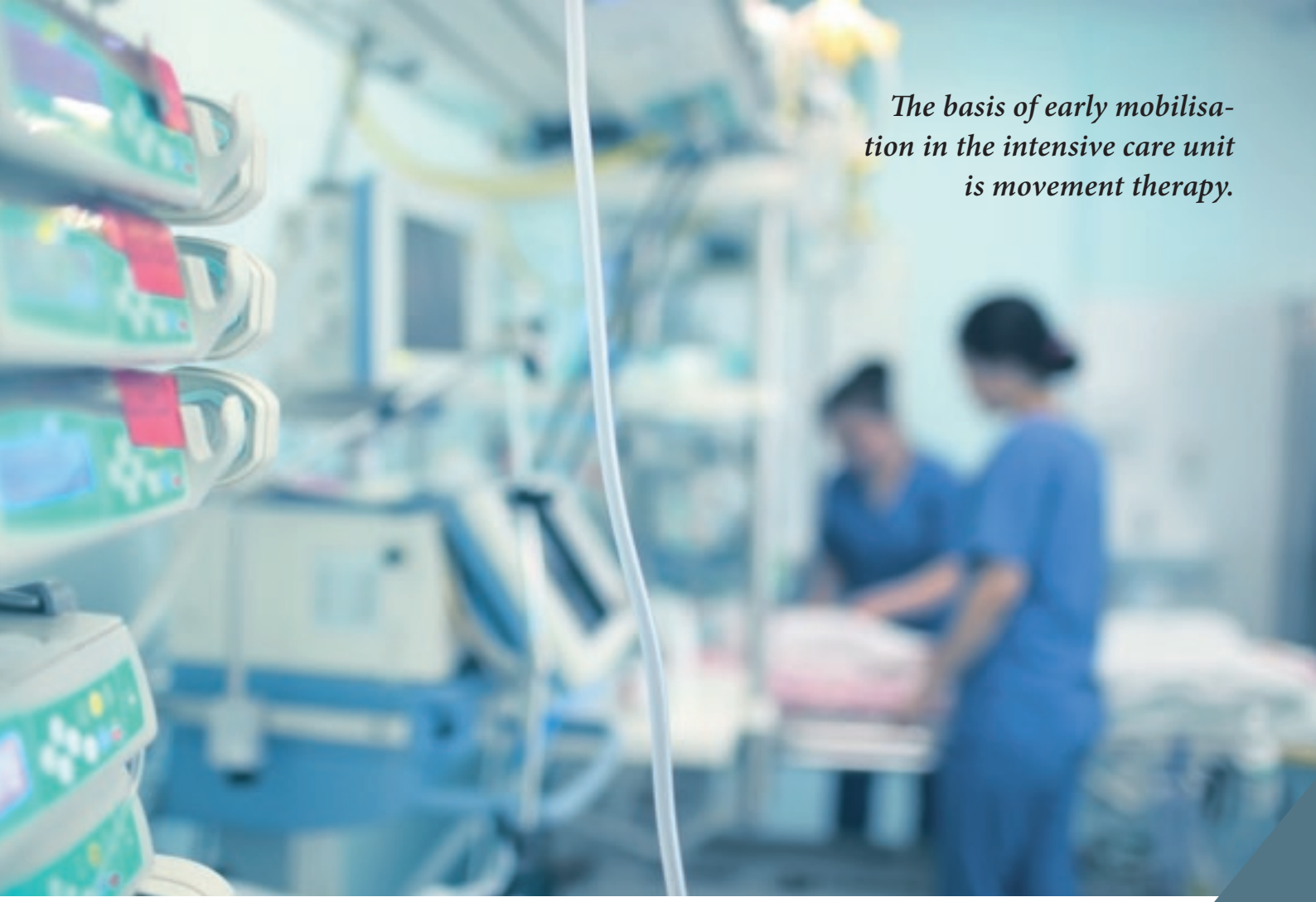


Safety criteria

It should be noted that in the studies mentioned, early mobilisation was always carried out by experienced physiotherapists and with interdisciplinary cooperation. Safe mobilisation in the intensive care unit requires at least two people. In addition, the following safety criteria should be checked before each mobilisation:

- Are there sufficient cardiovascular and respiratory reserves? The tolerance limit can be estimated individually based on previous reactions to an intervention. Example: a patient who is desaturated for a prolonged period by passive repositioning (SpO_2 <85%) is not really suitable for mobilisation due to their limited respiratory reserve.
- Are there any lines/installations (e.g. an intra-aortic balloon pump) that contraindicate mobilisation? In any case, all lines/installations should be checked and secured before mobilisation.
- Are there any neurological, orthopaedic or other contraindications?

Bed bicycle training for ventilated patients



The basis of early mobilisation in the intensive care unit is movement therapy.

- What medication is the patient currently taking and how might it affect mobilisation?
- Is the state of consciousness stable and does the patient agree to mobilisation?

The mobilisation method and intensity is then determined. Early mobilisation then takes place under continuous monitoring of haemodynamic and respiratory parameters. This allows – if necessary – immediate intervention, for example by reducing the intensity, giving additional oxygen or increasing the pressure support of the ventilator [13].

Structure and possibilities of early mobilisation

So far, there is a lack of optimal targets for training the critically ill. Since improved cardiorespiratory fitness is not the primary goal, training in stable patients should be more in depth. Successive interventions that build on each other with sufficient breaks in between have proven successful.

The basis of early mobilisation in the intensive care unit is movement therapy. As a rule, non-contactable patients are mobilised daily with three to ten repetitions per joint and encouraged by means of self-touch. As soon as a patient becomes more awake, simple everyday activities are added, such as turning, brushing the hair or washing the face. The patient should take over their own activity as quickly as possible under therapeutic guidance. To further counteract devastating muscle loss in intensive care, adapted strength training should be started as early as possible. For this purpose, light weights or therapeutic resistance are used and training is done at a medium intensity (estimated 50 to 70% of the one-repetition maximum, 8 to 12 repetitions, 2 to 5 sets).

Provided that the safety criteria are met, the actual early mobilisation begins with sitting upright in bed. If the vital signs remain stable, it is possible to proceed to the next stage: sitting at the edge of the bed, sitting in an armchair, standing up to walking (Figure 2).

Nowadays, various new aids enrich the early rehabilitation of critically ill patients. A motor-assisted bed bicycle ergometer enables moderate endurance training even for sedated or ICUAW patients. An electric standing table facilitates the mobilisation of a critically ill patient to a standing position and video games can promote motivation, as well as endurance and balance for critically ill patients [4].

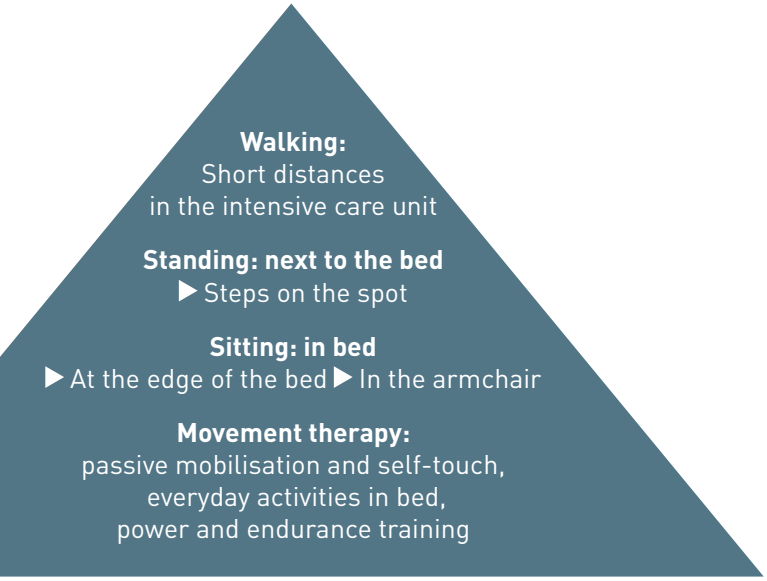


Figure 2: Early mobilisation pyramid with successive interventions building on one another

Early mobilisation improves outcome

Not only is the described early mobilisation of critically ill patients in intensive care units safe, but it has also been proven to improve the outcome. An early mobilisation concept in a medical intensive care unit therefore leads to a significantly shorter stay in the intensive care unit and hospital [7]. Additional bed-bicycle training in the intensive care unit improved walking distance, measured with the 6-minute walking test, as well as subjective physical functioning in the 36-item short form survey (SF-36) upon discharge from hospital [2]. Compared to the otherwise customary therapy, the combination of daily sedation stops with early mobilisation, including physiotherapy and occupational therapy, significantly shortened the number of days of ventilation and delirium. As a result, patients were much more independent in their everyday activities when discharged from hospital and, instead of requiring rehabilitation, could in some cases even be discharged directly home [9].

Leaving ICU as early as possible

The goal of intensive care measures is a return to an appropriate living environment [10]. In order to avoid complications, continuous rehabilitation should therefore already take place during the critical illness. Physiotherapists play an essential role in this often survival-focused setting, as they can evaluate and treat functional impairments while still in the ICU, in accordance with the available evidence and the motto: "Wake up, get up and get out of the ICU as soon as possible!" [3].

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Note: The original article was published in 2014 in Physioactive 4, the association magazine of the Swiss Physiotherapy Association.

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SCIENCE

Bored and alone – circuit training in neurorehab

Patients are inactive and alone for more than 60% of the rehabilitation day. They lie in bed bored. In many cases, more therapy is necessary, but is not easily possible under the prevailing conditions in the healthcare system. New concepts are needed. One promising approach is circuit training. Exercising in a group is a lot of fun for patients, promotes social interaction and, above all, is extremely effective. On your marks, get set, go!

Jakob Tiebel

The epidemiological development of neurological diseases around the world is dramatic. This is due mainly to the global demographic trend towards an older population. There is a growing number of patients in hospitals and rehabilitation centres today who need to be cared for by specialists from the field of neurology. In addition to patients with common diseases such as polyneuropathy and migraine, neurology primarily treats patients with neurodegenerative diseases such as Parkinson's disease and autoimmune diseases such as multiple sclerosis. Stroke care is being brought into focus in particular because there are increasingly better treatment options due to new therapy alternatives (cf. GBD 2017).

According to the WHO, stroke is now the second leading cause of death worldwide, the third leading cause of years of life lost to illness and death, and one of the main reasons for living with permanent disability (cf. GBD 2017, Feigin 2014, Go 2014). The number of people who suffer at least one stroke in their lifetime has risen to 33 million p.a. in the last 20 years (84 per cent, cf. Feigin 2014).

The number of cases is expected to double by 2030 (cf. Lozano et al. 2012, Murray et al. 2012, Krishnamurthi et al. 2013).

Exercise at the performance limit is crucial

While 30 years ago we did not really understand what to do with neurological patients and the focus was on palliation rather than rehabilitation, today there is an increased emphasis on exercise-based therapies to effectively treat sensorimotor and cognitive deficits (Dobkin 2004, Hanlon 1996, Page 2003, van Peppen et al. 2007). The human brain is plastic and remains adaptable into old age. After damage, the brain is able to regenerate itself to a certain extent and is able to compensate for deficits caused by damage (Kleim & Jones 2008). However, the establishment of new movement representations and the reestablishment of motor control abilities requires a performance-limit-oriented, repetitive practice of motor tasks that focus on the skills to be improved (Dobkin 2004, Hanlon 1996, Page 2003, van Peppen et al. 2007).

Although standards are constantly improving and the chances of successful rehabilitation of patients with sometimes severe brain damage are increasing in terms of prognosis, there is a general problem with which neurorehabilitation has to contend: it does not do enough of what it knows!

Even fit patients lie in bed all day long

As early as 2012, in their review paper "Physical Activity in Hospitalised Stroke Patients", West and Bernhard criticised the fact that patients in inpatient facilities spend around 60 per cent of the day alone in their hospital room and are inactive (West & Bernhard 2012). Recent studies also show that, for many patients, the hospital bed is still where they spend most of their time. Even fit individuals often lie in bed all day and only get up when necessary (Lay et al. 2016, Åstrand et al. 2016, Lacroix 2016, Rist et al. 2017). There are few justifications for this. Early activation and mobilisation is feasible and safe (Askim et al. 2012). This is also confirmed in the context of the early rehabilitation of COVID-19 patients, although the implementation of this therapy naturally involves some special features (AWMF 2020, see text below for more information).

Stroke patients are sufficiently active for just 64 per cent of the time in a conventional physiotherapy unit. Kaur, English and Hilier were able to prove that specific exercise in particular falls short.

Patients are inactive for more than a third of therapy time

Even in therapy sessions where the patient is supposed to break a sweat, there is a disproportionate amount of idle time (Kaur et al. 2012). Stroke patients are sufficiently active for just 64 per cent of the time in a conventional physiotherapy unit. Kaur, English and Hilier were able to prove that specific exercise in particular falls short. Only a quarter of the therapy time is spent working with stroke patients on relevant daily activities such as standing and walking (Kaur et al. 2012). One fifth of the time is spent on non-specific exercise, which according to current scientific knowledge has no significant influence on motor outcome (Verbeek et al. 2014). The required 800 step repetitions (Pohl et al. 2007; ReMoS working group 2015), which a non-ambulatory patient should do in order to regain the ability to walk, are rarely or never achieved (Lang et al. 2009, Kimberly et al. 2010). The average is just 185 steps per day (Kimberley et al 2010). This is not 5 repetitions per minute (Kimberley et al. 2010) and clearly too few for motor learning (ReMoS working group, Verbeek et al. 2014).

Therapists are subject to errors in perception

There is hardly any awareness of the problem. Therapists seem to make errors in their perception and systematically overestimate their patients' activity levels (Kaur et al. 2013). The discrepancy is often excused by the fact that the patients' capacity does not allow for the required increase in therapy. This is in contrast to qualitative findings by Luker and colleagues from 2015, which confirm that patients are more likely to believe that they cannot get enough therapy: "The more I did the better it was because this leg never worked. Now it is working!" They often don't know what to do outside the therapies because there are no offers: "The help was good downstairs [in the physiotherapy gym] but when I come up here, I go to bed again – so what can I do?" And they often feel alone and bored because of this: "What happens during the day? Nothing! It's boring, very boring!" (Luker et al. 2015).

The Dutch research group led by Kwakkel and Verbeek was already able to prove in 2014 that a specific increase in therapy of 16 hours within the first 6 months after a stroke leads to a significantly better outcome: "The results of the present research synthesis support the hypothesis that augmented exercise therapy has small but favourable effects on ADL (e.g. walking), particularly if therapy input is augmented at least 16 hours within the first 6 months after stroke." (Verbeek et al. 2014).

The passive culture needs to change urgently

One week in bed equals ten years of muscle ageing. Other departments have already recognised the problem for themselves and started to act. The EndPJparalysis campaign is a positive example of how experts and the whole organisation can help to change the positive behaviour of their patients in hospital in the best possible way, as reported by the Physiotherapy Journal in July 2019. "The challenge started back in April 2018 and so far, more than 760,000 patients in hospital are no longer in pyjamas as a result of the campaign, with nearly 800,000 mobile (as of May 2019). On the campaign website (https://endpjparalysis.org) you can read some moving stories of patients that will encourage and motivate you."

Structural reorganisation of therapies for improved patient care

In neurological rehabilitation, the structural organisation of therapies in particular can contribute to improved patient care and the necessary increase in activity. "People with stroke spend more time in active task practice when physiotherapy rehabilitation is provided in circuit classes compared to individual therapy sessions," was the key message of a 2014 observational study by Coralie English and colleagues (English et al. 2014). Circuit training is a form of training in which patients perform exercises at different stations one after the other. The individual stations each consist of a specific exercise and are usually arranged in a circle. Depending on the exercises selected and how they are executed, circuit training can focus on training power, endurance, mobility or speed.

Circuit training in stroke rehabilitation – individually or in a group (with more than two patients at a time) – usually consists of a tailored intervention programme with a focus on training functional tasks such as standing and walking. Circuit

In terms of additional training time, it turns out that at least 30 minutes more per day for 5 working days over 6 weeks is needed to significantly improve walking ability. For walking speed and walking distance, an additional training time of more than 60 minutes per week resulted in significant effects.

training is thus a suitable way of integrating different content in different phases of stroke rehabilitation. For therapists, this form of training allows them to keep an eye on both the group and the individual (ReMoS Working Group 2015).

Efficacy proven and well evidenced

Various reviews (including English & Hillier 2010, English et al. 2017, Wevers et al. 2009) and numerous individual studies (Mead et al. 2007, Verma et al. 2011, Mudge et al. 2009, Outermans et al. 2010, Salbach et al. 2004, Yang et al. 2006, Blennerhassett & Dite 2004, van Vliet et al. 2005, Pang et al. 2005) have evaluated the effectiveness of circuit training in relation to lower limb rehabilitation. The evidence shows that additional specific training to improve walking ability, walking speed and walking distance in subacute and chronic patients is very effective. However, not all additional training is equal. It has been found that specific leg function or gait training is necessary to achieve improvements in walking – non-specific functional training cannot do the same. In terms of additional training time, it turns out that at least 30 minutes more per day for 5 working days over 6 weeks is needed to significantly improve walking ability. For walking speed and walking distance, an additional training time of more than 60 minutes per week resulted in significant effects.

Group therapy not completely off-limits during the COVID-19 pandemic

During the COVID-19 pandemic, group therapy is naturally subject to more difficult conditions. Infected patients must be treated while strictly taking applicable isolation measures into account and keeping treating therapists protected. As a rule, the therapy here takes place in the patient's room, in the case of severely affected patients even in bed (AWMF 2020).

COVID-19 patients can only be admitted for regular (early) rehabilitation treatment without isolation if they have been symptom-free of acute COVID-19 for at least 48 hours, at the earliest 10 days after symptom onset, and if the PCR result from two swabs taken at the same time (one oropharyngeal and one nasopharyngeal swab) is SARS-CoV-2 negative (post COVID-19 cases) or if the Ct value is high and SARS-CoV-2 is non-culturable (AWMF 2020).

For group therapies, maximum group sizes should be defined depending on room size, volume, ventilation options, the physical intensity of the therapies and the use of barrier measures. Crowds of people, e.g. in waiting areas, must be avoided before, as well as when entering and leaving the therapy rooms. This can be organised in part by providing appropriate information or via electronic scheduling (AWMF 2020).

In the case of therapies on equipment that is used alternately by several patients, care must be taken to ensure thorough surface disinfection after use. In the case of cooperative patients, this can also be done by the patients themselves, but supervision is required (AWMF 2020).

A summary of the results

Group therapies in rehabilitation, especially specific circuit training, have proven potential when it comes to increasing treatment dose and intensity. During the COVID-19 pandemic, things are of course a bit more complicated in terms of group therapy, but by no means hopeless, as the recommendations of the cited AWMF guideline show. Stricter hygiene measures must be observed for any provisions and, of course, acutely infected patients are not permitted to participate. For follow-up rehabilitation of post COVID-19 cases, however, the group is once again a promising option.

Because the pandemic is putting therapeutic care in rehabilitation to the test even more, it is necessary to implement offerings that cover the increased need for therapies in a meaningful way. This is where group therapy comes into its own and also has effects that are not provided by an individual setting. These include group cohesion, which, from a psychological point of view, has a not insignificant impact on the success of a healing treatment after a longer period of isolation.

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Jakob Tiebel studied applied psychology at the Apollon University of Applied Science in Bremen. His clinical expertise is based on his previous work as an occupational therapist in neurological and neurosurgical early rehabilitation. In 2012, he switched to the medical supply store industry and some time later to medical technology. On behalf of medica Medizintechnik GmbH, he was instrumental in the development of evidence-based robotics-supported therapy concepts as a specialist for clinical applications and head of product management at the interface to marketing, sales and research. Since 2020, he has worked as Marketing and Sales Manager at Visionary AG, one of the largest Swiss companies for internet-based IT solutions and consulting services in the healthcare sector, as well as the developer of the internet-based software docbox.

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THERAPY & PRACTICE

“Don’t talk – walk!” – the gait lab at the DianaKlinik Bad Bevensen

A special kind of circuit training. Since September 2020, one of the largest rehabilitation clinics in northern Germany has been offering its patients innovative gait rehabilitation.

Mareike Hoffmann

In 2018, when the DianaKlinik Bad Bevensen was considering how to evolve its physiotherapy offering, several aspects of the therapy were revised. Existing group sessions were adapted in terms of content and structured to build on each other. Overall, the group therapies were meaningful, but there was an incentive to optimise them even more.

According to current guidelines, a post-stroke patient should walk about 800 steps a day. This is not feasible with conventional therapy and above all in a group setting. And so, the purchase of a gait trainer was on the agenda. Trade fairs and symposia – including the 9th THERA-Trainer Symposium on the topic “Use of robotics in modern gait rehabilitation” – were used to gather information. Further training in “Neurophysiotherapy” reinforced the idea again, and so we decided on a completely new concept: the existing equipment was to be supplemented by the THERA-Trainer complete solution and presented arranged in a circle as a gait lab.

After some renovation, the largest group room at the DianaKlinik (170 m²) became the new gait lab of the physiotherapy department. At the same time, the occupational therapy arm lab was created in a room directly next door. Interdisciplinary cooperation is an important aspect for us, which is significantly facilitated by locating these facilities together.

The gait lab has one outstanding advantage: a wide range of patients can be treated here.

As it happens, an unofficial slogan for the gait lab was also quickly found. Ever since a colleague motivated a non-German-speaking patient to concentrate more with the words "Don't talk – walk!", this rallying cry – which of course is meant to be a little tongue-in-cheek – has established itself as a kind of motto among the staff.

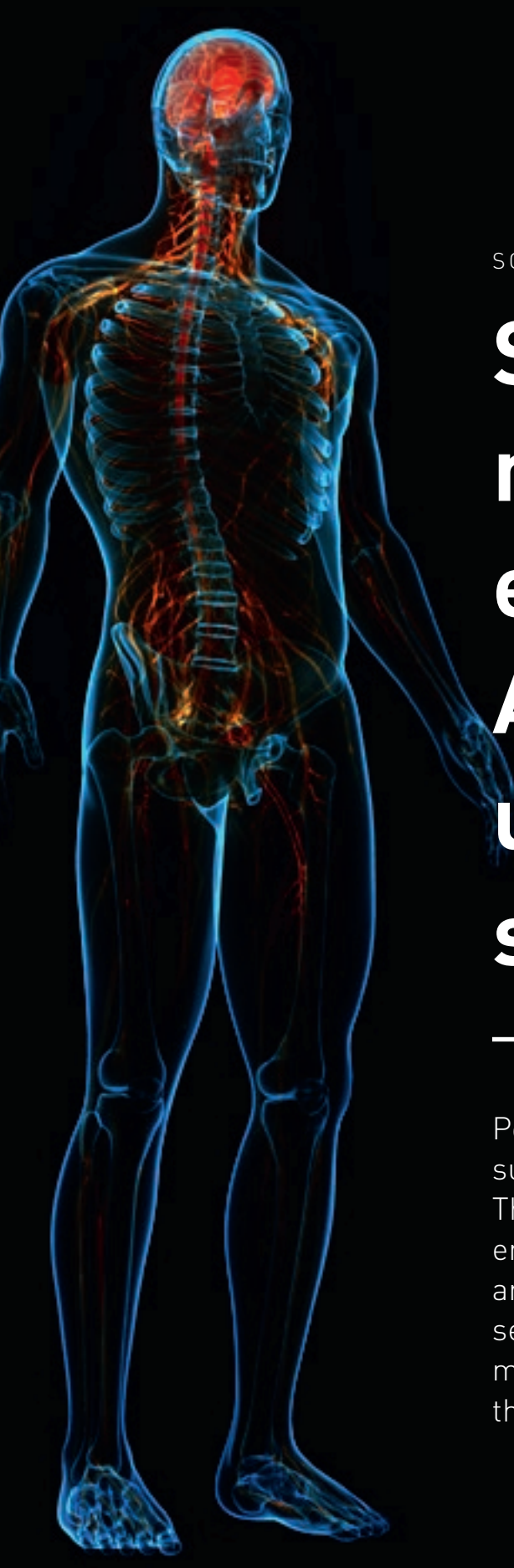
Here we may find, for example, the haemodynamically unstable patient whose body has to get used to standing vertically again. And then there is the walker who can apparently move around independently, but whose walking speed is not yet sufficient to participate in his or her normal everyday life.

With the help of the "Functional Ambulation Categories" (FAC), the physiotherapists determine the support the patient needs in terms of walking ability at their first appointment. Based on this score and the findings, they can then choose the appropriate therapy in the gait lab.

But it is not only the patients who experience an advantage; this open form of therapy also offers exciting opportunities and professional interaction for the colleagues working in the gait lab.

Digital evaluations of the individual exercises show the patient's progress and so can be used to guide further therapy. Both in the daily documentation and rehab team meetings, colleagues can describe the patient's progress, but now also provide measurable evidence – a clear increase in quality!

Mareike Hoffmann completed a voluntary social year at the DianaKlinik Bad Bevensen in 2010/2011 in the area of nursing. During that year, she decided to train as a physiotherapist at the affiliated school. In addition to her training, she continued to work as a nursing assistant and in 2014, after passing her exams, she decided to work at DianaKlinik again. After establishing herself in physiotherapy, she took over as team leader in 2017. After further training in "neurophysiotherapy", the design and establishment of the gait lab was the physiotherapist's biggest project to date.



SCIENCE

Study on movement exercisers in ALS: intensive use and high satisfaction

People with amyotrophic lateral sclerosis (ALS) suffer progressive paralysis of the arms and legs. Therapeutic movement exercisers are an aid that enable device-based physiotherapy of the legs and arms in the home. Therapeutic movement exercisers for the arms and legs offer an active or passive mode of device-based physiotherapy, depending on the severity of the paralysis.

How often are therapeutic movement exercisers used and what is the subjective experience of device-based physiotherapy and satisfaction with the equipment among people with ALS? A scientific study supported by Ambulanzpartner explores these questions. The results of the study are so informative that they were presented at the congress of the German Society of Neurology in November 2020.

The study analysed 106 patients with ALS (women: 64%, n=68; men: 36%, n=38) who were supplied with a therapeutic movement trainer. The study was conducted from February 2019 to January 2020 at nine specialised ALS centres. Data collection with a structured interview was carried out via the management and research platform www.ambulanzpartner.de.

People with amyotrophic lateral sclerosis (ALS) suffer progressive paralysis of the arms and legs. Therapeutic movement exercisers are an aid that enable device-based physiotherapy of the legs and arms in the home. Therapeutic movement exercisers for the arms and legs offer an active or passive mode of device-based physiotherapy, depending on the severity of the paralysis.

Frequency of use of the therapeutic movement exerciser

The majority of patients (60%) use the therapeutic movement exerciser at least 5 times a week. Almost 9% even get device-based physiotherapy more than 10 times a week. Only 19% use the equipment only once or twice per week. The exact weekly frequency of use is shown in the figure (Fig.1).

Benefits of device-based physiotherapy from the patients' point of view

From the patients' experiences, the following picture emerges about the benefits of therapeutic movement exercisers. Four treatment areas achieve a particularly high approval rating: Improvement of general well-being (98%), reduction of the feeling of immobility, improvement of the feeling of "having done something" and reduction of the feeling of "becoming rusty" (97% each). The two treatment goals of reducing muscle stiffness (92%) and preserving muscle power (91%) were also confirmed at high levels. Other important effects are shown in the following figure.

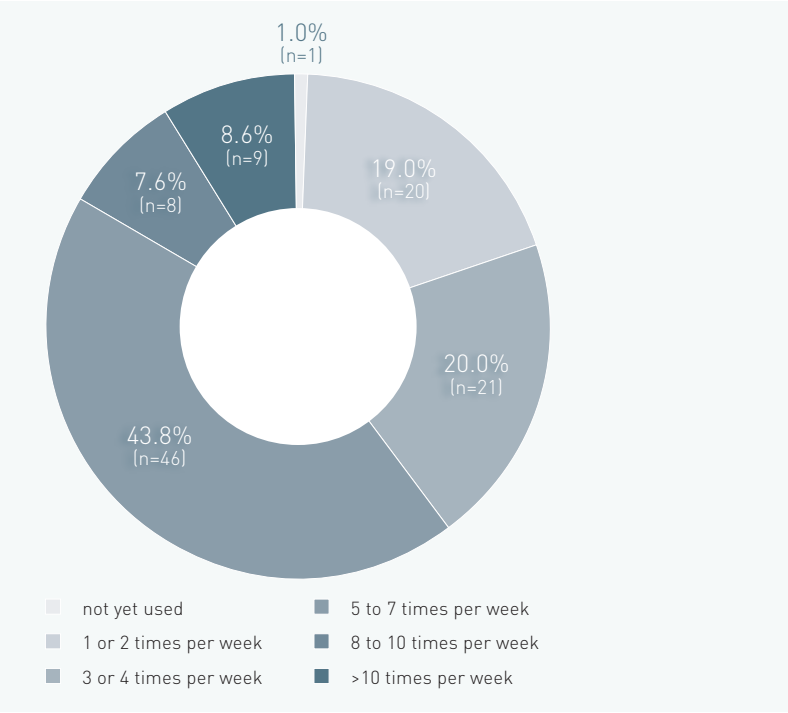


Fig. 1: Weekly frequency of use of the therapeutic movement exerciser, n=104

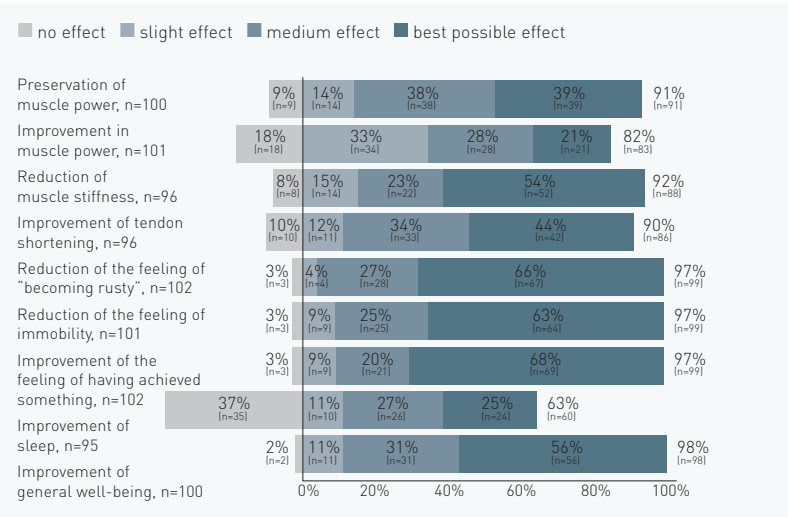


Fig. 2: Subjective benefits of device-based physiotherapy

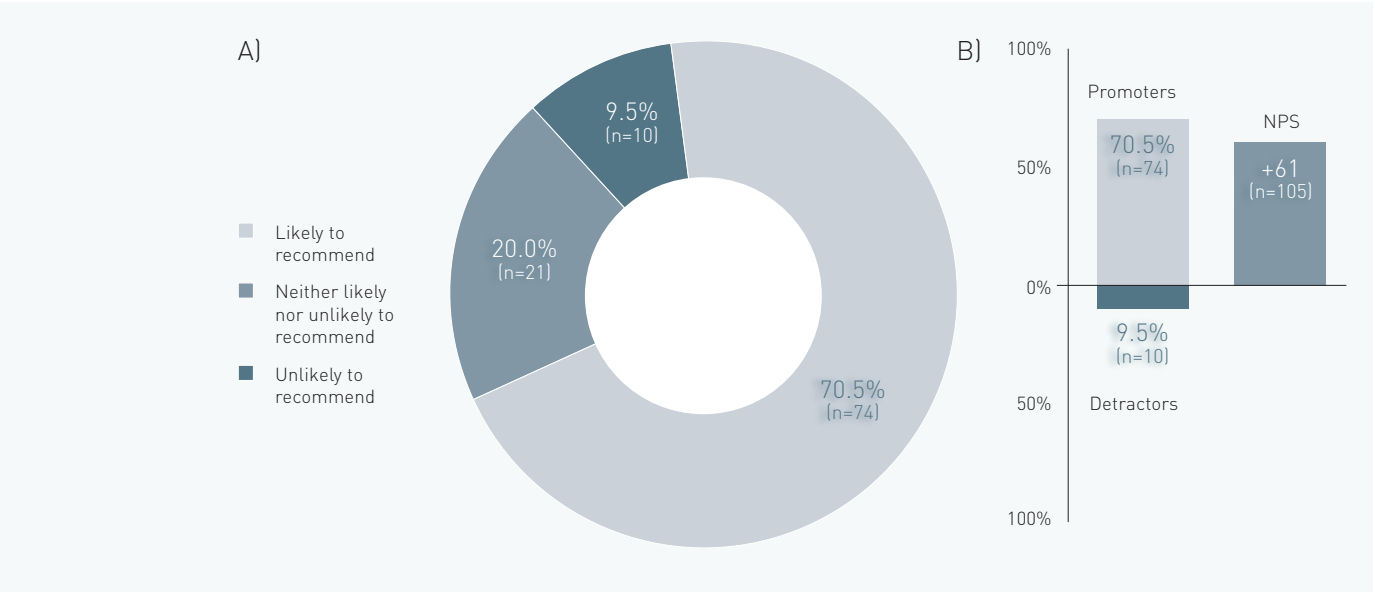


Fig. 3: Net Promoter Score (NPS) for satisfaction with a therapeutic movement exerciser, n=105

Patient satisfaction with a therapeutic movement exerciser

Satisfaction with a therapeutic movement exerciser was determined by the so-called likelihood of recommendation using the Net Promotor Score (NPS): "How likely is it that you would recommend the movement exerciser to a friend or colleague who suffers from spasticity or flaccid paresis?" The answers were given on a scale between 0 (absolutely unlikely to recommend) and 10 (highly likely to recommend) points.

The likelihood of recommendation for a therapeutic movement exerciser was assessed at an NPS of +61 points (NPS scale -100 to +100, >0 = positive evaluation). This corresponds to a very high level of satisfaction with the tool (Fig.3).

Patients with ALS use therapeutic movement exercisers intensively and are very satisfied with them

The study allows an in-depth insight for the first time into the topic of therapeutic movement exercisers for patients with ALS. The issue is particularly controversial due to the restrictive coverage of the costs of care by health insurance funds. The majority of patients with ALS (60%) use the therapeutic movement exerciser at least 5 times a week and are therefore getting frequent device-based physiotherapy in addition to their physiotherapy treatment. From the perspective of patients, the examined subjective treatment goals of device-based physiotherapy are almost universally achieved. Patient satisfaction with the therapeutic movement exerciser is very high (NPS: +61, an NPS >50 is considered "excellent").

The study clearly demonstrates the treatment potential of therapeutic movement exercisers for ALS. So far, however, the possible applications of a movement exerciser for ALS are insufficiently known and under-communicated.

In order to further develop the treatment method, it is important to find out in future studies whether an improvement of functions (e.g. through a reduction of spasticity) can also be achieved through device-based physiotherapy. Future analyses must also show how the use of therapeutic movement exercisers affects the emergence and development of secondary symptoms of limb paralysis (pain, contractures, lymphoedema) in ALS.

Thanks for the data

We would like to thank all the patients who participated in this movement exerciser study and provided their data for research. The research project was only able to succeed thanks to their kind support and the data they provided.

Your contact person for questions about the study:

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Project Manager Medical Research
Mail: susanne.spittel@ap-soziotech.de
Tel.: +49 (0)30 81031410

The study was conducted at the following ALS centres:

- Charité - University Hospital Berlin, outpatient clinic for ALS and other motor neurone diseases
- Bergmannsheil University Hospitals, outpatient clinic for ALS and other motor neurone diseases
- University Hospital Jena, Centre for Neuromuscular and Motor Neuron Diseases
- Alfried Krupp Hospital Essen, outpatient clinic for ALS and other motor neurone diseases
- University Hospital Bonn – Clinic for Neurodegenerative Diseases
- University Medical Center Göttingen – outpatient clinic for ALS and other motor neurone diseases
- University Hospital Leipzig – outpatient clinic for ALS and other motor neurone diseases
- University Hospital Dresden – outpatient clinic for motor neurone diseases
- Diakonissenkrankenhaus Mannheim, Neurology Clinic

THERAPY & PRACTICE

Let's cycle

The use of a bed bicycle in an acute hospital is a win-win situation for patients, therapists, clinics and our health care system

The rapid restoration of independent mobility is the goal for patients in acute care. In addition to individual therapy, the accompanying use of device-based training can offer opportunities for patients, therapists and clinics.

Tobias Giebler

Mobilisation should be started for patients within the first 72 hours – this is what the guideline of the German Society for Anaesthesiology and Intensive Care Medicine recommends

For early mobilisation in intensive care units, it is crucial that therapy is started promptly. Studies [12] suggest that the consequences of insufficient early mobilisation cannot easily be made up for in further rehabilitation. So for patients for whom there are no exclusion criteria, mobilisation should be started within the first 72 hours – as recommended by the guideline of the German Society for Anaesthesiology and Intensive Care Medicine [1]. Therapy should be performed twice daily for at least 20 minutes. Successful early mobilisation can significantly reduce the length of stay in intensive care units, the length of hospital stay and mortality [9]. The possibility of returning to an independent and self-determined life increases [10].

Early mobilisation is divided into:
1. Passive mobilisation
2. Assisted-active mobilisation
3. Active mobilisation

The recommendation to use a bed bicycle is found in the German guideline for all stages of mobilisation [1]. The bed bicycle is therefore an integral part of the entire early mobilisation concept.

In practice, after a systematic interdisciplinary evaluation of the patient's overall situation, the mobilisation level is usually determined using the ICU Mobility Scale [5] and a therapy goal is formulated. The ICU Mobility Scale, as simplified standardised language, is a scale from 0 to 11, where 0 denotes no mobilisation, 5 denotes active transfer to a chair and 11 denotes independent walking.

The use of a bed bicycle such as the THERA-Trainer bemo cannot replace therapeutic intervention. Here, the focus is on assisted sitting at the edge of the bed up to active walking as mobilisation goals as soon as this is possible. However, the bed bicycle can make a significant contribution to successful early mobilisation in intensive care units.

While the legs are completely guided and secured during passive mobilisation with the bed bicycle, the resistance can be switched on and increased with increasing activity. When used in conjunction with THERA-soft, a versatile and fun training software, it offers motivating and varied training, a welcome change for the otherwise monotonous and psychologically stressful everyday life in intensive care. The cardiovascular system is stimulated and the maintenance of joint mobility is promoted. Especially when it comes to extending walking distance, the bed bicycle proves useful for strengthening the lower extremities. In addition, long-stay patients, for example after sepsis, often suffer from polyneuropathy and myopathy, or ICUAW (intensive care unit-acquired weakness) for short, which is damage to the peripheral nerves and muscles. In addition to the characteristic onset of paresis, movement of the extremities is often painful. In practice, the use of the bed bicycle often has a pain-relieving effect after a few minutes. In the early phase, when patients are not yet able to initiate movements themselves, it has been shown that a bed bicycle can really be used to full effect.

Burtin [2] compared standard mobilisation with standard mobilisation plus 20 minutes of bed bicycle. As soon as the patients were able to pedal actively, the 20 minutes were divided into 2x10 min of active pedalling.

On discharge from hospital, the 6-minute walking test showed a clear difference in walking distance. While the control group walked an average of 143 m, the intervention group walked an average of 196 m – an increase in walking distance of 37%.

Independent walking was possible for 73% vs. 55% of patients. It also showed that the functional strength gain for the thigh extensors increased significantly through passive use.

The work of Machado [8] was able to underline that through passive use, i.e. when the patient is not yet able to support the pedalling action, a significant increase in muscle power (MRC score) can be achieved. The strength tests took place on the day of discharge (post-implementation) and on

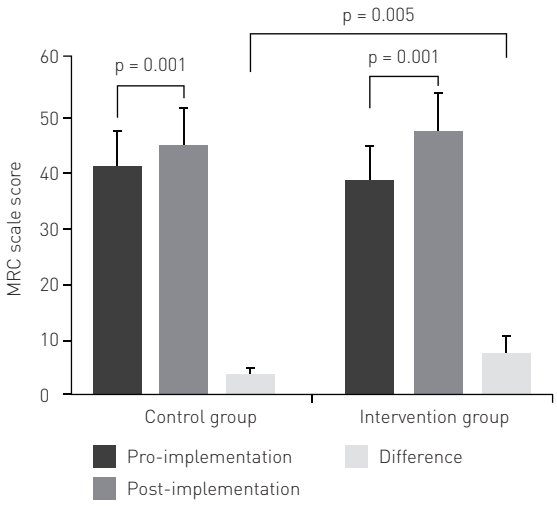

Fig. 1: Peripheral muscle strength, as measured by the Medical Research Council (MRC) scale, before and after the implementation of the study protocol. Student's t-test.

the first day (pre-implementation) that the patient could be awoken.

The issue of application safety [7] is also supported by evidence. Only one safety-relevant event (0.2 per cent) occurred in 541 uses of a bed bicycle.

Bed bicycle – evidence-based effects of early mobilisation at a glance:

- **Increase in walking distance [2]**
- **Independent walking becomes more possible again during the course of treatment [2]**
- **Strength increase in the knee extensors (quadriceps muscle), especially significantly faster strength increase during the further course of treatment after acute therapy [2,8]**
- **Reduction of oxidative stress [11]**
- **Low risk [7]**

Devices such as the THERA-Trainer bemo, for example, additionally offer the possibility of torso and arm training. Even though I am not aware of any evidence on this, I would expect the use as an upper body exerciser to be beneficial. For example, strengthening the trunk and arms generally promotes an upright posture, thus improving breathing mechanics and also chest mobility. This in turn leads to improved secretolysis and secretion transport. Last but not least, the deepening of breathing, the strengthening of the respiratory and respiratory support muscles probably contributes to weaning off the ventilator.

A bed bicycle such as the THERA-Trainer bemo can also be used effectively in the area of post-operative neurosurgery patients. Here it is mainly used for patients with restrictions in the area of the lower extremities due to paraplegia or hemiparesis, for example, regardless of the cause of these symptoms. However, it is also popular for patients who have been prescribed bed rest due to neuromonitoring for diagnosing epilepsy. The pedalling action of cycling and the motion of walking are similar [13], so the same muscle parts are used in a similarly coordinated way. Gait rehabilitation for these post-operatively neurologically affected patients can therefore be well supported. Especially for patients who can already take their first steps with a lot of support, the accompanying use of the bed bicycle has proven very successful. Since it requires only a manageable amount of time, it allows for an additional training session as well as the daily gait training with the therapists. Patients can perform and practise the gait-like pedalling action with high numbers of repetitions and at a speed according to their abilities, right through to simply improving strength in order to extend their walking distance. There are also high acceptance levels among patients for tone regulation and pain relief. Studies looking at RAGT (Robotic-Assisted Gait Training) show that especially high numbers of repetitions play a

Bed bicycles in no way replace therapists, rather they contribute to a successful recovery of the body's functions.

Benefits at a glance:

- Low personnel expense
- Low burden for personnel
- Evidence-based positive effects for walking ability
- Low risk associated with use
- More frequent repetition becomes possible in terms of motor learning

role in gait rehabilitation. These cannot be realised alone with one therapy session a day of group gait training. Bed bikes like the THERA-Trainer bemo therefore support gait rehabilitation, especially in the first days after surgical interventions, before the patients are then transferred to a rehabilitation clinic.

The limits of application are seen in the field of neurosurgery in patients with pronounced paresis and plegia of the upper extremities. Due to the lack of muscular control of the shoulder joint, its use is not indicated here. There are also limitations in the context of early mobilisation. In addition to injuries, femoral sheaths and catheters such as ECMO cannulas (extracorporeal membrane oxygenation) are reasons to consider its use carefully. The access points in the vessels move through regular hip flexion and extension. Germs from the skin surface enter the body and can pass into the bloodstream without a barrier. The tunica intima of the veins and arteries (inner lining) is also exposed to constant friction. The risk of vascular dissection, damage to the tunica intima with subsequent undermining by the bloodstream, increases.

In summary, bed bicycles such as the THERA-Trainer bemo support early mobilisation and gait rehabilitation in acute care hospitals very effectively. The ability to walk is a frequent and high-priority goal for patients. The bed bicycle does not replace the therapist, but it can contribute to a successful recovery of body function in terms of activity and participation according to ICF (International Classification of Functioning, Disability and Health) [3]. In the context of early mobilisation in intensive care units, it has proven to be attractive in many different respects.

Due to its intuitive handling, low usage costs and simple hygienic preparation, the THERA-Trainer bemo is an option for a supplementary, second mobilisation in accordance with the guidelines, especially in times of scarce personnel resources.

Successful early mobilisation is an important building block for patients to return to an independent and self-determined life [10].

A favourable cost-benefit ratio can also be demonstrated for the clinics. The shortened length of stay in intensive care units and hospitals associated with successful early mobilisation [9] and the reduction of complications has not only a direct positive effect. There is also a lightening of the burden on the healthcare system due to the savings in therapy and nursing costs [1,4,6,12,]. In my opinion, the use of a bed bicycle in an acute care hospital is a win-win for patients, therapists, clinics and our health care system. Let's cycle!

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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 7 years.

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