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L I F E I N M O T I O N

Linguistic diversity, inclusion and content

Dear readers,

You may have noticed that most of the articles in the German edition of THERAPY use the masculine form by default. This is not an oversight. Our female members of the editorial team are staunch advocates of the generic masculine. It leaves more space for more interesting things and preserves linguistic aesthetics. It makes the articles easier to understand and more reader-friendly while serving the needs of all our readers.

We know that many students and staff at universities, colleges and hospitals are encouraged to use gender-inclusive language. For this reason, we print original contributions using gender-inclusive language when explicitly requested by the authors. In all other cases, however, we will continue to refrain from doing so for the reasons stated.

In addition, English-language articles can be found from time to time in the German edition of THERAPY. THERAPY is an international magazine that accepts contributions from all over the world. Some guest authors are not proficient in German and usually submit their contributions in English.

We do not translate their articles into German. This would result in a not inconsiderable expense. We try – wherever possible – to publish articles in German. However, exceptions will also prove the rule in the future. We thank you for your understanding.

I am pleased to announce a wide range of specialist articles in this issue. In the main section on dialysis, we once again turn our attention to intradialytic exercise and report on the eagerly awaited results of the DiaTT trial. Another highlight is the contribution by Jan Inge Ebbesvik about the world's only indoor cycling world championship for senior citizens and people with dementia. This initiative and the commitment shown is impressive. Hopefully an inspiration for “more of the same” in the future.

Finally, your help is needed. We have included a reader survey with this issue on page 55. We look forward to your active participation and honest feedback. Thank you!

Enjoy reading!

Jakob Tiebel



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Case reports on early mobilisation in intensive care units

A practical excursion into early mobilisation in intensive care to disseminate scientific findings from everyday intensive care therapy.

Tobias Giebler

In recent years and issues of THERAPY, the topic of early mobilisation in intensive care units has been considered many times from different angles. A systematic review with meta-analysis by Wang et al [1] – published in the International Journal of Nursing Studies in 2020 – provides a succinct summary of the effects of early mobilisation of patients requiring intensive care and confirmation of the benefits.

Results:

- 2.1 fewer ventilation days
- 2.7 fewer days in ICU
- length of hospital stay reduced by 3.7 days
- 12% more muscle power
- 13% more independent in terms of care

Included were 39 studies with a total of 3,837 patients.

The issue of safety is also a barrier for more complex intensive care patients who need to be treated with extracorporeal membrane oxygenation (ECMO). Although research suggests good feasibility with

low risk [2]. Even in far less complex cases, accesses such as oral intubation can be a barrier to mobilisation from bed in clinical practice [3]. A systematic review with meta-analysis [4] shows that early mobilisation is safe to carry out. In 22,351 mobilisations, there were only 2.6% adverse events such as blood pressure changes and oxygen saturation drops. Only 0.3% entailed a consequence, such as an increase in blood pressure-raising medication. This 0.3% already includes complications with airway access. In a little over 22,000 mobilisations, there was an accidental extubation in only two cases – this corresponds to just 0.01%. This is unpleasant and possibly dramatic for the individual. In the overall picture, however, the opportunities and advantages of early mobilisation outweigh the disadvantages, which have a low probability of occurrence.

A shorter time span between knowledge and transfer to everyday clinical practice (knowledge-to-action gap) would be welcome. Unfortunately, it takes an average of 17 years for evidence in medicine to be consistently implemented in practice [5].





To stimulate the discourse and accelerate the transfer, I would like to present our implementation efforts on the following pages using practical examples. This is without any claim to achieving perfection and exhausting all possibilities.

Case study 1

Ms G. was found unconscious at the bottom of her stairs after the fire and rescue service had gained entry to her flat in the early evening. A neighbour had raised the alarm. The pattern of injury and body temperature suggested that Ms G. had fallen down about 8 steps and must have been lying on the ground for quite a while before the emergency services arrived. Her body temperature was initially at 25 degrees, her heart rate had slowed down and her blood pressure was low.

Intubated and completely immobilised, the patient arrived at the hospital by helicopter in the late afternoon.

Findings from the trauma room:

- minor trauma from “long lie”
- head laceration
- multiple rib fractures on the right, bilateral pleural effusion, bibasilar atelectasis

Preliminary findings:

- hypertension
- decompensation with shortness of breath associated with pleural effusions
- multiple bilateral thoracocentesis. Effusions of unclear cause with chronic inflammation
- medicated and regularly monitored

Admission to intensive care occurred in the late evening. The patient was intubated and required circulatory support medication.

Early mobilisation:

In the morning around 8:30 am, the patient was back to normal temperature, but still needed circulatory support medication, was still intubated and required assisted ventilation.

*A shorter time span
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(knowledge-to-action gap)
would be welcome.*

The patient responded in an untargeted way to loud and clear speech in combination with tactile stimulation.

In the interdisciplinary team, consisting of doctors, nursing staff and therapists, no contraindications for early mobilisation were determined. The daily goal was activation and mobilisation as far as possible from the bed. If possible, the patient was to be activated and her vigilance promoted to such an extent that extubation, the removal of the breathing tube, could become a possibility.

The following measures were carried out in the first early mobilisation unit:

- speaking to the patient, personal introduction and explaining the situation and goals of the therapy session;
- activating, body-oriented movement of the extremities;
- promoting vigilance by jointly washing the face using a cold flannel and wiping the mouth with a damp swab.

Ms G. became more alert during these measures and followed individual prompts – it became increasingly possible to communicate with her using head movements and she answered simple questions.

After activation, the patient was placed at the edge of the bed with the support of the nursing staff and a physiotherapist. In addition to further activation measures, communication with Ms G. was further intensified. The aim was for Ms G. to feel well cared for, protected and safe, in addition to the cognitive stimulation. Building on this, exercises were completed to improve sitting stability. After a few minutes, Ms G. required only minimal support to sit. It was clear from her behaviour that she was

in pain. In addition to the respiratory pain from the rib fractures, she reported pain throughout her body, presumably from the fall. A painkiller was administered – also as a basis for the next step, respiratory therapy.

The focus now turned towards respiratory therapy – the aim being to open the areas of atelectasis (collapsed lung areas) and optimally prepare the patient for extubation. This released secretions from the lungs, which could then be coughed up and suctioned. Ms G. was then transferred back to bed and placed in the cardiac chair position. With improved alertness, protective reflexes and respiratory gases, the patient was extubated a short time later.

During the second early mobilisation (on the same day), Ms G. was awake and followed simple prompts. She was not oriented in all spheres but remained friendly and approachable. With support, she was mobilised to the edge of the bed once again and performed the first exercises with a breathing trainer. She then stood in front of the bed with support on both sides. After a short break sitting down, she was able to walk the first 20 metres on the high walking frame with a lot of support. To do this, she only needed 3 litres of oxygen administered through a nasal cannula. Afterwards, Ms G. remained sitting mobilised in a wheelchair. This is beneficial in this situation for both lung function and cognition.

Ms G. was then transferred to a normal ward on the same day.

Case study 2

Mr H. is 19 years old and had been ill for 12 days. At first with a headache, then from the second day onwards with a fever and increasing listlessness, as well as a cough. Further deterioration of his general condition led to hospitalisation. The initial therapy with oxygen and non-invasive ventilation (NIV) with a mask was no longer sufficient, so intubation (insertion of a breathing tube) was indicated. Progressive lung failure occurred even under intensified mechanical ventilation. Contact was made with an ECMO centre and the subsequent implantation of an ECMO by specialists.

Mr H. was then admitted to the intensive care unit for further therapy.

Diagnoses:

- severe ARDS (lung failure) with septic shock associated with:
- pneumococcal pneumonia (bacterial pneumonia)
- influenza A detection (flu)
- ventilation requirement
- VV ECMO (veno-venous ECMO = pure lung replacement)
- prone therapy
- pleural empyema on the right (collection of pus in the pleural space)
- surgical therapy: VATS (video-assisted thoracoscopic surgery = minimally invasive surgery in the thorax) on the right, pleurolysis, haematoma evacuation
- repeat VATS for haemothorax (blood in the thoracic cavity)

As the disease progressed:

- acute renal failure requiring dialysis

Secondary diagnoses:

- prior Covid-19 infection with only minor impairment of general condition

Early mobilisation:

Due to the pronounced lung failure, Mr H. was initially placed in the prone position but could be mobilised. In the morning around 8:30 am at the interdisciplinary meeting, the patient was still in the prone position. A minimally invasive video-assisted surgery (VATS) to relieve the purulent collection in the area of the right lung was planned for that day. An initial early mobilisation in bed from prone position with a focus on respiratory therapy was arranged and carried out.

At the interdisciplinary early consultation on the following day, there were no contraindications for mobilisation of the patient. The goal was that the patient should be able to stand in front of the bed and take his first steps on the spot by the end of the week. Remaining prone for 16 hours and a sedation interruption were planned to allow mobilisation to the edge of the bed. In order to be able to provide Mr H. with optimal psychological support in his situation, his mother was brought in for mobilisation. As a trusted person, his mother was able

to provide practical support for this strenuous process. Mr H. was awake on the breathing tube at the time of early mobilisation and communicated by making small movements with his head. He seemed oriented and motivated. The situation and therapy goals were clarified and agreed together with his mother. The patient cooperated well with the preparatory assistive movement of the extremities. He was also able to spontaneously support the transfer to the edge of the bed. Mr H. seemed tense and frightened in view of the overall situation and the number of staff in attendance. At this time, an intensive care nurse, a doctor, the patient's mother and two physiotherapists were in the room to facilitate mobilisation under ventilation, ECMO and dialysis therapy.

Mr H. needed to be stabilised in his seat. He was supported in straightening up, and respiratory therapy measures were carried out. Massive amounts of secretions were loosened, coughed up and suctioned. The transfer back to bed took place after a few minutes – Mr H. needed to cough a lot and this affected the ECMO therapy. The patient was also exhausted. A short time later, he was placed in the prone position again to optimise the situation of his lungs.

The following day, the aim was to mobilise the patient to the edge of the bed. In addition to respiratory therapy, the patient's independence in terms of movement transitions and sitting stability was to be enhanced – this was the outcome of the early consultation.

Unfortunately, Mr H. was not awake during the sedation interruption and was – even after intensive stimulation with cold stimuli – so lacking in awareness that mobilisation was not possible.

In the interdisciplinary team, consisting of doctors, nursing staff and therapists, no contraindications for early mobilisation were determined.



As treatment progressed, this was supplemented by regular training with the bed bike to optimally support muscle development and strength in terms of standing and walking ability.

Following a further interdisciplinary consultation, an early mobilisation in bed took place. With the goal remaining unchanged and after a prolonged wake-up phase, the situation the next day was as follows. Mr H. was awake but not oriented. He didn't know where he was or what was happening. He was greatly troubled by the breathing tube and tried to pull at it when he was not distracted. Here, too, his mother had a calming effect. She once again provided support during mobilisation. His lung situation had already improved somewhat in the meantime.

Mr H. was mobilised at the edge of the bed with the support of nursing and physiotherapy staff. Exercises were carried out to improve spatial perception. As a consequence, Mr H. regained a feeling for gravity.

Support in the seat could be reduced. Furthermore, attempts were made to support Mr H. in his

orientation and to explain his current situation to him. His mother was not only an enormous help but also the main communicator. The last step was breathing therapy, along with the application of a hot towel roll. After about 15 minutes of sitting on the edge of the bed, Mr H. was exhausted and the mobilisation was stopped.

Mr H. was regularly mobilised into a sitting position over the following days, with the same objective. His lung situation increasingly improved. He was still kept in the prone position for at least 16 hours and mobilised during the sedation interruptions. Mr H. was increasingly oriented and motivated during therapy. He quickly regained skills such as turning independently to the side position, transferring to the edge of the bed and sitting freely. Mr H was able to write down the things he wanted to say, allowing for communication. Tolerance of the breathing tube remained difficult. The stress for Mr H. and his mother was

enormous – during a joint round it was decided to bring in the psychosocial service in a support role. In addition, the second therapy session was often used to promote relaxation by means of a hot towel roll, among other things – usually in combination with breathing therapy. By day 8, the lung situation had improved to such an extent that the lung could fully take over gaseous exchange once again and the ECMO was explanted. The following day, another minimally invasive operation had to be performed on the thorax. Blood had accumulated in the thorax after the operation.

After just over a week, the agreed early mobilisation goal finally came into focus: Mr H. was ready to be mobilised to the standing position. The breathing tube was still the biggest hurdle. Nevertheless, the goal was achievable. In the presence of his mother, Mr H. managed to stand in front of the bed three times. His knees were still unstable, but the first attempts to stand were successful. First steps on the spot were possible with support. Mr H. repeatedly gave a “thumbs up” sign and was pleased with his success. In addition, as treatment progressed, Mr H. received regular training with the bed bike to optimally support muscle development and strength in terms of standing and walking ability. In the days

that followed, there was sustained improvement in his lung situation. Mr H. was extubated and verbal communication was finally possible. Mr H. stood in front of the bed and could be transferred to the wheelchair by taking steps. A milestone had been reached.

The following day, Mr H. was transferred to a normal ward.

Conclusion and outlook

The case studies show that, in the context of early mobilisation in intensive care, adaptations to support each patient on an individual basis are essential. In the interdisciplinary team, the relevant therapy concept must be firmly integrated into everyday practice and its importance must also be considered beyond the boundaries of physiotherapy. Only through close interdisciplinary cooperation with a focus on patient well-being and great commitment from all sides is successful implementation possible. If the transfer from knowledge to action is successful, sustainable added value can be created, above all for patients, but also for clinics and the healthcare system.

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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 patients in the intensive care unit into his physiotherapeutic training. He has been working intensively on the topic of early mobilisation for 9 years. He works at the Tübingen University Hospital in the Therapy Centre and has been the deputy area expert for intensive care medicine and neurosurgery since 2023.

The Power of Technology and Expertise

Embracing the Future of Rehabilitation:
Implementing cutting-edge technologies in rehabilitation
may be hindered by some users' reluctance to reflect.

Peter Brem, MSc.

When implementing cutting-edge technologies in rehabilitation, some users may hesitate to reflect on their progress. Individuals must be open and receptive to new rehabilitation methods, as they can ultimately lead to better outcomes and improved quality of life. While change can be intimidating, it's important to remember that these technologies are designed to support and enhance the rehabilitation process, not replace it entirely. With a positive attitude and willingness to try new approaches, users can reap the benefits of these innovative tools and achieve their rehabilitation goals.

It's important to acknowledge the potential benefits of modern technologies in rehabilitation and how they can help professionals identify areas for improvement. By reflecting on their work and recognizing failures, professionals can provide more effective treatments for their clients and ultimately improve their overall quality of life. However, it's also important to be aware of the barriers that may exist in implementing these technologies and work to overcome them to realize their potential fully. With patience and perseverance, we can continue to progress in rehabilitation and provide the best possible care for those who need it.

Of course, integrating technology comes with challenges, such as concerns about complexity and effectiveness. But fear not. By taking a proactive approach and addressing these hurdles head-on, we can unleash the full potential of these tools.



Modern technologies to improve reflection

In rehabilitation, taking advantage of modern technologies to improve reflection on one's work and provide more effective treatments for clients is crucial. Therapists can continuously enhance

their therapeutic approaches and track clients' progress with digital records, data analysis, and other technologies. This allows for personalized and effective care, particularly in complex cases. It's also important to be aware of the challenges and barriers that may exist in implementing these

The key is to use data analysis, digital records, and other tools to reflect on our progress and identify areas for improvement.



technologies and work to overcome them, so we can fully realize their potential and provide the best possible care for those who need it.

A proactive approach to overcome challenges

As a therapist, it's essential to be aware of potential obstacles and setbacks that may arise in the use of modern technologies for rehabilitation. By analyzing data in detail, we can identify these issues before they become serious problems, allowing us to adjust our therapy approach promptly and help our clients progress faster. However, it's also important to acknowledge and address the concerns and challenges of introducing new technologies to our work. For example, some therapists may feel inhibited by these technologies' complexity and fear they won't be able to use them effectively. Others may need more information about how these

Personalized care is now within reach, especially for complex cases. Technologies empower us to continuously fine-tune our therapeutic approaches, ensuring our clients receive the best care possible.

By recognizing and learning from failures, we can provide even more effective treatments for our clients!

technologies can deliver better results than traditional methods. By taking a proactive approach to these challenges and working to overcome them, we can fully realize the potential of modern technologies to provide more personalized and effective care for our clients.

Interpreting data requires therapist expertise and experience

Professional training and support are critical to overcoming any inhibitions and maximizing the potential of advancing technologies in rehabilitation. At the same time, it's essential to acknowledge the potential risks of relying too heavily on technology and neglecting the human interaction and empathy crucial to successful therapy. We must never allow technology to replace the humanity and compassion necessary for healing. Additionally, safeguarding the security and confidentiality of client data is of utmost importance, and implementing adequate data protection measures is crucial to preserve privacy and prevent abuse.

*Protecting our clients' privacy is paramount.
By implementing robust data protection
measures, we can ensure their information
remains secure and confidential.*

With a proactive approach to these challenges, we can fully realize the potential of evolving technologies to provide more personalized and effective care for our clients. It's also important to reflect on our work and identify any potential failures so that we can continuously improve and provide the most effective treatments possible. We must consider user inhibition, potential dependence on technology, and privacy concerns when using technology in rehabilitation. With targeted training, wise use, and appropriate safeguards, the full potential of new technologies can be realized. It's important to note that interpreting collected data requires therapist expertise and experience and that more than data collection is needed to make effective and appropriate treatment decisions. A subject matter expert can analyze the data to identify patterns, trends, and potential trouble spots, but it's crucial to consider more subtle relationships.

There is always room for improvement

A therapist with extensive expertise can extract the relevant information from the data and classify it in relation to each client's needs and progress while also providing insight into the technologies' limitations and constraints. It's important to continuously reflect on our work and identify any potential failures so that we can constantly improve and provide the most effective treatments possible.

Every measuring device and software has its accuracy and weaknesses. A subject matter expert can

critically assess these and know when additional manual testing or further diagnostic procedures are needed to get a comprehensive picture. Therefore, the interaction of technological support and human expertise is crucial for successful rehabilitation. Technology offers valuable data and information that can support therapists in their work.

It's not enough to only collect data

It's essential to consider user inhibition, privacy concerns, and potential dependence on technology in rehabilitation. With proper training, careful use and appropriate safeguards, technology can be a powerful tool. However, interpreting collected data requires the expertise and experience of a therapist. It's not enough to collect data; a therapist must analyze it, identify patterns, and classify it in relation to each client's needs and progress. The therapist's expertise and clinical experience are critical in interpreting the data accurately and putting it into a patient-specific context. Technology can provide a wealth of data that therapists can use to optimize their clients' recovery process, but it should never be relied on exclusively. Therapists

*Proper training and support
are crucial in making the most
of these advancements.
And let's not forget the impor-
tance of human interaction and
empathy in therapy; technology
should never replace the heart
of what we do!*

must also recognize the limitations of technology and use their expertise to interpret the data with empathy and understanding.

A combination of technology and knowledge

This combination of technology and knowledge has the potential to take rehabilitation to an entirely different level, benefiting clients and therapists alike. It is crucial to consider user inhibition, privacy concerns, and potential dependence on technology when using it in rehabilitation. Technology can be a powerful tool with proper training, careful use, and appropriate safeguards.

However, interpreting collected data requires the expertise and experience of a therapist. It's not enough to collect data; a therapist must analyze it, identify patterns, and classify it in relation to each client's needs and progress. Therapists' expertise is vital in interpreting the data accurately and putting it into a patient-specific context. Technology can provide valuable data that therapists can use to optimize their clients' recovery process, but it should never be relied on exclusively. Therapists must also recognize the limitations of technology and use their expertise to interpret the data with empathy and understanding. The combination of technology and knowledge has the potential to take rehabilitation to an entirely different level, benefiting clients and therapists alike.



Let's embrace the future of rehabilitation together! By combining technology and human expertise, we can take our profession to new heights, ultimately benefiting those we serve. Let's have a discussion about that and empower each other to provide the best care possible in the ever-evolving world of rehabilitation.



SOURCES:

<https://www.linkedin.com/pulse/implementing-cutting-edge-technologies-rehabilitation-peter-brem-msc/>

Senior Clinical Specialist Physiotherapy, Winterthur Cantonal Hospital. With more than 20 years of experience in musculoskeletal rehabilitation, Peter Brem puts patients and their individual goals and aspirations first. The use of innovative technologies plays a central role for him. As a top speaker in this field, Peter Brem shares his knowledge and my experience on a national and international level. His goal is to bring about positive change and inspire a passion for continuous improvement in rehabilitation.

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Technology in therapy

Challenges of integrating technology into therapy

Miriam Keifert

The digital revolution has transformed almost all aspects of our lives and the therapy fields are no exception. The integration of technology into therapeutic practice presents both opportunities and challenges. While advancing digitisation and automation in therapy offer promising opportunities, therapists, researchers and healthcare systems face a variety of complex challenges. This article sheds light on some of the key facets.

Individual adaptation and patient needs

One of the key challenges in integrating technology into clinical practice is for therapists to take into account the individuality of each patient. Every patient has unique needs and health goals that require tailored treatment. Technology can help deliver individualised treatments at the highest level, but this requires a deep understanding of the patient's history and careful selection of the right technologies.

Ethics and personal contact

When expertly used, technology can help to make the treatment process more efficient, but at the same time there is a risk that human contact and the emphatic connection between therapist and patient are neglected. The relationship between therapist and patient (therapeutic alliance) is essential for treatment success and it is important to ensure that technology supports and does not diminish this relationship.

Selection and evidence-based technology

The multitude of available technologies is overwhelming and adds to the complexity. In therapeutic practice, we need to select carefully and consider which technologies are best suited to patient needs. The selection should be based on scientific evidence, but also on clinical validation to ensure that the technologies actually contribute



to improving patient outcomes. Only then do they fulfil their purpose.

Data protection and patient trust

Sensitive health information and data have always been collected in therapeutic practice. In addition, these data are now stored electronically en masse. The incorporation of technology – whether through microchip sensors in wearables or robotic devices – therefore requires strict safeguarding of data in order to maintain data protection and patient trust. The collection and storage of data must be transparent and comply with applicable data protection regulations.

Cost efficiency and accessibility

While some technologies are promising, they could also come at a high cost. As a practitioner, it is important to consider carefully whether the

benefits of the technology justify the investment. Due consideration should also be given to whether the technology is accessible to all patients or whether it could reinforce social inequalities.

Training and development

Given all of the above, the successful use of technology requires appropriate training and development. Mastering technological therapy devices, robotics, apps and modern software solutions is essential for optimal patient care. Continuous training is important in order to keep up-to-date with all the latest developments.

Conclusion

Overall, the integration of technology into therapeutic practice offers an exciting opportunity to optimise patient care and achieve better outcomes. However, the challenges should not be underestimated. By taking a balanced approach that respects individual needs, ensures data protection and uses technology in an evidence-based way, physiotherapists can seize the opportunities while optimising the quality of their services.



Miriam Keifert studied sports science (MSc) and works in product management at THERA-Trainer, specialising in Clinical & Scientific.



When expertly used, technology can help to make the treatment process more efficient, but at the same time human contact and the emphatic connection between therapist and patient must not be neglected.

Reader survey: Your opinion counts!

We very much appreciate your interest in THERAPY Magazine and would like to hear what you think! Your feedback is very important to us to ensure that we provide you with the best and most relevant content. Please take a moment to participate in our reader survey. Your answers are anonymous and will be treated confidentially.

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An algorithm for fall prevention

Sometimes you have to explore new avenues

Lars Timm



The THERA-Trainer senso is a highly efficient training device for improving mental and physical performance and reducing the risk of falls. Numerous scientifically validated training programmes are available. Intelligent algorithms automatically adapt the games to individual performance. Anybody can use the trainer, including wheelchair users.

It all started when Dr Eva van het Reve (Dividat AG) was awarded her doctorate at ETH Zurich. The aim of her research there was to validate a revolutionary training approach for patients with cognitive-motor impairments by combining movement and cognitive tasks. But it soon became clear that there was no suitable training equipment on the

market. Necessity is the mother of invention, and so the first prototype of today's senso was developed.

The first research results with the senso exceeded all expectations. The decision to embark on further research projects and develop the prototype into a market-ready product was clearly the next logical step. After going through several stages of development and a whole series of trials, today's senso is a unique training device that is supported by scientific evidence and fulfils every technical requirement.

Joris van het Reve (CEO Dividat AG): "We're very happy that we have THERA-Trainer as a long-term

partner who has clearly recognised the genius of this training approach. Thanks to THERA-Trainer's international distribution network, we can provide optimal therapy to our patients across the world with the senso."

Body and mind are the cornerstones for safe movements

All movements in our everyday lives rely on a fine interplay of the musculoskeletal system, sensory perceptions and the central nervous system. If one of these systems is out of balance or if they fail to interact with each other as they should, purposeful movement is no longer possible. Movement disorders of the lower extremities in particular can lead to falls with serious health consequences, which also place a heavy burden on the healthcare system. Optimal prevention offers the best protection against serious consequences.

Conventional therapy approaches usually focus on strengthening the musculoskeletal system and either partly or completely neglect the integration of cognitive functions in movement control. However, the latest research results show that in addition to strong muscles, effective control over them is also essential for fall prevention. The importance of cognitive training in relation to fall prevention can be illustrated in the case of patients with dementia. This group of patients has a significantly increased risk of falling, which is almost exclusively due to cognitive impairment.

Peter Kopf (CEO THERA-Trainer) explains it like this: "Imagine you're standing at a busy junction. You're carrying a bag of shopping. There are people all around you. It's loud, it's hot and you're exhausted. Due to your age, your eyesight and hearing are limited. In order to cross the road safely, you need to pay full attention to your gait. It is in situations like these that falls occur more frequently. You're overwhelmed by external stimuli and can no longer concentrate on the essentials, i.e. crossing the road safely. This is where the THERA-Trainer senso comes into play, because it specifically combines movements and simultaneous cognitive stimuli during training."

The key to the proven high training efficiency of the THERA-Trainer senso lies in precisely this link between cognitive and movement tasks. This unique combination simulates the multi-tasking demands of everyday life in a fun way. This produces synergy effects at the neuronal level, and this training approach is associated with a significantly higher effectiveness than other conventional concepts in this regard. This particularly benefits people who, due to ageing, illnesses or accidents, are confronted with limitations in terms of cognitive function, the musculoskeletal system or the interaction between the two.

Current research results show a significant reduction in the risk of falls, an improvement in cognitive function (reaction time, memory performance etc.) and strengthening of the musculoskeletal system in patients with cognitive or motor impairments after training with the THERA-Trainer senso. Training with the senso goes way beyond





static weight-shifting exercises. Due to its unique design, step exercises can also be performed, and the flat entrance even makes it possible to use it with a wheelchair. The high measurement accuracy of the force sensors built into the THERA-Trainer senso also allows clinical balance tests to be carried out.

An asset for patients and clinics

The rehabilitation market is facing unprecedented challenges. An ageing population combined with staff shortages and inevitable cost savings are forcing therapists and rehabilitation facilities to rethink training concepts and explore new avenues. New technology can play a key role in this.

This paradigm shift must not negatively affect the treatment of patients, who must remain the focus of attention. Targeted use of technology such as the THERA-Trainer senso is not only an asset in terms of therapy options, it also takes the strain off the therapists. In addition to the outstanding training effects, the senso is very easy to use and its challenging training character is a standout feature in everyday clinical use. After a short briefing, patients can train independently on the device through user recognition via an RFID wristband. Interactive training content and a visual display of training progress help keep patients motivated. The difficulty of the training session is constantly and automatically adjusted to the patient's performance thanks to an intelligent algorithm. In this



way, a challenging level of training can be guaranteed even without the constant supervision of the therapist. This can also help to relieve the pressure on limited resources.

Sabine Lamprecht (physiotherapist MSc Neurorehabilitation, HSH Lamprecht GbR): “The THERA-Trainer senso enabled me to motivate patients who were in fact unmotivatable.”



Lars Timm studied Sports Science with a focus on rehabilitation in Freiburg i.Br. and M.Sc. Sports Engineering at KIT Karlsruhe.

An elderly couple is jogging on a paved path in a park. The woman is in the foreground, wearing a grey long-sleeved shirt, grey pants, and a bright blue jacket tied around her waist. She has short grey hair and is wearing glasses. The man is slightly behind her, wearing a grey hoodie and black pants. They are both looking towards the right. The background is filled with green trees and a path covered in fallen leaves.

THERAPY & PRACTICE

Jogging instead of joggers

How movement accelerates
the fight against dementia

Lars Timm

Virtual reality, robotics and assistive technologies are increasingly used to improve cognitive abilities, promote social interactions and facilitate the daily lives of dementia patients. The use of innovative technologies can offer patients new experiences while training their cognitive and motor skills. The THERA-Trainer senso, for example, is ideal for this.

In recent years, the prevalence of dementia has increased dramatically worldwide, mainly due to an ageing population and improved diagnostic procedures. This rise represents an increasing challenge for both the people affected and their relatives. For those affected, the disease means a gradual loss of memory, cognitive abilities and orientation. As a result, simple everyday tasks can no longer be performed and independence decreases.



The increasing number of dementia patients puts a strain on the healthcare system and requires adequate care and support.

For those affected, the disease means a gradual loss of memory, cognitive abilities and orientation.

Patients can no longer find their way around in their own homes, have difficulty communicating and become increasingly dependent. This commonly leads to frustration, confusion and anxiety among those affected.

Everyday life is also immensely challenging for the relatives of patients. They suddenly have to care

for a loved one who is increasingly changing and in need of support. The physical and emotional burden of caring for a family member with dementia can be enormous. Relatives have to look after the patient's safety and well-being, often putting their own needs second and dealing with financial, legal and organisational matters.

Moreover, dementia is also associated with social and health policy challenges. The increasing number of dementia patients puts a strain on the healthcare system and requires adequate care and support. In order to provide optimal care, an improved infrastructure of specialised facilities and qualified professionals will be needed in the future to meet the needs of patients and relieve the burden on relatives.

Numbers tell an alarming story

The term dementia (Latin root demens: out of one's mind) is often commonly equated with the disease "Alzheimer's". However, this connection is false, as dementia is not a disease but only a pattern of symptoms. These symptoms can be caused by a variety of different diseases.

Symptoms:

- loss of memory and thinking skills with significant impact on daily activities
- impaired ability to record and retrieve new information
- increasing difficulties with language, orientation and alertness
- changes in social behaviour, impulse control, drive, mood and reference to reality can occur

Dementia can be divided into primary dementia (neurodegenerative/vascular) and secondary dementia (depression/alcohol misuse) based on their pathology. Primary dementia accounts for 90% of diseases, with Alzheimer’s disease being the most common in this group, accounting for approximately 70% of cases [8].

According to Alzheimer’s Disease International, an estimated 50 million people worldwide currently

suffer from dementia. This number could almost triple to 140 million people by 2050, fuelled by demographic change [1].

Therapeutic approaches

Unfortunately, there is currently no cure for most types of dementia. The fundamental cause of dementia cannot therefore be conclusively treated. Nevertheless, the therapy and treatment of dementia is of enormous importance because it can significantly improve the quality of life of those affected as the disease progresses. Medication and non-drug therapies can reduce the burden for those affected and their relatives [5].

The therapy and treatment goals for dementia are:

- to slow down disease progression
- to maintain the patient’s abilities for as long as possible
- to alleviate symptoms and side effects

Unfortunately, there is currently no cure for most types of dementia.

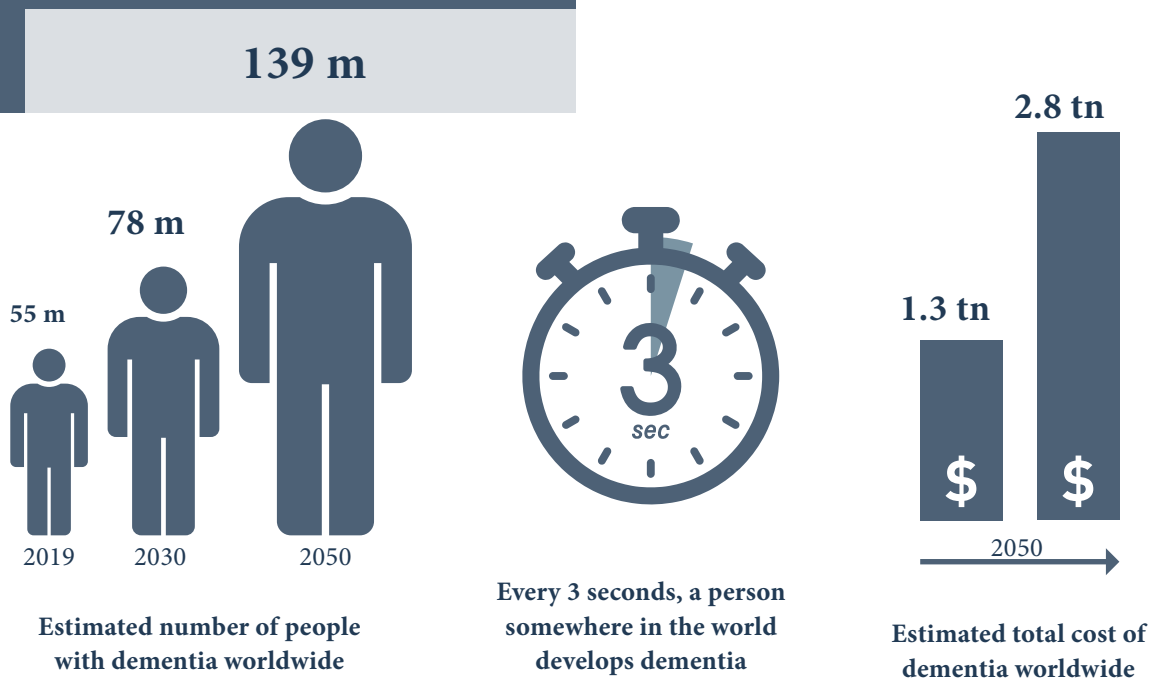


Figure 1: People with dementia

Sport as a wonder tool against dementia

In recent years, physical activity has been identified as one of the main factors in the prevention of dementia. In addition to the preventive effects, physical activity can also help to slow down the progression of cognitive impairment, as well as the loss of physical skills in people already affected by the disease.

In recent years, physical activity has been identified as one of the main factors in the prevention of dementia.

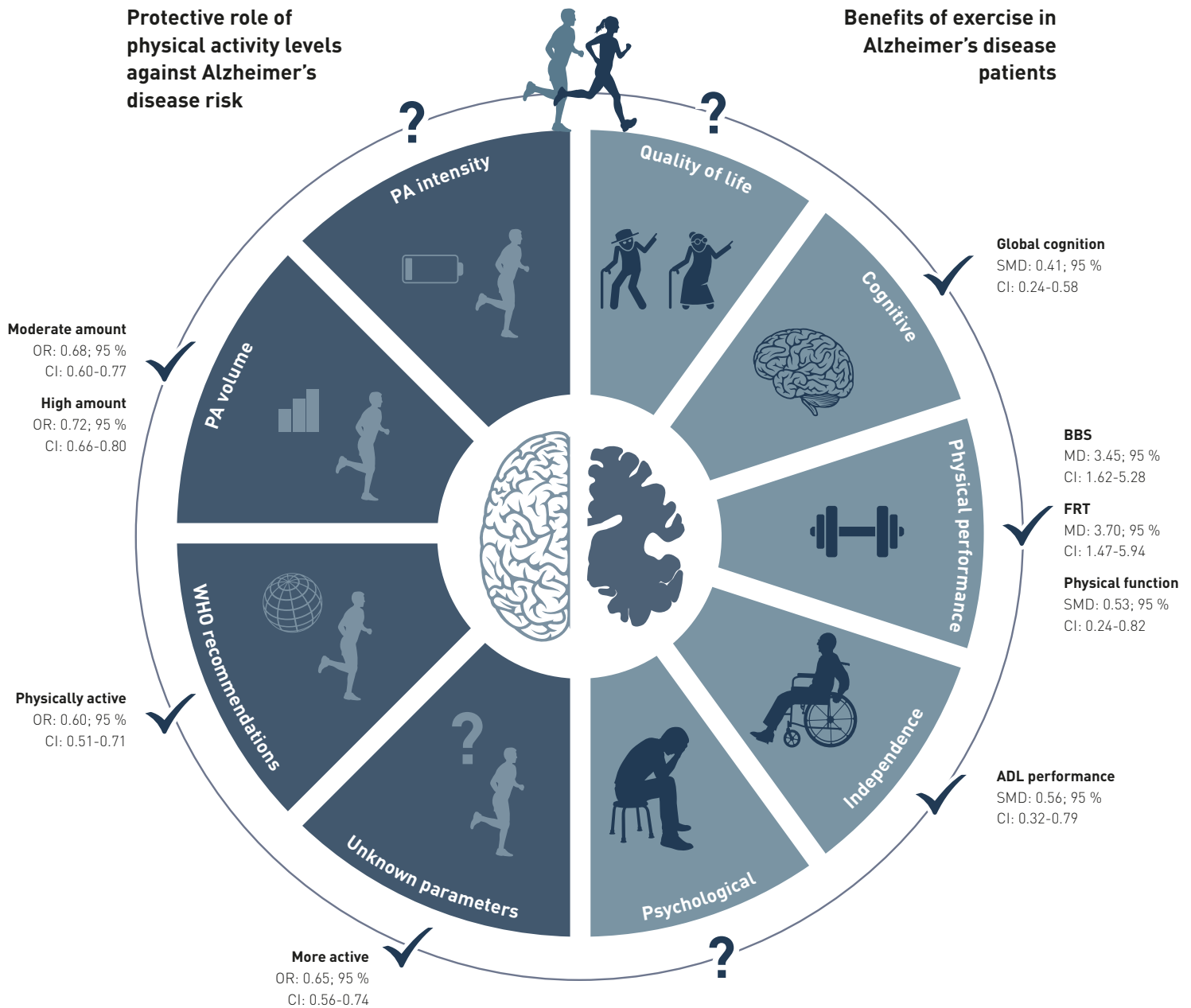


Figure 2: Preventive function and benefits of physical activity and exercise in relation to the development of Alzheimer's disease [4].

Preventive measures

According to a recent overview study [4], regular physical activity offers strong protection against the risk of developing Alzheimer's disease. Physically active people have a 30–40% lower risk of developing Alzheimer's disease compared to inactive groups [3,6]. This protective effect is largely due to physiological mechanisms [5,9]. Regular physical activity has been shown to reduce the occurrence of “traditional” cardiovascular risk factors (such as obesity, diabetes, hypertension), which in turn are associated with a higher risk of Alzheimer's disease. In addition, regular physical activity promotes the production of neurotrophic factors such as brain-derived neurotrophic factor (BDNF). This has an anti-inflammatory effect and improves the redox balance [9]. Studies have shown that regular exercise or physical activity has a positive impact on the volume of the hippocampus by preventing age-related decreases in volume. As the hippocampus is one of the most important brain regions for synaptic plasticity, exercise therapies could be an effective strategy to mitigate age-related cognitive decline. The dose-response relationship has not been conclusively established, but initial research suggests that a mix of intense and moderate activity provides the best protection against Alzheimer's disease [2].

Exercise in people already affected by the disease

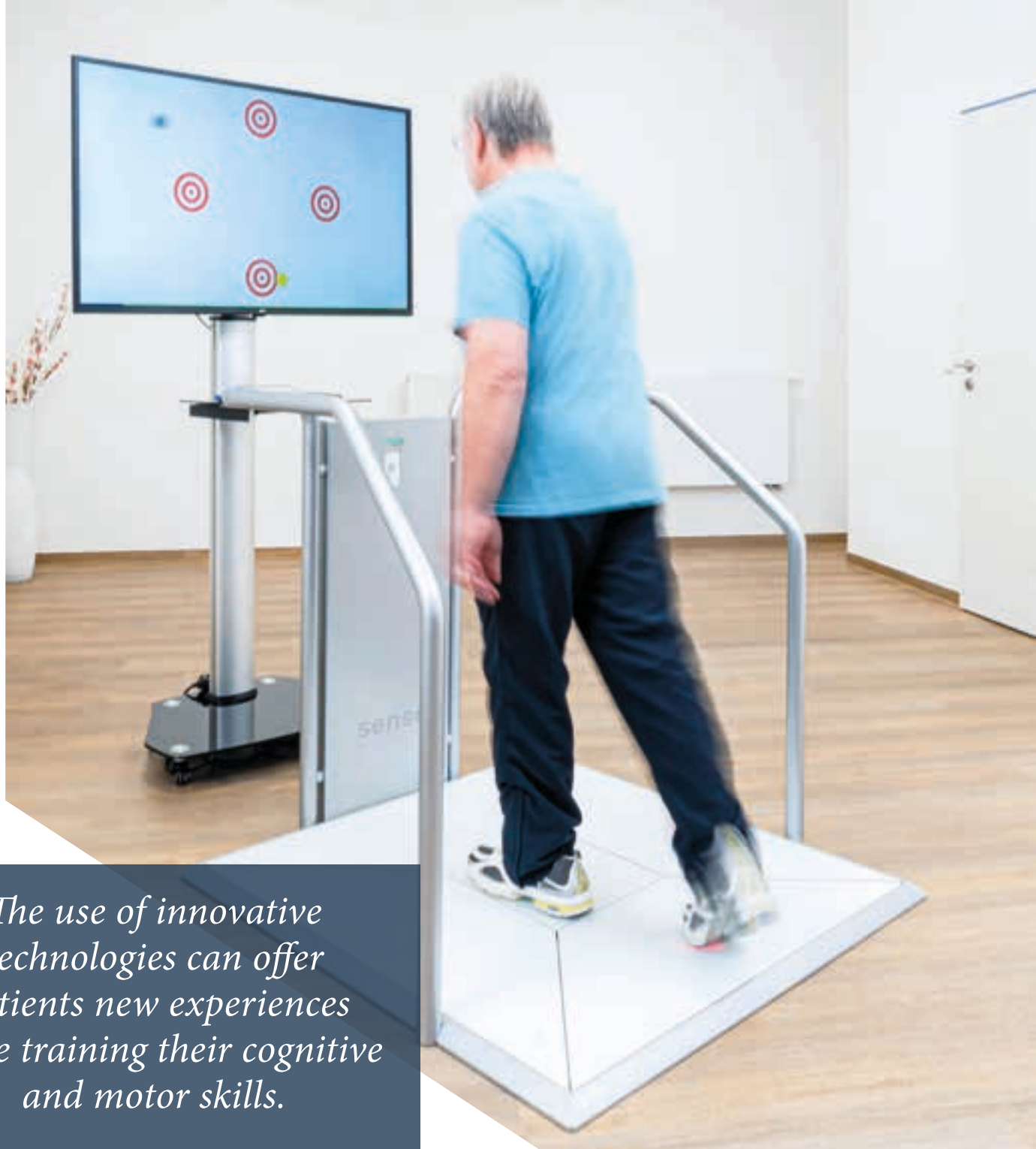
This review study also shows strong evidence for the beneficial effects of exercise therapies in patients already affected by Alzheimer's disease. These include improvements in global cognitive function, physical performance and functional independence. In addition, exercise therapy improves depressive symptoms and quality of life [4].

Cognitive-motor training

Virtual reality, robotics and assistive technologies are increasingly used to improve cognitive abilities, promote social interactions and facilitate the daily lives of dementia patients. The use of innovative technologies can offer patients new experiences while training their cognitive and motor skills. The THERA-Trainer senso, for example, is ideal for this.

Given the increasing prevalence of this disease, scientists have been intensively searching for new treatments to alleviate the effects of the disease and to slow down its progression.

In the treatment of dementia and Alzheimer's disease, physical activity and mental stimulation are increasingly recognised as important components to improve quality of life and well-being. A promising method that combines these two aspects is cognitive-motor training. Current research shows that this form of training offers significant benefits compared to traditional physical training. Cognitive-motor training goes beyond purely physical activity and integrates targeted cognitive exercises. By activating the body and the brain at the same time, different areas of thinking and coordination can be targeted. One of the most significant benefits of cognitive-motor training is the improvement of cognitive function. Studies have shown that this type of training can help improve memory, alertness and attention, problem-solving skills and information processing in people with dementia or Alzheimer's disease. The mental challenges posed by training promote neuronal plasticity and can slow down the progression of the disease. Another important aspect of cognitive-motor training is its impact on everyday skills. Training that uses targeted exercises adapted to the needs of dementia patients can help improve basic skills such as remembering names, performing daily tasks or orienting oneself in the environment. This enables people affected by the disease to remain independent for longer and to increase their quality of life [7].



The use of innovative technologies can offer patients new experiences while training their cognitive and motor skills.

Other treatment approaches:

Given the increasing prevalence of this disease, scientists have been intensively searching for new treatments to alleviate the effects of the disease and to slow down its progression. Recently, promising advances have been made that give hope for a better future for dementia patients.

Pharmacological treatment

New drugs are being developed to target specific mechanisms of the disease, such as the formation of amyloid plaques and neurofibrillary tangles in the brain that are characteristic of Alzheimer's disease. These medicines aim to slow down the disease progression and alleviate the symptoms.

Although further research and clinical studies are needed, initial results suggest that pharmacological approaches may be promising [10].

Magnetic field stimulation

Magnetic field stimulation uses a weak magnetic field to specifically stimulate certain regions of the brain. Studies suggest that magnetic field stimulation can have positive effects on the cognitive abilities of dementia patients. By targeting the magnetic field to specific regions of the brain, neuronal activity can be stimulated and communication between brain cells can be improved. This in turn can help reduce cognitive deficits and increase mental performance. Moreover, magnetic field

stimulation also has the potential to reduce mood swings and behavioural symptoms of dementia. Patients often report an improvement in general well-being, a reduction in anxiety and depression, and an increased quality of life. Although magnetic field stimulation is promising, further research and clinical studies are needed to confirm the long-term

Virtual reality, robotics and assistive technologies are increasingly used to improve cognitive abilities, promote social interactions and facilitate the daily lives of dementia patients.



efficacy and safety of this method. It is important to note that magnetic stimulation is currently used as an adjunctive therapy to standard treatment and is not a single solution for dementia [10].

In search of the key to memory

Despite these promising advances, it is important to note that dementia is complex and no one-size-fits-all solution exists. Every patient is unique and requires individual treatment approaches. It is therefore essential that holistic care and support

is provided and that it takes into account both the medical aspects and the psychosocial needs of patients.

Current advances in the treatment of dementia give reason for hope. With further research, clinical studies and the use of innovative approaches, we can hopefully create a better future for dementia patients. It is crucial that we, as a society, understand the needs of these patients and provide them with the support they need to live a dignified and fulfilling life.

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Robot-assisted therapy – a new treatment method?

Cost coverage for robot-assisted therapy in outpatient treatment in Germany

Claudia Müller-Eising, Dr Alisa Berger

Claudia Müller-Eising and Alisa Berger address the problem of the costs for treatment with gait robots in outpatient facilities not being covered by statutory health insurance providers with reference to the Federal Joint Committee (G-BA). This contrasts with the desire to offer patients early, effective and high-frequency treatment. Possible solutions are presented.

Robotic systems have become indispensable in modern neurorehabilitation [14]. In particular, they enable severely affected patients to receive early, intensive motor training, which is not possible with conventional therapy methods [13]. According to Mehrholz et al., one in eight walking impairments after a stroke could be averted by robot-assisted gait therapy [7]. In contrast to inpatient care, therapies with robotic systems in the

outpatient setting are not reimbursed by statutory health insurance providers. The reason usually given is that treatment with robotic systems is a new treatment method that has not yet been recognised by the Federal Joint Committee (G-BA), which is why the costs are not covered for legal reasons. The professional associations, liability insurers and private health insurance companies behave differently. Their insured persons receive treatment in outpatient facilities that work with modern robotic systems. To date, the statutory health insurance providers have not addressed the issue of robotics in neurorehabilitation. This means that people with statutory health insurance are denied access to outpatient care with robotic systems. This article discusses the issue of whether on the basis of the current legal situation the G-BA is responsible for the use of robotic systems and whether a positive



Early and highly repetitive treatment using modern robotic systems is key for the outcomes of neurological patients.



assessment is required as justification to compel the health insurance providers to cover the costs. At present, this issue is only relevant for the care of statutorily insured persons within the framework of the provision of therapeutic products, not within the framework of outpatient neurological rehabilitation. To date, this has only been envisaged for patients who have “independence in the area of self-care and active locomotion (in the general Barthel Index ≥ 80), a consistent ability and willingness to co-operate, the ability to act and learn, and sufficient orientation” (BAR framework recommendations, item 2.7 [1]). Moderately and

severely affected patients (Barthel Index < 80), for whom treatment with robotic systems is of much greater relevance than for mildly affected patients, are excluded from services for outpatient neurological rehabilitation (BAR framework recommendations, item 5 [1]).

Robotic systems in neurorehabilitation

Damage to the brain or spinal cord is often accompanied by persistent motor impairment [15]. Gait and balance disorders as well as impaired arm and hand coordination are common symptoms of

Robot-assisted gait therapy uses the gait training treatment method, which has been recognised in science and as a billable service for years. Therefore, robotic systems can only be as good as the therapeutic treatment concept on which they are based.

the damage [5, 6]. If left untreated, they prevent a self-determined life, occupational activity or social participation, and are often the cause of a long-term care dependency [4, 11, 16]. In neurorehabilitation, the relearning of lost motor functions is therefore of particular importance. While it was assumed until the middle of the last century that the central nervous system of an adult is not changeable in its functions and structures, it is now undisputed and proven by numerous findings on neuroplasticity that it can regenerate and restructure itself even in old age [8]. The degree of functional regeneration depends on the frequency and intensity of the use of neuronal resources [3].

Robotic systems are increasingly being used in neurorehabilitation to provide intensive and highly repetitive training for motor impairments. They enable early, intensive, variable, task-specific and multisensory training, which is essential for motor recovery and neuroplastic changes [3, 15].

This applies to inpatient, but particularly to outpatient neurorehabilitation, in order to prevent pathological patterns and chronification of the damage patterns. Although recent clinical studies have shown that functions can improve even after several years, there is a critical window of about six months after brain or spinal cord damage in which regeneration and reorganisation can optimally

take place due to higher neuroplastic processes [9, 10]. Early and highly repetitive treatment using modern robotic systems is key for the outcomes of neurological patients.

While robotic systems in inpatient facilities are covered by statutory health insurance providers within the framework of the flat rate per case, they are regularly rejected in outpatient rehabilitation settings on the grounds that they are a new treatment method that the Federal Joint Committee (G-BA) has not yet recognised or for which it has not yet issued a positive assessment. Therefore, the costs are not covered by the collective body of the insured.

The G-BA is mandated and authorised to issue guidelines that specify the statutory criteria for the use and provision of healthcare services (Section 92 of Volume V of the German Social Security Code (SGB V)). Section 92(1) sentence 2, no. 5 of SGB V includes, in particular, guidelines for the introduction of new examination and treatment methods. What constitutes a new examination and treatment method has been defined by the highest court of the Federal Social Court (Bundessozialgericht (BSG)). According to established case law, a new method is “a medical procedure [...] if it is based on its own theoretical-scientific concept which distinguishes it from other procedures and which is intended to

justify its systematic application in the treatment of certain diseases” (BSG, judgement of 23/07/1998, reference: B 1 KR 19/96 R).

These may only be provided in an outpatient neurorehabilitation setting under Section 135(1) of the SGB V at the expense of the statutory health insurance providers if the G-BA has issued a corresponding recommendation. In the case of outpatient rehabilitation, prohibition with reservation of permission applies; in the case of inpatient rehabilitation, permission with reservation of prohibition applies. With regard to treatments with robotic



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The healthcare system in Germany faces a significant challenge in terms of billing options for outpatient treatment. Particularly in the case of robot-assisted therapy, there has been a notable discrepancy for years between the available evidence and the services that are actually billable. The German healthcare system has earned a reputation for high standards of medical care, but there are still aspects that show potential for improvement. Robot-assisted therapy in an outpatient setting is a promising approach for early, effective and high-frequency treatment of patients. Studies prove the effectiveness and positive effects on patient recovery. However, the costs for this innovative form of therapy are an obstacle because the statutory health insurance providers do not currently cover the costs and refer to the Federal Joint Committee (G-BA). This places doctors and patients in a difficult situation, as on the one hand they want to use the best treatment options, but on the other hand they are confronted with financial hurdles. This article by Claudia Müller-Eising and Alisa Berger takes a closer look at the background to this issue. The authors investigate the existing challenges and the potential impact on patients. In addition, possible solutions are presented to improve the situation and facilitate access to robot-assisted therapy.

For our international readers, the article offers an exciting insight into the current situation in Germany. It reveals how the German healthcare landscape could evolve to meet the needs of patients and is intended to encourage readers to reflect critically on the facts described in relation to the situation in their own country.



systems in an outpatient neurorehabilitation setting, it is therefore crucial to determine whether robot-assisted therapy is a new treatment method.

Robot-assisted therapy – a new treatment method?

In accordance with the case law of the Federal Social Court and in the opinion of the G-BA (<https://www.g-ba.de/themen/methodenbewertung/>, last accessed on 11 January 2023), a new method is a procedure for the examination or treatment of specific diseases or injuries that follows its own theoretical-scientific concept and differs from other methods. Robot-assisted therapy is not based on a separate theoretical-scientific treatment concept. Robotic systems support patients and therapists by providing the patient with a stable, physiologically correct movement sequence over a long period of time [12]. Beyond that, there is no clear demarcation from other methods. Instead,

robotic systems are integrated into conventional treatment methods. Robot-assisted gait therapy uses the gait training treatment method, which has been recognised in science and as a billable service for years [2]. Therefore, robotic systems can only be as good as the therapeutic treatment concept on which they are based. It is not the robotic system but the therapeutic treatment concept that determines how a robotic system is used and which treatment goal is pursued. Their mode of action depends on the damage pattern, the symptoms and the dosage of the robot-assisted therapy (e.g. duration, intensity, frequency). Consequently, robot-assisted therapy is by definition not a new method. Instead, robotic systems are therapy systems if they are used to restore a function in rehabilitation or aids if they are used to compensate for functional deficits in everyday life without therapeutic intervention. Therefore, robot-assisted therapy can be permissibly provided as a service within the framework of the provision of therapeutic products at the

*Access to appropriate treatments
with modern robotic systems
is undoubtedly a suitable type of therapy
to achieve the rehabilitation goals – avert,
eliminate, reduce, compensate for
or prevent the worsening of disabilities
or need for care.*

expense of the statutory health insurance providers. However, in practice, there is no market for this, as the reimbursement rates within the framework of prescriptions for therapeutic products for the use of robotic systems are not sufficient. In contrast to materials used in conventional therapy (e.g. treadmill, therapy couch, etc.), they are very cost-intensive to purchase and cannot be refinanced through the reimbursement rate.

What are the potential solutions?

The treatment of neurological patients is complex. In order to achieve the goals of rehabilitation – to avert, eliminate, alleviate, compensate for or prevent the worsening of disabilities or the need for long-term care, or to mitigate their consequences (Section 11(2) of SGB V) – it is essential to rethink neurorehabilitation formats in the health-care system in order to be able to provide patients with damage to the brain or spinal cord with suitable therapies at an early stage and in a sustainable manner [16]. Access to appropriate treatments with modern robotic systems is undoubtedly a part of this.

On the one hand, prescriptions for therapeutic products could be extended by a reimbursement figure for treatment with robotic systems. Without question, different devices must be given due consideration. On the other hand, the legislator could extend the cases of private co-payments

in the SGB V. To date, prescription co-payments have only been permitted in the cases expressly mentioned by law. Private co-payments for the use of therapy equipment are not included. This also applies to creative models, such as prescription billing for the therapeutic service and a private rental payment for use of the device. The co-payment system is not alien to SGB V. Private co-payments for special treatments have existed for a long time in dentistry, and it is also worth remembering the self-funding IGeL services (individual health-care services). This solution is simple from a legislative perspective and can be implemented quickly. It is cost-neutral for health insurance providers and would give many patients access to up-to-date and high-quality treatment in an outpatient setting. It would also provide robust data in terms of patient care needs and outcomes, which are essential for appropriate care management.



To the discussion on LinkedIn:

[Lead.me/Dr_Claudia_Mueller_Eising](https://lead.me/Dr_Claudia_Mueller_Eising)

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Link to the original paper:

[Lead.me/Originalarbeit_Hippocampus](https://lead.me/Originalarbeit_Hippocampus)



Dr Claudia Müller-Eising is a founding shareholder of neuroneum in Bad Homburg. The interdisciplinary therapy centre offers innovative neurological rehabilitation for children and adults on an outpatient basis in the Rhine-Main region. Modern robotics support the practice team during therapy. Together with **Dr Alisa Berger**, she is closely involved in the billing of device-based therapies in the outpatient setting.



Modern treatment, sustainable help

‘live PRAXIS neuroreha’ special show at therapie LEIPZIG 2023

Tirza Berger

Europe’s largest special show on neurorehabilitation took place from 4 to 6 May 2023 as part of the therapie LEIPZIG trade fair. For three days, ten patients with various neurological diseases, together with their physiotherapists and occupational therapists, gave live demonstrations of state-of-the-art digitally and robotically assisted therapy and training equipment. They travelled from Schweinfurt with the THERAMotion Therapy Institute.

“I brought around 20 devices – from robotic gait trainers to exoskeletons – which I also use in my practice, for the live demonstrations,” Maik Hartwig, Managing Director of THERAMotion, explains. “The special show attracted a lot of visitors right from day one. I was particularly pleased that my peers actively participated in the event and asked lots of questions. I have the impression that new treatment methods are now gaining momentum because the progress that can be achieved with them is becoming increasingly clear.”

Even new patients came to the special show at the trade fair. Among them was a man with a severe impairment as a result of a traumatic brain injury, who has been in a wheelchair for 22 years.





“We developed the first treatment options with him. With the support of a mobile exoskeletal system, he walked for half an hour for the first time in 22 years,” Maik Hartwig explains.

The practice owner and his team hope that during their time at therapie LEIPZIG they have helped to increase the acceptance of therapy methods in neurorehabilitation based on robotics and virtual reality. After all, what ultimately counts is what the patients want to achieve and the best way to achieve it. Tradition, experience and technology are not mutually exclusive. “We offer holistic therapy for a wide range of symptoms – from stroke to long Covid – based on goals set by patients. These goals are all at the everyday or participation level – carrying and holding objects, independent personal hygiene, walking better and walking faster.”

“We always work in a transdisciplinary way,” Jule Schneider, physiotherapist at THERAMotion, adds. “Many of our therapies combine computerised, game-based methods to stimulate motivation and ambition with traditional applications such as dumbbells or weight vests.” The advantage of computers and virtual reality is that patients can see their successes as a high score on the screen and can transfer them to their everyday life in a clear and tangible way. The interactive character of virtual reality, 3D visualisations and robotic systems motivate patients. The built-in biofeedback helps patients to achieve their training goals. In addition, these systems achieve a high training intensity, enable training at the individual performance limit and, above all, can sustainably activate the mechanisms of neuroplasticity. This enables the brain to make new connections that ‘bridge’ the damaged areas.



“We regularly evaluate the current therapy status and the goals achieved with the patient because the devices are not there to replace the therapeutic work but to support the therapy. I find it incredibly motivating to see how enthusiastic the patients are! It’s fantastic when they can get out of their wheelchair and walk on their own again! Creating quality of life is the best possible achievement – that’s why communicating these new concepts at the special show has been so important. Because our patients are the best proof that this approach works,” Jule Schneider explains.

Achieving more

Sabine E. is one of the patients who travelled specially to Leipzig with THERAMotion. In 2012, she suffered a stroke as a result of a damaged artery during an operation. She woke up with the left side

of her body paralysed. Her days were then dominated by rehabilitation, occupational therapy and physiotherapy. “I had to relearn everyday movements. I have practised, practised, practised. At first, progress was small and often frustrating. I wanted to be able to look after my one-and-a-half-year-old son! I managed to get out of the wheelchair and move around my home independently. I was able to walk to my doctor’s appointments using a walking stick. I couldn’t drive though. I wasn’t happy with the situation,” the 45-year-old says. She was eventually able to walk without the walking stick, but still wore an ankle foot orthosis because a dorsiflexor weakness kept making her trip and stumble.

“Most therapists said: You can walk, that’s good. Be happy with that achievement. That was depressing for me because I wanted more,” Sabine E. recalls.

She was of course pleased to have survived and see her son grow up. But she wanted her everyday life back. In 2015, she heard about THERAmotion and completed an intensive computer and robotics-supported therapy programme – in addition to the treatments listed in the therapeutic products catalogue that can be prescribed and funded by the health insurance providers. “These three weeks were decisive! The intensive training with a gait robot and exoskeleton was something completely new for me. I could walk upright again in the exoskeleton! And without the fear of falling,” Sabine E. recalls. Computer-assisted fine

motor training for the fingers also had a successful outcome when she finally saw the movements in her paralysed hand.

She would like her participation in the special show to be a sign of courage and determination. Courage to combine traditional and modern methods in physiotherapy and occupational therapy while focusing on the wishes of patients and rethinking previous forms of rehabilitation: “I’m enormously pleased about all the great interest and the many questions. Clearly, health insurance providers should see this too!” Along with the other patients, she sees this as a great opportunity to demonstrate at a trade fair what is achievable.

Pole position for new technology

Alexander Kamps, Head of Sales Germany, THERA-Trainer by medica Medizintechnik GmbH: “The ‘live PRAXIS neuroreha’ special show put us in pole position for our devices whose practical application could be experienced live. Real patients, real therapists who achieve and demonstrate positive treatment effects – a presentation of this kind is something very special. Experts looking to kit out their practices with up-to-date equipment also came to therapie LEIPZIG. And this trade fair offers them everything in a very concentrated form: if you want to find out about therapy equipment, you have to go to Leipzig. The special show is another highlight – because when treating an increasing number of severely affected people, getting by without up-to-date technology is no longer an option.”



Tirza Berger is the press officer for medical trade fairs and conferences at Leipziger Messe and is head of communications for therapie events.



Forum Neurorehabilitation & Orthopädie



SCIENCE

Getting healthier with training during dialysis

Results of a multicentre study in 21 dialysis centres prove that renal patients benefit from movement exercises

Christian Gorbach, Jakob Tiebel

Exercise during dialysis? The evidence for the effectiveness of intradialytic exercise has so far been weak. Study results sometimes yielded contradictory findings. Due to methodological weaknesses of individual studies and a low number of study patients, no clear recommendations for the intervention have been possible so far. Thanks to a large-scale, multicentre trial led by the Technical University of Munich (TUM), it has now finally been proven that patients who follow a targeted movement programme during dialysis are physically fitter and require hospital treatment less often.

The Dialysis Training Therapy (DiaTT) trial, published in June 2023 in the renowned New England Journal of Medicine – Evidence, included an impressive participant group of about 1,000 patients from 21 dialysis centres in Germany. The trial by a consortium of the Technical University of Munich (TUM) led by Martin Halle is currently

the world's most comprehensive investigation of exercise training during dialysis in humans with specific kidney disease. Interestingly, the composition of participants in terms of age, gender and state

After one year, the participants' state of health had improved significantly. Among other things, they were able to get up from a sitting position more often within one minute than at the beginning of the trial and to walk longer distances within six minutes.



The trial by a consortium of the Technical University of Munich (TUM) led by Martin Halle is currently the world's most comprehensive investigation of exercise training during dialysis in humans with specific kidney disease.

of health proved to be representative of the broader population of dialysis patients, as determined by cross-checking the data held by health insurance providers. This supports the generalisability of the findings to the broad population of people with kidney disease in Germany and worldwide.

The participants were divided into two groups and treated over a period of twelve months. Half of them completed supervised intradialytic training at least once a week and ideally three times a week during dialysis, while the other group received only medical care. The specific training consisted of 30 minutes of endurance training on an ergometer and

another 30 minutes of task-specific exercises with weights, resistance bands and balls. The exercises were individually adapted to each patient's potential in order to ensure optimal implementation.

Significant improvements in standardised tests

After one year, the participants' state of health had improved significantly. Among other things, they were able to get up from a sitting position more often within one minute than at the beginning of the trial and to walk longer distances within six minutes. In the control group, these values were even lower at the end than at the beginning.

“At first, such standardised tests do not seem very close to everyday life,” Martin Halle explains in a TUM press release. “But, in fact, the results show a gain in quality of life and self-determination. For example, those affected are able to get up from an armchair at home without assistance, which wasn’t always the case previously.” Another sign of the positive effects of the training is that the number of days spent in hospital within the trial period by participants who undertook regular training was only half that of the control group – two days on average compared to five.

Low costs per training session


As Martin Halle stated in a TUM press release, “For me, the findings are clear.” “With comparatively little effort, we can improve the health of those

affected and also reduce costs for the healthcare system.” According to the researchers’ calculations, the cost of individualised training would be around 25 euros per training session and person.

Positive about the future

This landmark study provides promising insights into how exercise during dialysis can improve the well-being and health of patients with kidney disease. The findings suggest that supervised training during dialysis is a useful adjunct to medical care and can help to reduce hospital stays and improve the quality of life of those affected.

Given these promising results, the researchers recommend that training during dialysis should be implemented as standard. The opportunity to

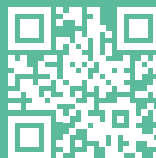


“With comparatively little effort, we can improve the health of those affected and also reduce costs for the healthcare system.”

Given these promising results, the researchers recommend that training during dialysis should be implemented as standard.



In addition to TUM, the DiaTT consortium partners were University Hospital Cologne, The Medical Center – University of Freiburg, the Kuratorium für Dialyse und Nierentransplantation e.V., the Deutsche Gesellschaft Rehabilitationssport für chronisch Nierenkranke e.V., the Bundesverband Niere e.V., and the health insurance providers Techniker, AOK Plus and Barmer – Landesvertretung Sachsen.



<http://www.diatt.de/>

be physically active during treatment could have a significant impact on the health and quality of life of patients and reduce the burden on the health-care system in the long term.

The DiaTT consortium has already submitted the final report on the trial (financed by the innovation fund set up by the health insurance providers) to the Federal Joint Committee of health insurance providers. This committee will decide whether training during dialysis should be offered to all insured persons. “I hope that our training programme will be covered by the health insurance

providers,” Martin Halle adds. “Our trial shows how important it is to take a holistic view of health, particularly for elderly and frail patients. High-tech medicine is important, but it can only reach its full potential in combination with other fields such as preventive medicine.”

Further investigations will certainly be needed in the future. Particularly with regard to understanding the long-term impact of this approach. In the coming years, the trial participants will be followed up in order to learn more about the effects of long-term training.

SOURCES:

<https://www.tum.de/aktuelles/alle-meldungen/pressemitteilungen/details/gesuender-durch-training-waehrend-der-dialyse>



Christian Gorbach specialises in exercise during dialysis. His experience comes from his work over several years as a project manager for dialysis at THERA-Trainer. He has extensive expertise and strong links with many industry experts.



Jakob Tiebel studied Applied Psychology with a focus on Health-care Management and has clinical expertise through previous therapeutic work in neurorehabilitation. He researches and publishes on theory-practice transfer in neurorehabilitation and is the owner of Native.Health, a digital health marketing agency.

SCIENCE

ReNi-Forum 2023

The 10th ReNi-Forum of the Deutsche Gesellschaft
Rehabilitationssport für chronisch Nierenkranke e.V.
A milestone in patient support

Jakob Tiebel

The 10th ReNi-Forum took place from 23 to 25 June 2023 in the m&i-Fachklinik Bad Heilbrunn. The event of the Deutsche Gesellschaft Rehabilitationssport für chronisch Nierenkranke e.V. marks a significant milestone in the work of this organisation. The forum provides a platform to exchange knowledge, experience and new developments in the field of rehabilitation sports for people with CKD conditions.

A place for networking and knowledge exchange

The 10th ReNi Forum brought together a wide range of experts, medical staff, rehabilitation sports participants and other interested parties. It provided an opportunity to share the latest findings, best practices and experiences in healthcare. For more than 10 years, ReNi has been promoting networking and interdisciplinary dialogue to continuously improve the quality of care and support for chronic kidney disease (CKD) patients.

Varied programme

The forum offered an extensive programme that included lectures, workshops and many exciting discussions. Experts from different fields shared their knowledge and experience on topics such as rehabilitation sports programmes, physical activity, nutrition, psychosocial support and the latest medical developments in kidney health. Participants had the opportunity to ask questions, learn about new approaches and expand their network.



Structured exercise during dialysis reduces the hospitalisation rate by half and exercise has been shown to make dialysis patients fitter.

Presentation of success stories

Other highlights of the ReNi-Forum included the success stories of people who have taken part in rehabilitation sports. Those affected showed how rehabilitation sports have helped them to improve their quality of life and to cope with their illness. These stories are inspiring and encourage others to look at rehabilitation sports as a way to overcome their own challenges. At the same time, it became clear that transplant patients and people with CKD conditions in Germany do not embrace the power of sport and exercise as much as the rest of the world. Instead, they are encouraged to rest rather than be active. A situation that needs to change.

Innovation and research

The ReNi Forum also provided a platform for the presentation of the latest innovations and research projects in the field of rehabilitation sports for CKD patients. Experts and researchers presented their latest findings and discussed future trends and developments. This is an important contribution in terms of keeping rehabilitation sports up-to-date and for developing innovative approaches to improve the quality of life of those affected. The highlight at this year's event was the presentation of the DiaTT trial. Structured exercise during dialysis reduces the hospitalisation rate by half and exercise has been shown to make dialysis patients fitter, according to Dr Anding Rost from Bischofswerda who presented the findings of the DiaTT trial.




Conclusion


The 10th ReNi-Forum was once again an important milestone in supporting people with CKD conditions. By exchanging knowledge, presenting success stories and promoting innovation and research, the forum made a valuable contribution to improving the quality of life and well-being of those affected. An outstanding event that celebrates the progress made in the field of rehabilitation sports for CKD patients and at the same time creates a space for future developments and collaboration.


Exercise during Hemodialysis in Patients with Chronic Kidney Failure

Summary In a real-world dialysis setting combined endurance and resistance intradialytic exercise training over 12 months improved physical function, reduced hospital days, and was feasible and safe.

Study design:


 Cluster-randomized controlled trial (1:1), parallel assignment


 Participants recruited at **21 centers** (clusters)

 Intention-to-treat analysis

Population Adults with a representative variety of underlying kidney failure entities and comorbidities.

 **1211** (917 included in the full analysis)

 **39%** female

 **66 ±14 years** (large age spectrum)



Comparison

12 months intradialytic exercise:

50% aerobic exercise, 50% resistance training thrice a week for 60 min per dialysis session, and health literacy counselling

 446 patients  10 units

Usual care:

Usual care with no exercise intervention or health literacy counselling

 471 patients  11 units

Treatment effects: Mean 95% CI; P value

Sixty-second sit-to-stand test, repetitions	19.2 ± 9.1	3.85 2.22 to 5.48; P <0.0001	14.7 ± 7.9
	Decline from 16.2±7.1 to 14.7±7.9 in the usual care group		
Timed up and go test, seconds	19.2 ± 9.1	-1.11 -1.93 to -0.29	12.2 ± 5.9
	A change of 0.9–1.4 seconds is clinically important		
Six-minute walk test, meters	19.2 ± 9.1	37.54 14.69 to 60.38	287.8 ± 159.3
	A change of 14 to 31 meters is clinically important		

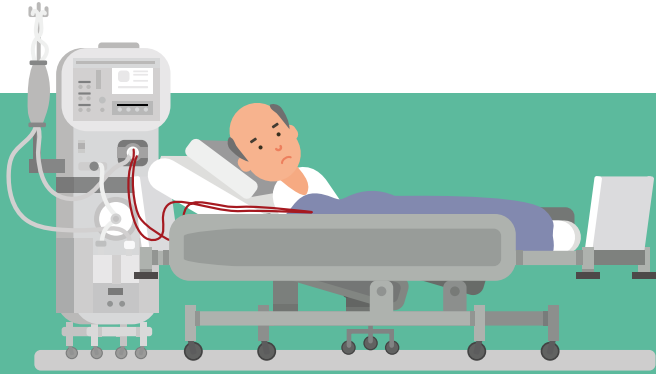
6.01 [95% CI, 9.39 to 2.63] points difference in the SF-36 vitality subscale in favour of the intervention.

In both groups similar adverse events during dialysis sessions.

Median -3 days per patient spent in the hospital annually in the intervention group.

HEALTH & VITALITY

despite daily dialysis routine



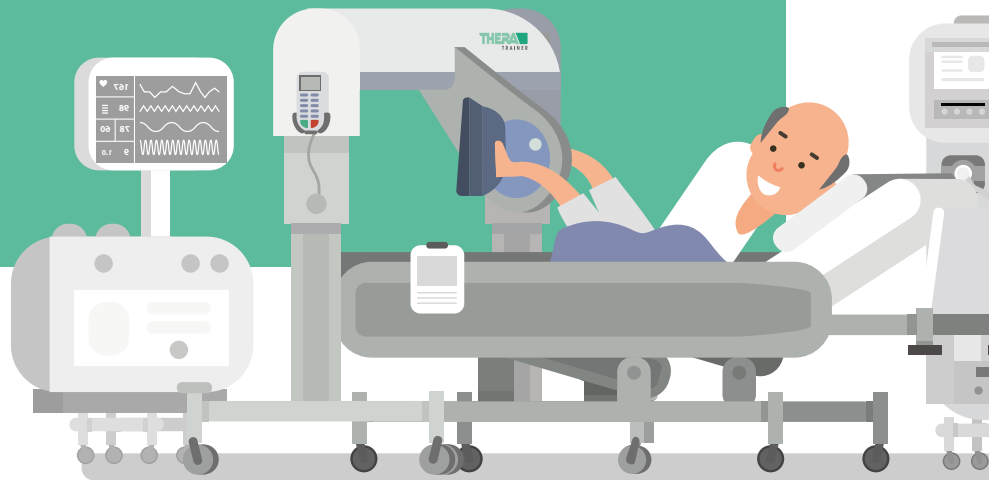
THE PROBLEM

Due to the long periods of dialysis, there is hardly any time for sporting activities outside dialysis.

THE SOLUTION

Activity & movement during dialysis

- + Minimise secondary diseases
- + Maintain strength and endurance
- + Activate heart and circulation
- + Positive effect on wellbeing



THERA-Trainer bemo

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- + Active, assistive and passive exercise training during dialysis
- + Training at the individual performance level
- + No extra time required

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THERAPY & PRACTICE

World champion at 100 years

The only global indoor cycling championship
for seniors and people with dementia

Jan Inge Ebbesvik

Road Worlds for Seniors is the only global indoor cycling championship for seniors and people with dementia. Every year, thousands of cyclists from all over the world participate in the race for trophies, personal triumph, friendship and glory.

Imagine becoming a world champion in cycling at the age of 100 years! Road Worlds for Seniors (RWS) makes this possible. In October each year, care homes, activity centers and day care centers turn into a sports arena with cyclists wearing bike hats, buttons, t-shirts and big smiles.

The RWS is free of charge and is designed to encourage physical activity, reminding everybody that no matter how old you are, you can still be an athlete.

A global movement

RWS allows older people and people with dementia to take part in a global sporting event - even though they might live in a long-term care facility. The championship makes the cyclists become a part of a global movement focusing on physical activity and reminiscence for people that are normally not able to take part in such initiatives. Participants use a stationary bike, such as the THERA-Trainer, to cycle to videos from the Motiview video library. The motivational tool offers over 2200 videos from all over the world, which are used by seniors to reminisce and share stories with those around them as they pedal. The km they cycle are counted and the winners are the cyclists who have covered the longest distance in the competition period.





In our championship everyone can participate, whatever their functional level. We focus on abilities- not disabilities. It is important that all participants can take part in the joy this competition brings- both in their local area but also across international borders.



roadworlds.com

It's truly inspiring to see seniors from around the world gather and participate in the Road Worlds for Seniors.

Documented health benefits include improved mobility, fewer falls, better weight management and reduction in physical pain.

This is in addition to an improved quality of life, increased confidence and more social interactions, faster rehabilitation and improved mental wellbeing.

A yearly highlight for seniors

Road Worlds for Seniors was first held in 2017. At that time, Motitech entered into a collaboration with Bergen2017, which was the organizer of the UCI's cycling world championships in Bergen, Norway. RWS became part of the public health campaign for the championship and engaged 1100 cyclists from five countries.

Since then the competition has grown and reached the highest number of signed up participants last year with over 5600 seniors from 7 countries. Together they traveled over 180,000 km!

In our championship everyone can participate, whatever their functional level. We focus on abilities-not disabilities. It is important that all participants can take part in the joy this competition brings-both in their local area but also across international borders, says Jan Inge Ebbesvik, President of Road Worlds for Seniors.



Crowning the world champions

RWS is a competition where world champions for men, women and teams are crowned. Despite high age it should never be denied that seniors have a strong competitive instinct.

The winners are awarded with large trophies and a lot of attention.

But the main focus is that the competition is open for everyone. Every participant will get rewarded for their effort with their own medal and certificate despite the length of distance cycled.

It's truly inspiring to see seniors from around the world gather and participate in the Road Worlds for Seniors. Witnessing their dedication to staying active and engaged is a testament to the remarkable impact of sports in bringing people together, says Ebbesvik.



“A very famous cyclist once said pain is temporary and memories are forever. Our cyclists have created memories forever. I have been in cycling for over 20 years and what we achieved was the best cycling event I have ever witnessed!”

Zac Hulm, Partnership Manager
at Harbison Care in Australia



Jan Inge Ebbesvik took the lead as president of the Road Worlds for Seniors when it started in 2017. Every year since, he’s played a key role in making sure seniors globally have a place to come together and compete.

SCIENCE

Motor-assisted movement training for people with ALS

Current state of research and implementation in practice

Dr André Maier, Sabine Lamprecht

Motor-assisted movement training equipment refers to devices that support people with ALS in physiotherapy in the home environment. A regular movement routine in combination with motor-assisted movement training shows benefits and is already integrated into the standard ALS treatment plan. Interdisciplinary cooperation between various healthcare professionals (medicine, physiotherapy, medical aid suppliers) is essential at all stages: examination of the indication, advice and testing, supply of an exercise trainer, and ongoing training management. In a webinar for groups of healthcare professionals (medicine, physiotherapy, medical aid suppliers) and people with ALS, Dr André Maier, ALS outpatient clinic at Charité – Universitätsmedizin Berlin and Sabine Lamprecht, MSc Neurorehabilitation, owners of the HSH Lamprecht practice, discussed the current state of research on the topic of movement training in ALS and highlighted important implications

for improved healthcare practice. The event was recorded and can be accessed online free of charge.

Usage and subjective experience of the effect of motor-supported movement exercisers among people with amyotrophic lateral sclerosis. Findings of a multi-centric observational study

Dr Meier reported in depth on the research results regarding the use of intensive motor-assisted movement training, and subjective experience of its effectiveness, in people with amyotrophic lateral sclerosis. They support the positive effects of the intervention in terms of training adherence, achievement of individual therapy goals and patient satisfaction. Dr Meier's presentation reflected the results of current research on this topic in a practical way and supported the justification for extended care as part of a holistic approach to ALS treatment.



Dr André Maier

ALS outpatient clinic at Charité –
Universitätsmedizin Berlin



Sabine Lamprecht

MSc Neurorehabilitation,
owners of HSH Lamprecht practice

Dr André Maier, ALS outpatient clinic at Charité – Universitätsmedizin Berlin

Dr André Maier is a neurology specialist in the ALS outpatient clinic at the Charité hospital in Berlin. He is responsible for diagnosis, prognosis, indication as well as for care co-ordination. He is also involved in ALS research. Since 2007, he has been working in the field of supporting outpatient care through telemedicine and internet technologies in ALS. Dr André Maier was responsible for planning and implementing the above-mentioned study, as well as for carrying out statistical analyses and interpreting the data.

Sabine Lamprecht, MSc Neurorehabilitation, HSH Lamprecht practice

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



The results of the study have been scientifically published and are available at the following link:
[Lead.me/Mobility_training_with_ALS](https://lead.me/Mobility_training_with_ALS)

Implementation of high-frequency motor-assisted movement training in ALS as an adjunct to physiotherapy: Implications for and experiences from healthcare practice

In the following contribution, Sabine Lamprecht emphasised that high-frequency motor-assisted movement training can be carried out at least 5 days a week for people with ALS. Provided that the attending therapists provide appropriate support and guidance, this supplementary training is an important adjunct to conventional physiotherapy. In the presentation, Sabine Lamprecht discussed important aspects of healthcare practice and training management.

Highly engaged participants and many questions about training

Finally, the experts answered FAQs about the application of structured self-training in the home environment and were also available to answer questions from the webinar participants.



Link to the recording:

[Lead.me/Motorunterstuetztes_Bewegungstraining_bei_ALS](https://lead.me/Motorunterstuetztes_Bewegungstraining_bei_ALS)



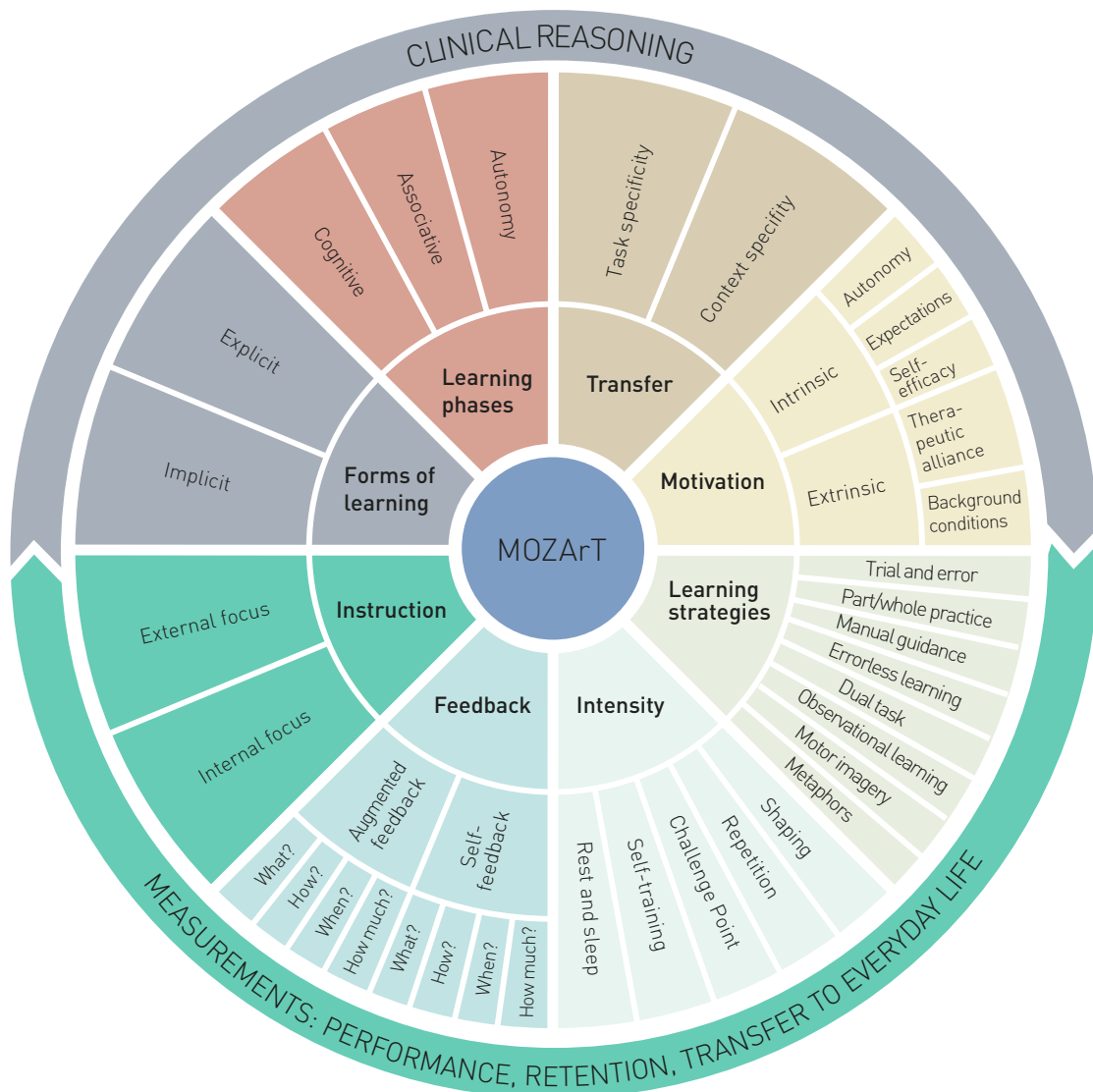
Motor learning with the THERA-Trainer senso

The principles of motor learning in cognitive-motor training

Miriam Keifert, Jakob Tiebel, Martin Huber

Re-learning movements or even learning them for the first time in order to be able to lead as self-determined and independent a life as possible is a key element in rehabilitation. Motor learning (ML) is therefore an integral part of modern rehabilitation concepts [1,2,3]. This is because the effectiveness of interventions is determined by the extent to which they incorporate and implement the principles of ML [4]. This article explains the principles of motor learning based on cognitive-motor training using the THERA-Trainer senso. The LEARNING WHEEL is a reference model that can be used to analyse the principles of motor learning in a practical way.

Research on senso has shown that exercise for older people can be viewed as a fun and intrinsically motivating intervention to promote physical and mental activity under dual-task conditions.



The learning wheel

In neurorehabilitation, the focus is on relearning and optimising motor skills. Motor learning plays a central role in relation to the achievement of defined therapy goals. However, motor learning is challenging to implement due to a high level of complexity and lack of an application description. To solve this problem, the LEARNING WHEEL was developed as an evidence-based reference model for motor learning. It allows therapists to use participation-oriented clinical reasoning based on ICF and guidelines in order to develop tailored therapies while taking into account resources, wishes and environmental factors.

At the centre of the LEARNING WHEEL are the motor goals at the activity or participation level (referred to by the German acronym MOZArT) – the nucleus around which everything revolves. The eight most important principles of motor learning (forms of learning, learning phases, transfer, motivation, learning strategies, intensity, feedback and instruction) are arranged equally in the middle circle and do not follow any fixed hierarchy. The outer rings include the methods for implementing these principles, supported by clinical reasoning and targeted information gathering through assessments [5].

THERA-Trainer senso

The THERA-Trainer senso is a research-based training device used in neurorehabilitation and training for older people. It is an interactive system that offers a wide range of exercises to improve physical and cognitive skills. The focus is on promoting balance, coordination, responsiveness and cognitive functions [6].

The senso consists of a platform with built-in sensors that detect movement and touch. Users are instructed to perform various tasks via visual and auditory feedback. These tasks may include tapping moving light points, balancing on the platform, or recognising shapes and colours.

The device enables personalised therapy and training since the exercises can be adapted to individual abilities and needs. The senso is often used by therapists in clinical settings, rehabilitation centres or care homes to improve patients' physical fitness, balance and cognitive functions, and to reduce the risk of falls.

In the case of senso training, the people exercising are not primarily focused on the balance requirements, but on solving tasks in an exergame.



The following case study shows the use of the THERA-Trainer senso in action: Ms. Müller, 72 years old, with existing gait insecurity after a hip fracture and increased fall risk, regularly used the THERA-Trainer senso for cognitive-motor training. The aim was to improve balance, coordination of step movements and responsiveness in everyday situations. Her progress was documented through targeted measurements and training history, while the therapist, Inge, based her approach on the principles of motor learning from the LEARNING WHEEL.

Forms of learning

1. Implicit (unconscious learning): asks what?
What is the task? Unconscious movement control.
Requires relatively few cognitive resources;
2. Explicit (conscious learning): asks how?
How should the task be carried out? Conscious movement control. Requires more cognitive resources.

During senso training, Ms Müller was primarily focused on the therapeutic games. In other words, she was focused on fulfilling the tasks shown on the screen (e.g. taking a step forwards at a specific time so that a flying dot lands in the middle of the target). Inge therefore focused on the principle of implicit learning (related to movement performance). She did not want Ms Müller to focus primarily on balance requirements and step movements, but on solving the tasks in the game.

Ms Müller was required to constantly shift attention back and forth between the screen (task in the game) and the balance/step requirements. The requirements are therefore very close to everyday life (this point will be developed further under the transfer of learning principle). Due to the simultaneous recall of the cognitive task (play) and the motor task (movement), Inge was able to evoke dual-task situations typical of everyday life and which caused Ms Müller difficulties, particularly in complex situations, and posed a fall risk.

*The training programme
uses an algorithm
to automatically adjust
the requirement level to
the user's performance
level in real time.*

Learning phases

1. Cognitive learning phase: understanding the task requires a high level of attention for movement performance;
2. Associative learning phase: less attention for movement performance, partially successful movement, fewer mistakes;
3. Autonomous learning phase: automatism, only minimal attention for movement performance, skilfully performed movement, hardly any mistakes, dual-task capacity during movement performance.

Ms Müller went through all the learning phases with senso training, because this training was completely new and unfamiliar to her. In the first learning phase, the cognitive demands were particularly high for Ms Müller. At the beginning of the therapy, an additional difficulty was understanding how the exergame (i.e. the task) works and how the floor plate reacts (e.g. how long to apply pressure with the foot on the measuring plate). For Inge, it was important to consider that part of the learning effect in this early learning phase was primarily that of coping with the device and the game. A phenomenon that Inge was already familiar with from the use of other device-based therapies (e.g. robotics) [7].

After some initial difficulties, Ms Müller made good progress. During the second learning phase, Inge was able to observe that she paid less and less attention to going through the movements. She became more confident with her movements and made significantly fewer mistakes in the therapeutic games. This was also evident in the training evaluations.

The improvement in Ms. Müller's dual-task capacity was an essential characteristic of the third (autonomous) learning phase, which is considered a sign of the automation of a movement. Ms Müller could now concentrate fully on the task on the screen during training. In the autonomous phase, it was primarily speed and precision that determined Ms Müller's training successes (this point will be discussed in more detail under the intensity learning principle).

Learning strategies

Trial+Error: Making mistakes and learning from them (consciously and unconsciously), errorless learning, part/whole practice etc., the targeted use of learning strategies promotes ML.

As can be seen from the previous descriptions, initial training was largely trial and error learning. Inge initially gave Ms Müller time to try things out so she could understand what senso training required of her. In the process, Ms Müller repeatedly made mistakes, which were important in order to perform the required tasks faster and in a more targeted manner over time.

As training progressed, it became increasingly a question of the timing of targeted movements (e.g. a step at the right time of the game on the front quadrant of the standing space). Movements had to be performed at precisely time X in order to come to a stop exactly on time at target location Y of the floor plate (temporal and spatial components).

In the meantime, Ms. Müller had progressed so far, and her movements were so well practised, that the main focus had shifted to errorless learning. She could solve the movements that were demanded of her, even under additional cognitive strain. She could only improve in the games and in her cognitive-motor skills if she could perform the exercises without errors.

In relation to the therapy goals, Inge sees senso training as fulfilling both the desire to improve safety when walking (part-practice) and anticipatory postural adjustments when standing (whole practice).

Motivation

1. Intrinsic motivation: self-motivated, promoted by autonomy, increased expectations and self-efficacy;
2. Extrinsic motivation: motivated from outside, reward-driven, influenced by the therapeutic relationship and background conditions such as family.

In terms of motivation, Inge can see that senso training has a positive influence on Ms Müller's exercise compliance [8]. Inge knows from professional training on evidence-based practice that the literature indicates that the motivational influence of exergames can wear off over time [9]. To prevent this, Inge regularly compiled new training programmes for Ms Müller from the portfolio of therapeutic games to ensure the necessary variety.

The senso offers a range of attractive game options that can be adapted to individual performance levels, and that can automatically adjust their level of difficulty (this point will be discussed in more detail under the intensity learning principle).

Research on senso has shown that exercise for older people can be viewed as a fun and intrinsically motivating intervention to promote physical and mental activity under dual-task conditions [10]. To be on the safe side, Inge also used an assessment that helped her evaluate the exertion and enjoyment of training with Ms Müller.

Inge regularly discussed how the training tasks relate to the real world with Ms Müller so that she could understand the purpose of the training and how she could repeat similar exercises in everyday life (this point will be discussed in more detail under the transfer of learning principle).

Instruction

1. External focus of attention (EFA): the instruction directs attention to the effect that the movement has on the environment;
2. Internal focus of attention (IFA): the instruction directs attention to one's own body movements or body feeling.

The instructions in senso training primarily have an external focus of attention (EFA). The instructions that the exergames gave Ms. Müller drew her attention to the effect of her movements on how the game unfolded (e.g. taking a step when a ball is in the middle of a target).

Inge wanted Ms Müller's attention to be focused on the effects of her movements on the environment. Inge therefore followed the constrained action theory, according to which an EFA reduces the need for conscious movement control and thus favours automatic control processes [11].

In addition, Inge gave Ms. Müller an instruction with an internal focus during training. Due to the hip fracture, Ms Müller repeatedly adopted a bent posture during the exercises. This is what Inge wanted to avoid or promote awareness in Ms Müller of her posture. Since body posture cannot be detected by the sensors in the senso, Inge was responsible for this type of instruction.

Feedback

1. External feedback: feedback from an external source of information e.g. PT, device, or similar;
2. Self-feedback: Feedback that the person receives or gives to him/herself during a movement. Self-assessment. Feedback is essential for ML. Particularly the ability to provide adequate self-feedback is crucial.

Ms Müller received feedback from the senso both during and after completing each training sequence. This feedback includes, among other things, the duration of the training sequence, the reaction speed, the accuracy of aim and a game score. Like the instructions, the feedback from the senso has an external focus. It is based on an objective performance assessment of the device.

Self-feedback is not directly requested by the senso. This is where Inge's therapeutic competence comes into focus. Ms Müller's subjective assessment was very important to Inge, which is why she had certain aspects of the training session assessed by Ms Müller herself after each unit had been completed. For example, Inge used the BORG scale to subjectively determine the feeling of exertion. This helped her to regulate the load level and training duration.

Intensity

This is the sum of repetition, shaping, training on the challenge point [25]. Intensity is a very relevant aspect for ML. Note: Intensity is more than just the number of repetitions!

In the case of senso training, intensity is primarily defined by the difficulty of the task and the duration of the exercise. This then determines the number of movement repetitions. The training programme uses an algorithm to automatically adjust the requirement level in real time to Ms Müller's performance level [12]. This was a great relief for Inge, as the measurement of reaction times and movements via the senso is extremely precise and scientifically validated.

If Ms Müller was having a good day, she could perform the exergames accurately and quickly. The level of difficulty then increased directly in the training situation. In other words, automatic shaping was carried out, giving Inge the confidence and certainty that Ms Müller was always training at her individual performance limit. So the exercises were neither too easy nor too difficult. Even if Ms Müller was not having good day, the training session did not become a demotivating experience with all the exercises suddenly becoming too difficult for her. Quite the opposite. She entered a kind of "flow state" and was fully immersed in the training, which by this stage had its own dynamism.

Shaping also had a critical advantage for Inge. She was able to use the training evaluations to precisely track how Ms Müller's performance was progressing. For example, Inge was able to identify that Ms Müller had significant drops in performance during longer training sessions. They therefore reduced the duration of the sessions and then gradually increased them as training continued. At the same time, this finding had an important implication for everyday life. Because here, too, Ms Müller was able to describe to Inge that she would quickly become tired and unsteady during prolonged daily activities. They therefore agreed that Ms Müller would take more frequent breaks,

not only during training but also in everyday life, to reduce the risk of falls.

Transfer of learning

What is meant here is the transfer of learning to the application situation (everyday life); the more the task and the environment of the therapy situation resemble the application situation, the higher the transfer tendency. Transfer is one of the key themes for successful therapy.

Senso training is geared to the demands of daily life. Above all, dual-task situations (combination of a cognitive and a motor performance) can be trained in a “protected” context, a so-called standardised environment, in a safe and controlled manner. However, Inge was aware that capacity improvements as measured by training success in the senso do not necessarily lead to an improvement in performance in Ms Müller’s daily life [13]. Inge therefore included everyday exercises in the therapy plan in addition to senso training in order to ensure transfer of learning into the real world environment.

OUTLOOK

Senso training formed an integral part of standing postural control therapy in the treatment of Ms Müller. Use of the LEARNING WHEEL enabled Inge to conceptualise the principles of motor learning in a meaningful way, and the frame of reference also enabled her to locate the opportunities and limitations of technology. She succeeded in creating an animating therapy environment that continued to motivate Ms Müller to maintain her commitment to and compliance with her training exercises.

The use of targeted training of cognitive-motor dual-task situations enabled Inge to offer Ms Müller some fun ways of training certain aspects of postural control. To ensure that the training tasks connected with the wider environment, Inge additionally considered the issue of transfer and did not rely blindly on spontaneous transfer effects of standing and walking. She also added specific exercise situations in everyday life to the senso training programme.



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Martin Huber is a physiotherapist and received his Master of Science in Neurorehabilitation in 2007. As a therapist, he mainly treats patients with damage to the central nervous system. Since 2010 he has been working on a freelance basis in outpatient physiotherapy with neurological patients. Several years ago he reported on postural control and task-oriented therapy in well-known scientific journals, and he has been a speaker at various national physiotherapy conferences.

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Dialysis & Movement: Focus on subjective benefit

Results of a preliminary study on the subjective patient benefit of physical activity during dialysis

Fabian Scheffold, Fabiola Zinser, Christian Gorbach, Jakob Tiebel

The results of this study confirm a positive user experience of CKD patients who completed assistive ergometer training with the THERA-Trainer bemo during dialysis. The majority of respondents rated the training as fun, pleasant and motivating, indicating that this form of exercise intervention meets with approval among dialysis patients. After only 6 weeks of training during dialysis, the patients confirmed that they felt physically fitter, more balanced, in better shape, more satisfied and happier, and had more energy overall. More detailed interviews with larger groups of patients are necessary to verify the results and to gain further insights into the subjective benefit functions.

It is widely known that patients with CKD conditions receiving haemodialysis benefit from an increase in their physical activity level. Decades of clinical studies on physical activity have shown improvements in various areas of health and quality of life in dialysis patients. The results of the world's largest multi-centre dialysis training therapy trial with over 1000 patients (DiaTT, see p. 48) were recently published.

The DiaTT trial proves that intradialytic cycling is a particularly effective and at the same time gentle and practicable exercise intervention for kidney patients. During dialysis, patients train their strength and endurance in a recumbent or semi-recumbent



position on a motorised bicycle ergometer, which is operated over the bed or dialysis couch.

In addition to clinically measurable parameters that can be demonstrably improved through regular training, the subjective benefit of the intervention for patients is also important for research and clinical practice. To this end, Patient Reported Experience Measurements (PREMs) and Patient Reported Outcome Measurements (PROMS) were collected in our study by conducting acceptance surveys among patients for intradialytic exercise with the THERA-Trainer bemo in several German dialysis centres. PREMs and PROMS are an important complement to standard clinical outcome measures. PREMs, on the one hand, can be influenced by patient expectations and are used in particular to measure subjective experiences. In this case, the satisfaction and direct experience of intradialytic exercise. PROMs, on the other hand, which are also self-reported by the patients, reflect the influences of the intervention on the state of health of the patients, for example relating to vitality, quality of life, symptoms and treatment effects.

The PREM survey consisted of four evaluation dimensions on training with the THERA-Trainer bemo during dialysis:

1. I enjoy training with the bemo;
2. Training with the bemo is very pleasant;

3. Training with the bemo is motivating;
4. Training with the bemo is strenuous.

The participants rated the statements on a 6-point Likert scale from 0 = “not applicable” to 5 = “strongly agree” according to their subjective perception.

The PROM survey consisted of six assessment dimensions on the treatment effects:

1. Training with the bemo makes me feel physically fitter;
2. Training with the bemo makes me feel more physically balanced;
3. Training with the bemo makes me feel in better shape;
4. Training with the bemo gives me more energy overall;
5. Training with the bemo makes me feel more satisfied and happier;
6. Training with the bemo makes me feel safer in everyday life.

PROM ratings of < 3 points on the Likert scale were considered rejected by the subjects and PROM ratings of ≥ 3 points on the Likert scale were considered accepted. The data was collected using paper questionnaires, which were then digitised and then analysed descriptively in Microsoft Excel.



I enjoy training with the bemo



Training with the bemo is very pleasant.



Training with the bemo is motivating.



Training with the bemo is moderately strenuous.

Median (from 0-5)
IQR*



* The interquartile range, also called quartile range for short and abbreviated IQR, is a measure of dispersion in descriptive statistics. The IQR indicates how wide the interval is in which the central 50% of the sample elements lie.

A total of 27 patients from three different dialysis centres participated in the PREM and PROM survey after six weeks of training. The subjects had an average age of 76 (\pm 8.5) years, with 52% male and 48% female.

The results of the PREM survey show a strong tendency towards a positive user experience with the training. The participants rated the training as fun, pleasant and motivating with a median of 4 out of 5 points each. The training was perceived as moderately strenuous with a median of 2 out of 5 points.

The results of the PROM survey provide first indications of the positive effects of the treatment.

Of the 27 participants, 74% said they felt physically fitter after the training. Similarly, 70% said they felt a sense of physical balance.

63% confirmed they felt in better physical shape as a result of the training. In addition, 67% said they had more energy as a result of the training. A pleasing result is also shown in terms of satisfaction and happiness. 56% of the participants felt more satisfied and happier as a result of the training.

It is particularly noteworthy that 37% of the respondents noticed some transfer effects after only 6 weeks of training. This manifested itself in the fact that they felt safer in everyday situations.

74%



feel physically fitter after the training

63%



feel physically more in shape as a result of the training

67%



have more energy as a result of training

To this end, Patient Reported Experience Measurements (PREMs) were collected in our study by conducting acceptance surveys among patients for intradialytic exercise with the THERA-Trainer bemo in several German dialysis centres.

Overall, these findings indicate that the training has positive effects on the physical and emotional condition of the participants and may also contribute to an increased feeling of safety in everyday life.

The results of the PREM survey show a strong tendency towards a positive user experience with the training.

It is important to note that these findings should be considered preliminary and that more comprehensive surveys of larger patient collectives are needed to corroborate the findings. In the future, particular attention should be paid to the PREM factor “motivation”, as it can play a critical role in long-term exercise adherence and the results here show a strong dispersion. An investigation of the correlations between the subjective perception of exertion and the factors of fun, well-being and motivation also appears interesting. In addition, a stronger focus should be placed on PROMs in the future in order to further investigate the subjective treatment effects, particularly with a focus on vitality, quality of life and disease-specific symptoms. It would also be advantageous to evaluate the user experience on the part of the staff who are entrusted with the setup and handling of the technical device.



70%

feel physically balanced
after the training

56%



feel more satisfied and happier
as a result of the training

Interprofessional outpatient rehabilitation

An interview with Torsten Erler from
Ambulant-Physio Ergo Logo GmbH in Cottbus.

Interview with Torsten Erler by Jakob Tiebel

Ambulant-Physio Ergo Logo GmbH in Cottbus is an interdisciplinary centre for occupational therapy, physiotherapy and speech therapy. A competence centre for perception, movement and communication. In addition to the therapeutic specialist groups, social education is also an important link in the holistic care concept. All interventions are client-centred and focused on enabling social participation. To achieve agreed rehabilitation goals, the interdisciplinary

treatment team relies on a useful combination of empirical rehabilitation concepts with the latest innovations. In this interview, Torsten Erler, founder and owner of Ambulant-Physio Ergo Logo Cottbus, explains how the desire for mobility, self-care, communication and an individual lifestyle is the starting point for interdisciplinary cooperation and what role modern technologies, such as robotics, play in everyday treatment.

If we are able to reflect critically on our actions within the practice and can make this part of our self-image as practitioners – whatever the discipline – then we will be able to provide participation-oriented therapy.

Interviewer: Mr Erler, thank you very much for the interview. How would you describe in a few sentences what you have created in your therapy centre in Cottbus?

Torsten Erler: We combine tradition with innovation. We have been gaining extensive experience with the major empirical treatment concepts for 25 years and at the same time we see the need for evidence-based, guideline-oriented practice. We are innovative and we work with the latest technologies. One challenge is that we specialise in out-of-hospital intensive care, among other things. I'm sure we'll talk about this later, but this already explains why we use a healthy mix of tradition and modernity.

Interviewer: We'll go into that in more detail later. Let's first talk about interprofessionality. You combine physiotherapy, occupational therapy and speech therapy. The practice landscape in Germany today is predominantly organised on a unidisciplinary basis. What is the benefit of patients receiving all their therapies at the same location?

Torsten Erler: As I mentioned, many of our patients have serious conditions. Some of them have a tracheostomy tube and a stomach tube for artificial feeding since they can't swallow. All of this places special demands on therapy that cannot be met by one speciality alone. Our advantage is that we can work together in an interdisciplinary way. This not only increases the duration of treatment, but also the quality of care, and opens up completely new treatment options.

Interviewer: What role do the relatives of seriously affected patients play?

Torsten Erler: Particularly in the case of patients with impaired consciousness and cognitive limitations, the relatives are involved whenever possible – if they want to be – and play an active role in shaping the therapy. Relatives can often interpret the patient's behaviour during therapy in a completely different way than we can. The assessment of facial expressions, gestures and other



physical reactions is extremely important. And who can do this better than those closest to the patients? We want to put our patients at the very centre of treatment. This is only possible in the case of patients with serious conditions if there is close co-ordination and co-operation with the relatives, nursing staff and physicians. From goal setting to the continuous therapy process itself, we are connected as well as we can be with every actor involved in the overall care process.

Interviewer: On your website, you write that Ambulant-Physio Ergo Logo is the right choice for all those looking for good therapy. What makes for good therapy in your opinion, Mr Erler?

Torsten Erler: That's almost a philosophical questions (laughs). In my opinion, the answer is an in-depth self-examination. Motor skills, cognition and motivation are necessary for the recovery of skills. We often cling to the knowledge of previous successful therapies. But every therapeutic process

always requires the therapist to adapt to the client's situation and to the constantly developing findings on methodology, proof of effect and the usefulness of the therapeutic tool in question. In my professional career, it has often been my experience that the necessary humility of those in charge – in the face of the complex changes to the patient's body, mind and soul – quickly diminishes. Especially when dealing with the complexity of disorders and the biopsychosocial consequences for our clients, our minds must remain energetic and hungry to learn. A great respect for the client's endurance and struggle against their own demons should spur us on in the search for the ideal therapy. I'm in no way trying to be provocative. If we are able to reflect critically on our actions within the practice and can make this part of our self-image as practitioners – whatever the discipline – then we can provide good therapy to patients. This is what Ambulant-Physio Ergo Logo stands for as an interdisciplinary team. We are looking for the IDEAL of outpatient rehabilitation. Our interactive training centre will be opening soon.

Interviewer: In terms of modern treatment approaches, you are a strong advocate of device-assisted therapy and the use of robotics in your practice. What are the advantages of this?

Torsten Erler: I'll give you an example. We have a patient who is in remission after a vegetative state. The patient has regained the ability to swallow,

If we didn't have the equipment, we wouldn't be able to stand or walk for thirty minutes with our most severely affected patients.

and the ability to communicate by blinking, but is still fitted with a tracheostomy tube. What we offer patients such as these is a combination therapy consisting of intensive swallowing therapy in conjunction with mobilisation and verticalisation. The idea is to get patients standing and walking to activate the torso and head posture reactions in order to improve swallowing quality. In a way, this is a professional provocation. But we haven't stopped there, we have gained experience in the clinic and have successfully managed to transfer the idea conceptually to the outpatient setting. For this, we need appropriate technologies and equipment, such as the dynamic standing frame and the electromechanical gait trainer. If we didn't have the equipment, we wouldn't be able to stand or walk for thirty minutes with our most severely affected patients. We tried that at the beginning. But failed



because of the everyday reality. The patients stood for a short time during the thirty minutes and perhaps took a few steps. After that, it was the therapists who were at their performance limit, rather than the patient (grins).

Interviewer: What exactly are the effects of combining the therapies in this way?

Torsten Erler: We experience a significant increase in patient vigilance. Through verticalisation, we achieve conditions for an ideal alignment of the body with respect to gravity, where the head is first of all positioned and swallowing is physiologically possible. This is also possible when lying down or sitting, but it is often much better when standing. Sometimes we even do gait training, which we interrupt in order to include short swallowing sequences or to do oral stimulation. The device support is simply great. It allows us to work very effectively and efficiently, to make corrections in a few easy steps and create optimal conditions. This is very fortunate and would not be possible without the use of technology.

Interviewer: How do you ensure that the treatments are actually goal-oriented and effective?


Torsten Erler: We have set up our own ICF-based documentation for this purpose. This defines participation and includes all the activities we do with our patients. All professional groups report according to the same framework. The result is a very clean and consistent documentation and an excellent doctor's report. Transfer of learning



is particularly important to us – which brings us to the topic of evaluation. Starting with the question: What can the patient achieve in therapy? For example, a transfer or change of position with forty percent initiative – let's see what actually sticks in everyday life. This is the biggest challenge. Often we see that patients have some ability in therapy, but for various reasons that ability isn't always there in everyday life. This is what needs to be worked on. In addition, we also use standardised assessments in the individual treatment fields in order to objectify relevant parameters both clinically and therapeutically. We always have students in our practice who are still studying. That's great, because they always check what we are doing with a scientific expectation that everything is up to date. We're never bored (laughs).

Interviewer: I can very well believe it. I wish you continued success and thank you very much for the interview, Mr Erler.

The idea is to get patients standing and walking to activate the torso and head posture reactions in order to improve swallowing quality.



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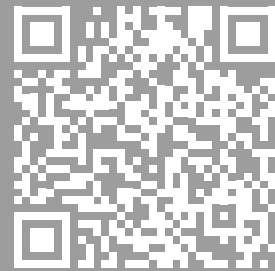
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