

Intensive therapeutic treatment in neuro-rehabilitation – a qualitative analysis from the therapist's perspective

Abstract

Objective: This study aimed at evaluating a specific therapeutic concept in neuro-rehabilitation developed by physiotherapists at the rehabilitation center “Zentrum der Rehabilitation” in Pforzheim, Germany. The treatment addresses especially patients severely affected by neurological disorders (e.g. tetraplegic, traumatic brain injury, severe stroke) who are often diagnosed as “incurable”. This pilot study examined the therapists’ experiences and assumed effectiveness with this new concept.

Design: Qualitative interview study.

Methods: Guided interviews were conducted with 12 randomly assigned therapists (24 in total) at the rehabilitation center. All interviewees work with the specific therapeutic concept in neuro-rehabilitation. All interviews were audio recorded, transcribed verbatim and analyzed using content analysis.

Results: All participants agreed that the new concept for neuro-rehabilitation shows an extraordinary effectiveness based on interdependent context factors. The concept consists of the following theories: a) constraint induced movement therapy (CIMT) concept, b) Bobath concept, and c) neuroplasticity. The context factors determined are: Individual and 3-6 hours care by at least one therapist for one patient, working with patients up to exhaustion, client- specific approach and suitable therapy rooms where therapists and patients work together and communication and motivation is supported.

Conclusion: This new innovative and progressive approach to interdisciplinary therapy for people with severe neurological disorders must be considered for further research. On the one hand more objective data about patients’ progress have to be examined. On the other hand these objective data have to be combined with qualitative analyses of patients’ and family members’ views of this new concept in a long-term context.

Keywords: neuro-rehabilitation, therapy concept, qualitative research

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Clinical messages

- i. Neuro-rehabilitation should involve repetitive and intensive training adjusted to levels of difficulty and client-specific tasks.
- ii. Temporal and spatial conditions are the prerequisites for a meaningful therapeutic relationship and communication to increase intrinsic motivation and exercise adherence.
- iii. A defined structure of therapy organization and controlling are essential for effective therapeutic care.

Introduction

The rehabilitation of severe neurological disorders belongs to the socially and economically relevant medical and therapeutic work areas. Rickels et al.¹ estimate an incidence of traumatic brain injury of 332 per 100,000 inhabitants and approximately 273,000 traumatic brain injuries in Germany each year. According to the S1 guidelines of the German Society of Neurology (DGN),² the annual incidence of acute traumatic spinal cord lesions located in industrialized countries is 10-30 cases per one million inhabitants. Men are affected 70% more often than women. The average age at accident is 40 years.³ The incidence of non- traumatic spinal cord injury (including tumors,

spinal perfusion disorders, myelitis) is not known, but their frequency increases significantly with the aging of the population.

In the rehabilitative context, patients with severe neurological deficits are often among the so- called “hopeless cases” or considered “incurable”. From the beginning of the rehabilitation phase it seems to be clear that intensive nursing and therapeutic measures from the date of occurrence of the neurological disorder are required, whose success in terms of regaining motor function and regeneration or other physical limitations cannot be safely achieved, certainly cannot be reliably predicted. After numerous therapeutic measures these patients are considered “untreatable”, a status which question further rehabilitative efforts, especially as no apparent physiotherapeutic strategies in an effective and efficient treatment of such disorders exist.

The present qualitative pilot study examined a unique intensive therapy concept at a rehabilitation center in Pforzheim, Germany. As part of the planning discussions between the management of the rehabilitation center and the investigators there had been evidence of successful rehabilitation courses of the above-mentioned cases. Core subject of this rehabilitation concept is the possibility of treating patients with severe neurological disorders with at least a therapeutic

1:1 contact up to a 5:1 support (five therapists to one patient) over a period of up to six hours per day for several weeks and months. The objective of this intensive therapy is to achieve greater success than by conventional forms of therapy and to increase the patients' opportunities for participation and quality of life.

The therapeutic concept is timely flexible and can be adapted to the patients' individual needs. It is based on evidence due to neural plasticity and integrates measures of the Bobath concept (BC), constraint-induced movement therapy (CIMT) and uses as needed gait robot locomotion therapy on a treadmill (GRLT). In addition to physical and occupational therapists speech therapists are involved in the treatment of neurological speech disorders.

The therapeutic treatment in this rehabilitation center seems to be successful for patients with most serious neurological disorders. Considering this therapeutic treatment from an empirical point of view, the current pilot study examines the influencing factors of the therapeutic concept from a therapist perspective. For an understanding of a basic theoretical model whereon this therapeutic concept is grounded the following inductively developed categorical research question was edited: What are the theoretical and practical aspects of the new concept and how do aspects such as communication, business organization, goal-setting, therapy documentation and evaluation, self-perception of therapists, quality management concerning further education and finances affect the therapeutic success?

Methods

Research ethics approval was obtained before recruitment from the Ethics Committee of the Hochschule Fresenius, University of Applied Sciences (Idstein, Germany). A qualitative research approach using content analysis was chosen for this study.

Sample selection

Before recruitment an information event for all employees of the rehabilitation center "Zentrum der Rehabilitation" took place in January 14th, 2014 at Pforzheim (Germany) held by the research team of the Hochschule Fresenius, University of Applied Sciences. Within this information event all aspects of the planned research project were presented and all open questions were discussed. Therapists were free to decide whether they wanted to participate or not in this study and had the chance of gaining comprehensive information about the project procedure, data collection and evaluation. Out of 24 therapists working for the rehabilitation center "Zentrum der Rehabilitation" (Pforzheim, Germany) at this particular time of the project start (January 2014), 23 therapists gave written informed consent to the participation in the study. These participants were allocated a number. Out of this participant pool 12 therapists were chosen by lot for guided interviews (6 physiotherapists, 2 speech therapists, 4 occupational therapists). All interviewees have already completed their full education and work full-time with the specific therapeutic concept in the rehabilitation center. Participants agreed to be interviewed and recorded and again gave verbal informed consent for data selection before starting the audio taped interview. The characterization of the interviewees is shown in Table 1.

Data collection

For the purpose of this study, an interview protocol was developed by the research team of the Hochschule Fresenius, University of

Applied Sciences. The first part of the interview covered information about education, profession, and the work duration at the rehabilitation center. The guided interview was semi-structured. The interview guide providing a set of questions and interview support is summarized in seven primary inductively formed categories (Table 2).

Table 1 Participants' characterization

No	Sex	Age	Profession	Work duration for ZdR in years
1	male	35	Physiotherapist	9
4	male	31	Physiotherapist	4
9	male	36	Physiotherapist	1
10	Female	25	Physiotherapist	0
12	Female	32	Occupational therapist	8
14	Female	27	Occupational therapist	4
15	Female	32	Occupational therapist	3
16	Female	25	Occupational therapist	4
23	Female	30	Speech therapist	6
24	male	51	Speech therapist	2
25	male	53	Physiotherapist	9
26	male	57	Physiotherapist	9

Table 2 Categories of the guided interview

No	Category	Contents
1	The therapy concept	Theoretical foundation, theoretical & practical aspects of the new concept
2	Communication	Communication between therapists, patients, family members, management
3	Organization	Business organization, goal setting, therapy documentation & evaluation
4	Self-perception	Personal strength & weakness, own position in the therapy process
5	Quality Management	Internal & External further education
6	Finances	Information about financial aspects, costs, and patients' budget concerning the specific individual therapy
7	Conclusion & interview reflection,	Miscellaneous & interview reflection

All guided interviews were carried out by two persons according to the recommendations of Kuckartz.⁴ These two interviewers belonging to the research team of Hochschule Fresenius, University of Applied Sciences, were trained with the same interview guide including the same set of questions prior to project start. Before each interview all interviewees were informed about content and objectives of the interviews. At the end of each interview, the interviewer checked all open-end questions on the interview protocol with respect to avoiding important contents omitted. The interviewer was encouraged to arrange a friendly atmosphere and was free to enquire, especially in situations where the interviewee hesitated or was not sure to proceed. Interviewees were characterized coincidentally and named

via the numbers given prior to the interviews. The interview lasted approximately 45-60 minutes per interviewee. By completion of interviews with 12 therapists in total, it appeared that saturation had been achieved. Sessions were audio-taped and transcribed verbatim considering the transcription guidelines by Kuckartz.⁴

Data analysis

The transcribed interviews were analyzed by computer-assisted software MAXQDA+ (Version 10). Considering the primary unknown scheme due to the new therapy concept, an inductive content analysis was used. Two independent reviewers translated the transcribed data into codes and categorized all coding segments. Both reviewers initially interpreted the statements of the categories independently. Analyses were compared in several meetings and disagreements of both reviewers were discussed and clarified in order to achieve a consensus. Quotations from the interviews are used to illustrate the results.

Results

The new therapy concept for patients suffering from highly severe neurological diseases has been considered by all interviewees from a therapists' point of view. First, all therapists agreed that this special therapy concept developed in the "Zentrum der Rehabilitation" (Pforzheim, Germany) leads to an extraordinary and incomparable effectiveness with severely affected neurological patients because of the characteristics of therapy procedure, given circumstances in therapy time and room, and the combination of several aspects of the given business guidelines.

The therapy concept

The therapy concept is named "I.N.P.U.T.": *Intensive Neuro Plasticity Using Therapy* (German "*Intensive NeuroPlasizität Utilisierende Therapie*"). The name was coined by the two general managers of the "Zentrum der Rehabilitation" (Pforzheim, Germany).

Theoretical basis of this therapy is the Bobath concept. It aims at promoting motor learning for efficient motor control in various environments in order to improve participation and function.

"[...] and what is an integral component of (the therapy), that we practice incredibly much. Many repetitions, based on the Motor Learning by Taub [...]. Yes, I think the repetitions, the exhaustion, less compensation, that it is all about." (Therapist no. 4, 00:04:26-4).

Furthermore, the concept describes a combination of the following theories: a) the forced-use- concept, b) Bobath concept, and c) the theory of neuroplasticity.

"The basic element is the Bobath therapy [...] which is developed and changed more and more (in this center) and that is, I believe, the meaning of it all, that you do not stop at a point, but that you continue developing, sense and purpose of I.N.P.U.T. is the belief in possible plasticity in the brain [...], to change it via sprouting or (nerve) growth or parts of the brain undertaking tasks and that is how the name I.N.P.U.T. has been formed, neuroplasticity and everything that belongs to it. [...]" (Therapist No 16, 00:01:07-7)

Most specific aspects characterizing the therapy concept of I.N.P.U.T. are summarized in Figure 1. One therapist is responsible for one patient and if necessary more than one therapist works with one patient at the same time (depends on the disease severity and the assumed therapy intervention). The long-term goal for all patients and therapists is to walk and therapists' motivation is to work with their patients up to exhaustion. All therapists agree that the client- specific approach defines the key strategy of this concept to improve patients' motor and mental performance. Therapeutic goals are oriented on patients' everyday lives. The specific nature represents the individual supervision inclusive of a long-term commitment between therapist and patient. The therapy time of at least 3 to 6 hours per day and the unusually large therapy rooms, where all therapists and patients (and even family members) work together, allow communication and motivation between therapists, patients and family members.

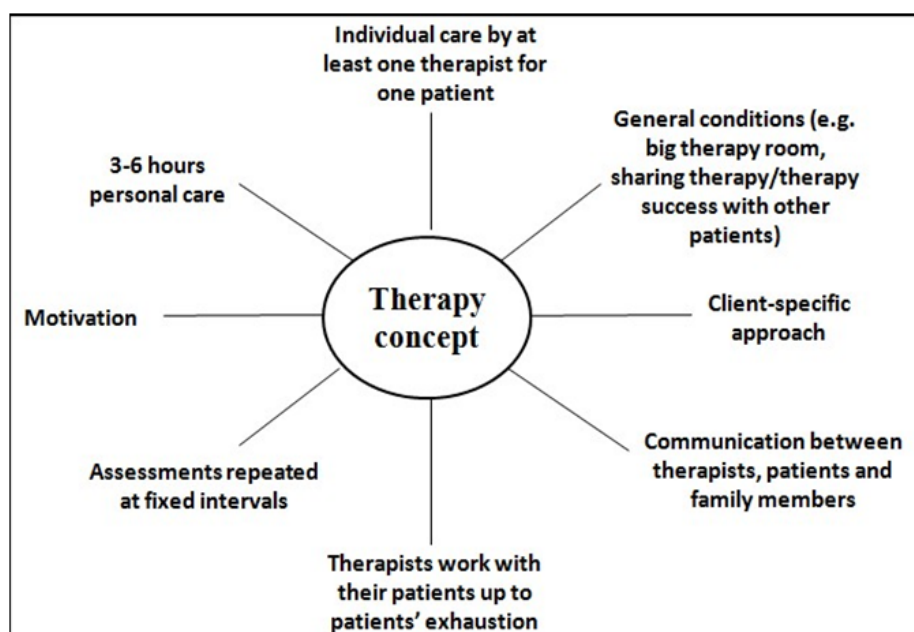


Figure 1 Specific characterization of the therapy concept from therapists' perspective.

[...] that we treat in these rooms. [...] all the equipment we have is there, [...] running from room to room, losing time, then I'd rather go in the big room, where everything is available. [...] Most patients do not have a problem with that. (Therapist No 4, 00:47:59-5) “[...] Maybe patients have problems with it (large rooms), but that is the idea of it, that people when they exercise, that they never have environmental conditions without disturbances. [...] when they are in the city, they have to walk and concentrate as well although there is a lot of noise around.” (Therapist No 1, 00:06:57-5)

Communication

The spatial conditions are the fundament for the communication between all therapists, assistants, patients and family members/partners. Large therapy rooms give the opportunity of having more than one patient working with his/her therapist(s) at the same time in the same room. From a therapists' perspective it is possible to provide advice or to seek advice from colleagues.

“[...] Even if there are the very hard cases (patients), the atmosphere is always good. You can laugh with each other.” (Therapist No 15, 00:10:29-9). But despite all the advantages of the large therapy rooms, there are disadvantages for the therapists.

“[...] Sometimes there are three, four patients at the same time. Then it can become really mentally exhausting in these rooms [...]. [...] the sound intensity of the therapists can be a little bit too high

[...]” (Therapist No 4, 00:46:38-5)

The communication is very personal because the therapy is not as anonymous as in a usual physiotherapeutic practice (one small room for one patient without interaction with other patients/therapists). The daily therapy and the huge amount of time between one patient and his/her therapist lead to a very personal relationship. This leads to an increasing motivation both in the patient and in the therapist to work hard in order to reach therapy goals.

Organization

The reasons for the concept's success are the specific chronological order of the therapy, the therapy contents and the general conditions for patients and therapists. All patients treated in the center pass several stations: 1. A free non-committal and complimentary trial lesson in order to get information about the patient's status quo and to try out a few therapeutic interventions. 2. A discussion after the trial lesson between patient, optionally family member, and the two heads of the center in order to talk about specific, realistic therapy goals, 3. Development of an individual therapy program (at least for 3 weeks, 5 days a week, 3-6 hours a day) and the estimate of costs (including physiotherapy, occupational therapy, speech therapy, required accommodation and adequate supply), and 4. Starting the therapy program with detailed assessments repeated at fixed intervals (anamnesis, video, motor tests, etc.). The procedure from the initial contact to therapy start is shown in Figure 2.

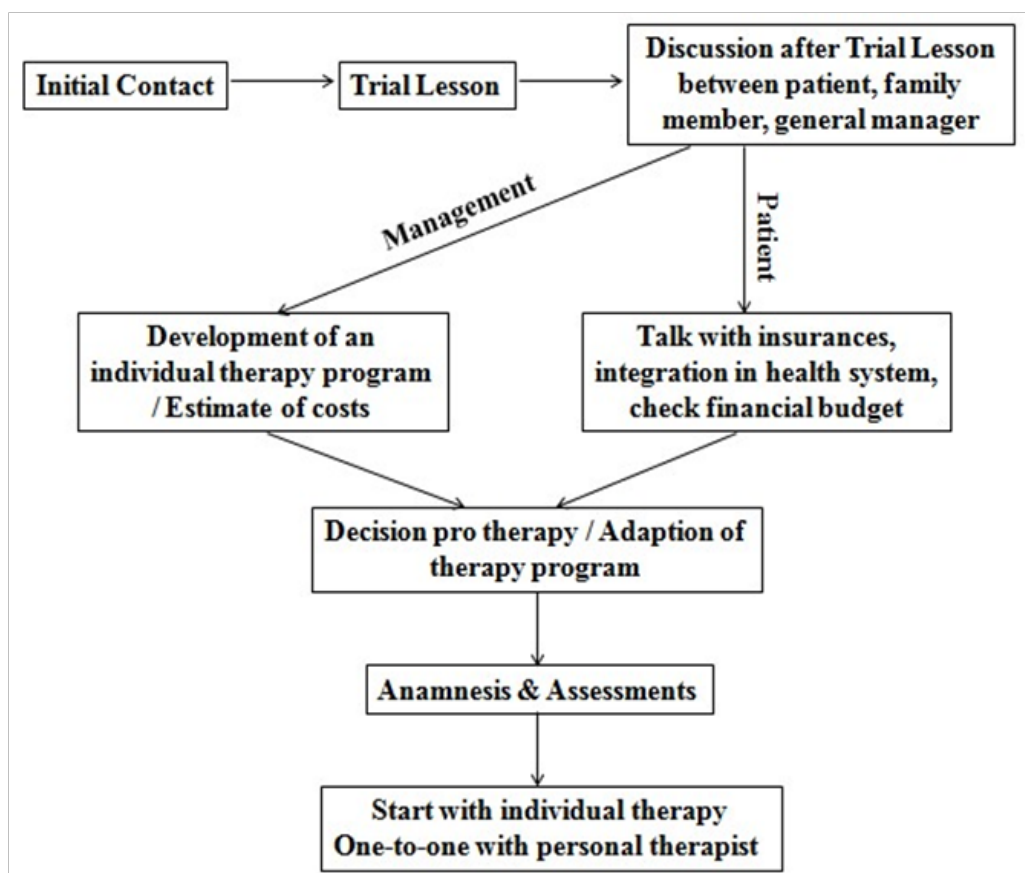


Figure 2 Procedure from initial contact to therapy start.

Obviously, the therapy contents and goals are determined by the two general managers. Moreover, it is possible to receive a special nutrition protocol, accommodation and care for the stay at the “Zentrum der Rehabilitation”. But, from the outset of therapy, in practice one therapist is responsible for the realization of all therapy goals assumed. In the I.N.P.U.T. concept both physiotherapists and occupational therapists do the same work with the patient and carry the same responsibility for their patient. They have assistants helping for certain exercises, if required.

“Basically, (as an assistant) I am doing the same job like every therapist. [...] we have to render assistance. So, we practice a lot walking, straightening up, and it is important that the leg keeps stable,

that the knee doesn't block [...] or help with the arms or you have to support the people. Actually, there is no big difference to what other therapists do. But some determine what to do.” (Therapist No 9, 00:05:37-0)

As soon as there are at least two therapists working with one patient, there has to be a kind of a hierarchic structure during the therapy process. “[...] I would say, if I have an assistant, I am the one saying what is going on. So, I have my conception [...]” (Therapist No 16, 00:33:29-2).

The corporate structure and facilities at the “Zentrum der Rehabilitation” for a holistic therapy I.N.P.U.T. are pictured in Figure 3.

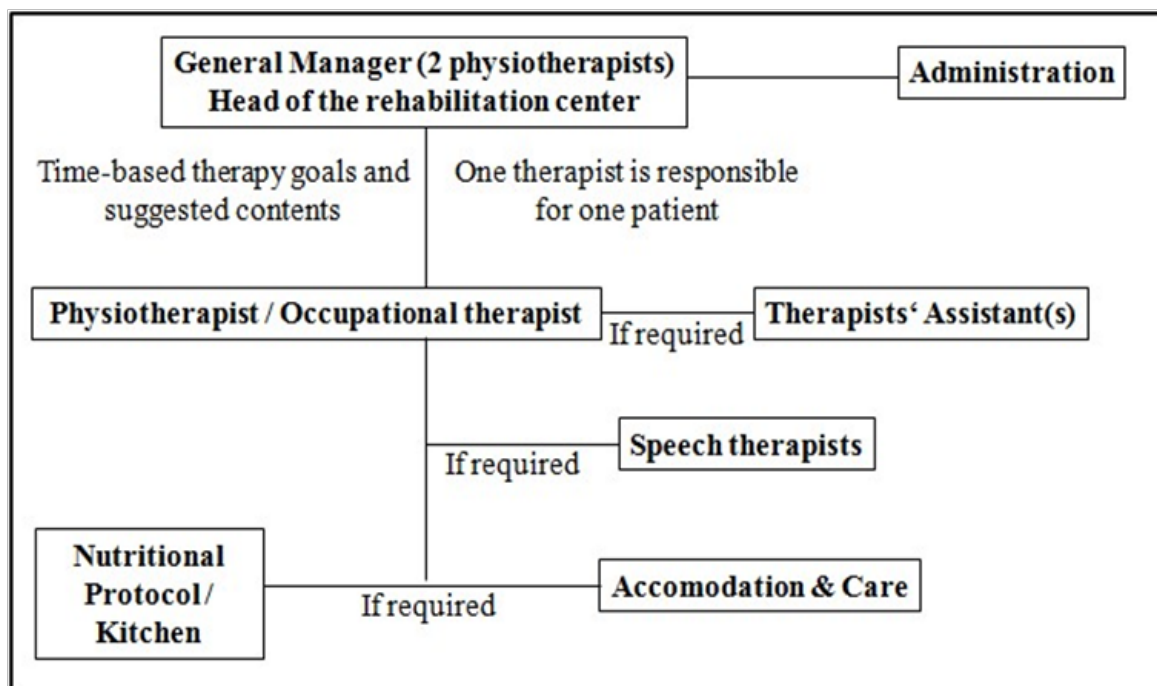


Figure 3 Corporate structure & facilities for I.N.P.U.T.

Self-perception

The self-perception of each therapist seems to depend on their work duration at the “Zentrum der Rehabilitation”. Those who work more than about two years for the rehabilitation center and with the new concept I.N.P.U.T. envision themselves as general element of the center. They want to be a constant companion in the therapy process and want to challenge patients every day. Those who are new at the center work mainly as assistant and want to learn more about the concept. Their goal is to feel more confident with the therapy concept and to receive more and more responsibility.

Quality management

All physiotherapists and occupational therapists receive an internal further education in Bobath concept. Next to the qualification as physiotherapist/occupational therapist/speech therapist it is urgently necessary to be capable of working in a team.

“For me [...] you have to be able to be independent-minded. To see

mistakes in therapy exercises. To correct exercises if necessary, [...]” (Therapist No 4, 00:50:29-6) “To like working in neurology. That is why we always say that they should work for a few days on probation [...] It is necessary to have basic knowledge. And the Bobath course. If they do not have the Bobath education, we support it financially.” (General manager No 25, 00:55:33-2)

Finances

With reference to financial decisions, all employees admitted to not knowing anything about them. They are not involved in financial plans, decisions or budgets and they are grateful that they do not have to be. All financial decisions are made by the general management and the administration of the rehabilitation center.

Conclusion & interview reflection

None of the interviewees felt uncomfortable in the interview situation. There was no strict guidance that made them answer in a specific way, but they could answer freely.

Discussion

According to Langhorne et al.⁵ concepts evaluated in the therapeutic care of patients with severe neurological disorders exemplified at stroke patients lead us to three important observations on fundamental problems in physiotherapy:

1. Neurophysiology is not fully understood, so that plasticity of the nervous system, and thus the therapeutic options are not well known.⁶
2. The interventions are complexly aimed and involve interdependent components (e.g. power, tone regulation as a prerequisite for the ability to walk), which are trained through individual action. Here the mutual influences are largely unexplored, but are combined for individual, therapeutic opinion or organizational aspects.⁷
3. The measures are so diverse that they have different goals, from alleviating various problems to the improvement of activity and participation. Thus, no apparent physiotherapeutic concept can be found.

Although the evidence on aspects of neurological rehabilitation is extensive and varied, evidence-based recommendations for therapeutic practice are not possible because of the heterogeneity of existing therapeutic models⁸ and hyper-summativ characteristic of an effective system that has not been studied in its context. Hence, difficulties become apparent in finding a successful concept for the treatment of severe neurological symptoms, which are often referred to as being incurable and for which there is no hope of improvement in symptoms.

Due to the heterogeneity of the existing disorders and their characteristics, individual treatment goals and design and different feasibility of the necessary measurements on the patients' mechanisms of action, such as are usually collected in the exercise therapy rehabilitation (measurable therapeutic outcomes, such as parameter for determining the mobility, functional status, and other biometric data), are initially undetectable. The fact that no evidence-based rehabilitation strategies exist in terms of the interaction of various therapeutic measures, calls for the development of a more effective model that outlines heuristic relationships of physiological, motivational, emotional, and personal aspects of outpatient physical therapy care in neuro-rehabilitation. Such a model of possibly existing influencing factors and their interaction is not known. For the local community of therapists and the patients that are cared for in the abovementioned rehabilitation center, the development of an action model is relevant for identifying influencing effects and its systematic implementation in therapy. If there is no consistent evidence of the efficacy of given interventions and underlying conditions, a scientific based neuro-rehabilitation must be taken over and provide the necessary arguments.^{9–11}

The key findings of this study suggest that, from therapists' perspective, the contextual factors of the therapy model investigated such as individual care, communication-promoting general conditions, client-specific approach, working with patients up to their exhaustion and 3 to 6 hours duration of personal care can decisively influence the treatment outcome.

Theoretical aspects

The "I.N.P.U.T." therapy concept is a theoretical and evidence-

based treatment concept that systematically includes knowledge of neuroplasticity and refers to theses on necessary therapeutic conditions to trigger changes in brain structures and/or function.¹² The therapy concept investigated provides a therapeutic and organizational environment that is comparable as the conditions of an environmental enrichment stimulating neuroplastic operations in the brain by its physical and social surroundings. It is conceivable that just motion and functional based training supports dendritic sprouting and the formation of new and functional adaptations of existing synapses. Motor learning is known to be more effective if the practice method is meaningful, repetitive, and intensive.¹³ Although this has been mainly studied in the context of the rehabilitation of stroke patients, it can be assumed that especially intense motor learning is also effective in other severe neurological disorders such as cerebral palsy or traumatic brain injury.¹⁴ Accordingly, Jones et al.¹⁵ noted that activity based therapy has the potential to promote neurologic recovery and enhance walking ability in individuals with chronic, motor-incomplete spinal cord injury. Further it is recommended that neuro-rehabilitation is applied in special institutions where multidisciplinary teams support active patient participation.¹⁶

As previously mentioned, aside from being based on the theory of neuroplasticity, the concept is also based on the treatment concepts of Bobath and CIMT. A cornerstone of the redefined Bobath concept is the integration of posture and movement with respect to the quality of task performance. A key fundamental principle of its clinical application is the selective manipulation of sensory information, namely, facilitation, to positively affect motor control and perception in persons' post-central nervous system lesion. This aspect of clinical Bobath practice requires further investigation¹⁷ and objective data, especially concerning different pathology and functional disease orientated practice strategies. The Bobath concept aims at motor learning for an efficient motor control in various environments in order to improve walking ability, function and participation. Bobath as a neuro-developmental treatment concept elicits differential effects on gait patterns in adults with cerebral palsy,¹⁸ traumatic brain injury¹⁹ and chronic stroke as well.²⁰ The original and modified types of CIMT have beneficial effects on motor function, arm-hand activities, and self-reported arm-hand functioning in daily life, immediately after treatment and at long-term follow-up, whereas there is no evidence for the efficacy of constraint alone (as used in forced use therapy).²¹

Practical aspect

The interviewees' suggestion of positive influences on treatment outcomes by a client-specific approach, exhaustive and 3 to 6 hours duration therapeutic work is supported by basic neurophysiological research results. Relearning of a given task or skill is less efficient by simple repetition of the task. Although for a simple training the primary motor cortical representation of the muscles involved increases, it disappears within a short time.^{22,23} A stable cortical representation could be observed if the difficulty of the task increased and/or a new task should be learned.²⁴ At a certain level of learning a task there are no further neuroplastic processes induced so that in terms of changes in plasticity a repeated practice of the task makes little sense. A plasticity-promoting training is about setting client-specific goals (the main aspect of a client-specific approach) in order to improve the patients' motor performance.^{25,26} Nielsen et al.²⁷ recommend that "the therapist has to help the patient setting realistic goals that are sufficiently above the current level of performance, but not more than can be achieved with practice within a reasonable time period".

The duration of daily therapy measures reveals itself from the required scope of the training load related to neuroplastic changes and re-learning tasks. Studies by Nielsen et al.²⁷ have shown “that training needs to be much more intensive and of a much longer duration than what is normally the case in clinical studies on neuro-rehabilitation”. In clinical neuro-rehabilitation studies patients performed less than 10% of the movement repetitions that were performed by experimental animals in studies on neuroplasticity.^{27,28} The information on the necessary duration of training varies between twice 10 to 30 minutes at a time in both animal and human trials.^{29,30} The time required in neuro-rehabilitation for the re-learning of motor function is by clinical experience 6-18 months up to lifelong training.^{27,31} Referring to findings of sports sciences, after which you need to learn skills up to 10,000 hours to achieve expert status (equivalent would be 3 hours training per day over 10 years!),²⁶ it is clear that for the achievement of everyday skills an adequate daily amount of exercise appears to be 3 to 6 hours, respectively. However, the therapeutic success probably depends on a combination of an intensive client-specific motor and task orientated training related to increasing levels of difficulty, which can be organized in the multidisciplinary setting and implemented as part of the rehabilitation concept investigated. More objective data is needed to distinguish functional exercise programs related to different levels of difficulty and the necessary training duration including decision support in changing the therapy program and intensity.

Conditions, goal setting, communication and motivation

A therapist's major challenge in the context of neuro-rehabilitation is to maintain the patients' intrinsic motivation to adhere to the treatment goals set and the necessary exercises. From the perspective of the therapists interviewed, the huge daily amount of therapy time, and the spatial conditions (large therapy rooms in which more than one patient can be trained) as well as the prerequisites for a personal relationship and communication between therapists and patients increasing their motivation and exercise adherence. The setting investigated creates conditions that promote an intrinsic process motivation, e.g. the fulfillment of the basic physiological need to be able to move under one's own power, and the internal self-concept based motivation of personal goal achievement. The fact that a number of patients and therapists work simultaneously in a large therapy room is able to create a collaborative and like-minded working atmosphere with the common goal of improving their own performance. The shared experience of one's own efforts to achieve a defined therapeutic goal could create a form of social recognition acting as an external motivator (external self-concept based and goal internalization motivation) for further goal achievement.³² The excitation of the affiliation motive leads to dopamine release³³ which improves the consolidation of the motor program responsible for the behavior in the motor cortex and basal ganglia.³⁴

Therefore, in our view, the following essential requirements for effective therapeutic care (not only in neuro-rehabilitation) could be derived: to necessity (goal) orientation corresponding motives, achievable goals and to the goal achievement connected social recognition, as well as social contact is required. This is what the spatial and temporal conditions of the setting described may enable. Nevertheless, a patient's motivational predisposition rather than being passive and completely subjected to environmental forces and conditions has to be considered.³⁵

Organization

Following a clearly defined structure of the business and therapy organization, the need for therapy is patient-oriented determined, the therapeutic goals are derived and the relevant evidence and science based therapeutic measures, as well as business activities to finance the rehabilitation, are initiated. Immediately after contacting the rehabilitation facility, the patient has the possibility of a trial lesson to gain first experiences of treatment (Figure 2) in order to decide whether the manner of treatment is acceptable. Within this new concept the trial lesson is a core element to ensure the patients' self-determination supporting their intrinsic motivation process.

Therapy documentation

From the start of the rehabilitation process the therapeutic concept follows scientific knowledge of therapy planning and controlling with the key elements of continuous documentation and regular evaluation for reflection and control of therapy progress (Figure 2). The present study is focused on the investigation of the whole concept and influencing factors, so that we abstained from an in-depth consideration of the therapy control measures. Further research in evaluating these measures and assessments of daily changes and outcomes are necessary.

Strength of the current study is the exploration of a novel therapy model in a multidisciplinary rehabilitation setting that has a positive impact on the effectiveness of therapeutic interventions in the treatment of severe neurological disorders attempting and including contextual influencing factors from a therapist perspective. In the context of evidence-based practice the therapists' internal evidence is a mainstay in therapy decision-making process. To complete the action model of the therapy concept investigated the patients' and their families' perspectives have to be included in the analyses for further research. On the one hand the patients' relatives are limited in their quality of life depending on the degree of physical impairment of the patient,³⁶ on the other hand it can be assumed that family functioning plays a supporting role in patients' rehabilitation processes. Objective data of the patients' rehabilitation progress have to be analyzed while taking into account the relatives' perspective on the rehabilitation context.

A limitation of this study is that, in addition to the lack of objective data on treatment success of combined therapeutic measures, the undifferentiated consideration of respective neurological disorders. In addition to the collection of objective data on recovery progress and the inclusion of further perspectives of the people involved in the rehabilitation process, the development of disorder-related treatment models with differentiated recommendations for therapeutic action should be the goal of further research. Furthermore, the findings of the study are not readily transferable, because it is a model of a selected therapy setting with its own requirements. However, they give indications of possible key factors in the context of neuro-rehabilitation.

Conclusion

In the present qualitative analysis of a new therapy concept first relationships and key points for the development of an effective model of relevant contextual factors could be determined from the therapists' perspective. To ensure a neural plasticity-promoting training, setting client-specific goals in order to improve the patients' motor performance is essential. In addition to aspects concerning

practicality, content and intensity of the therapeutic measures, the importance of an intensive therapist-patient relationship and the design of a temporally and spatially social contact conducting environment must be considered for a successful and efficient neuro-rehabilitation.

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Conflict of interest

The authors declare no conflict of interest

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