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Research Article

Dimension of Behavioral Deficits in Subacute Rehabilitation after Stroke

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Received: March 21, 2017; **Published:** April 15, 2017

Abstract

The dimension of neuropsychological disturbances and behavioral disorders after brain damage is of a major importance for a good quality of life and a successful social and occupational reintegration.

This study centers on the analysis of behavioral disorders after stroke. Furthermore, it attempts to answer the following questions: how many patients in a subacute disease phase after stroke have deficits in behavior; which deficits were exhibited and to what degree were they exhibited. In a retrospective study 61 patients 0-6 months after hemorrhagic or ischemic stroke were included. Examination of the kinds of behavioral disorders was made using the Neurobehavioral Rating Scale (NBRS) and the Marburger Kompetenz Skala (MKS) was used for examination of daily behavior.

Initially, in the early phase of the disease a huge spectrum of behavioral deficits can be recognized. These are mainly symptoms of depression and fear, but also limitations in mental capacity and attention. Results of the MKS-score of daily behavior showed that most of the limitations are found in recreational activities, physical work and mobility (driving a car, using public transport etc.).

A lack of behavioral deficits is essential for social, family and occupational reintegration. Therefore, resolving these behavioral deficits should be given special consideration even in the early phase of rehabilitation. One would expect that an important factor for improving reintegration of these patients is early adoption of individually customized neuropsychological and behavioral therapy, accompanied by therapeutic care in a social and family environment.

Keywords: *Disturbed Behavior; Stroke; Rehabilitation; Reintegration; Behavioral Therapy*

Introduction

People who sustain brain damage after stroke can be confronted with very different functional deficits due to damage to the central nervous system [1-3]. In addition to sensory deficits and motor impairments, neuropsychological disorders, which can affect all areas of cognitive performance, often occur depending on the location, type and extent of the damage [4,5]. There are often also emotional changes, which are subsumed by some authors under the concept of "personality change" [6], such as increased irritability and aggressiveness, increased or decreased sexuality, impotence or lack of affect control [7,8]. The temporal course of the complaints is very difficult to assess, particularly because of the heterogeneity of the disease as well as the assessment instruments used [9]. However, in many patients persistent chronic disorders of neuropsychological functions can be interpreted [10,11]. While in the acute phase questions of survival and

weight loss are the main focus, personality and behavioral changes as well as lasting cognitive losses are becoming increasingly relevant for patients and their relatives. In particular, after returning from inpatient rehabilitation to their usual environment, there is often a special need for psychotherapeutic support as the chronic consequences of the disease can lead to a growing burden on the patients as well as their relatives [12]. In other studies attention has been paid to the diagnosis and treatment of depressive disorders, as depression has been shown to be a complicating factor in the rehabilitation process and the outcome of stroke [13,14]. As already mentioned, the focus of the diagnostic assessment at the beginning of neurological rehabilitation is usually on the sensory and motor deficits. Cognitive and communicative functional limitations are usually the next focus of therapeutic interest. Sensomotoric deficits can often be compensated for by means of strategies and individually adapted supplies. The extent of neuropsychological disorders and behavioral deficits is responsible for a good quality of life as well as for a successful social and professional rehabilitation [15,16]. Initially these are not usually considered a priority, although they have a bearing on the outcome of the patient [13,17]. They have long-term implications for the return to the old or new social environment and have a considerable impact on the chances of a professional reintegration [18,19]. In addition, these deficits are usually assumed to receive considerably lower tolerance in relation to the environment than the sensorimotor deficits. Patients who have suffered brain damage often change their social behavior in a way that causes discomfort and incomprehension of friends and relatives [20,21]. Social withdrawal is a frequent consequence of depression and anxiety [22]. The effects of these psychological impairments on the everyday competency in work and private life can be considerable and reintegration is often difficult [23]. In other studies, a variety of assessment scales have been developed for detecting behavioral problems. Among the essential scores for the detection of behavioral disorders at the neurobehavioral level is the Psychiatric Rating Scale (BPRS), developed by Levin (1987). However, this is mainly used for the detection of psychiatric diseases. It does not adequately depict essential neurobehavioral deficits that are observed after a brain damage (attention, memory, etc.). This has been achieved with the development of the neurobehavioral rating scale (NBRS) for the detection of behavioral deficits after cerebral injury. This rating scale has already been used in numerous disorders of the central nervous system [15,24-26]. For this reason, it was also used within the framework of this study.

Material and Methods

In a retrospective study, from the year 2012, all 79 patients included in the clinical trial were diagnosed with a hemorrhagic or ischemic stroke and admitted into the ambulatory Neurological Rehabilitation 0 - 6 months after the event. Out of the 79 patients in the o.a. 61 fulfilled the criteria in order to participate in this study.

The analysis of the spectrum of behavioral deficits was carried out in the overall collective (n = 61) with the aid of the Neurobehavioral Rating Scale (NBRS) in addition to the recording of everyday relevance with the Marburg Competence Scale (MKS) [28]. The 61 patients were 44 men (72.1%) and 17 women (17.9%). They were on average 66.8 + - 11.4 years old (median 69 years, minimum 38 years, maximum 85 years, Q1 61 years, Q3 75 years).

Inclusion criteria

- Age 18-85 years
- Initial diagnosis of ischemic or hemorrhagic stroke
- Date of survey: 0 - 6 months after stroke

Exclusion Criteria

- Neurological and / or psychiatric disorders
- Abuse of alcohol or other drugs
- Severe secondary disease (e.g. oncological diseases)

- Heavy aphasia
- Pre-existing dementia
- Insufficient knowledge of the language

18 patients were excluded from the total of 79 patients: eight patients for neurological and / or psychiatric diseases, four patients for severe prognosis, 2 patients with dementia, 3 patients with severe aphasia and a patient with insufficient language skills. In all patients the clinical neurological examination was performed and the NBRS behavioral scale was used as an assessment report for behavioral disorders as well as the Marburg competence scale.

Neurobehavioral Rating Scale - NBRS [28]

The NBRS is an assessment sheet for determining the severity and chronicity of brain injury. It consists of 27 items that are rated on a scale from 1 (disorder not present) to 7 (disorder extremely difficult). With the aid of the NBRS, several problem areas can be interrogated and evaluated within a short-structured interview [15]. They can then be grouped into four factors: "cognition / energy", "metacognition", "body related complaints / anxiety" and "language". "Cognition / energy" includes attention deficit disorientation, emotional withdrawal, formal mental disorders, memory impairments, lack of initiative, fatigue, motor slowing and affective flattening. "Metacognition" can be summarized as de-inhibition, agitation, inadequate self-assessment, unusual thoughts, excitement and disturbed planning ability. "Body-related complaints / anxiety" includes body-related symptoms, anxiety, depressive mood, mistrust and tension; "Language" includes expressive disorders, comprehension disorders and speech disorders.

Marburg Competence Scale - MKS [29]

With the MKS, it is possible to assess the effects of the brain damage suffered on the patient's functional disability. The cognitive and psychosocial impairments of the disease or injury are primarily recorded. The self-assessment procedure consists of 30 items. The MKS consists of two sections of 15 questions each. The first section "motor subscale" covers motor everyday competencies. This section primarily relates to impairments which may also be caused by purely motor deficits (e.g., hemiparesis). The second section "cognitive subscale" covers cognitive everyday competencies. This section concentrates on the performance of cognitive and psychosocial abilities, in which motor performance is of no importance (for example, problems in accepting criticism, memory, re-recognition, communication, empathy) [30]. The higher the MKS value, the higher the patient's everyday competency.

Statistical Analysis

Statistical analysis was carried out with Microsoft Excel®. For each distribution, a descriptive statistical acquisition was performed and included the following parameters: mean value, standard deviation, median, minimum, maximum, Q1 and Q3. The additional detection of the range was not used since this results in a difference between minimum and maximum.

Results

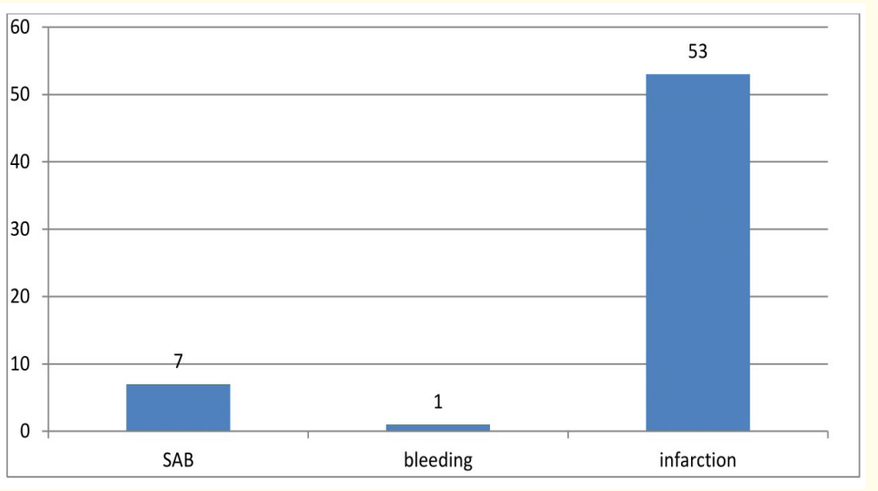

Figure 1: *Diagnosis distribution.*

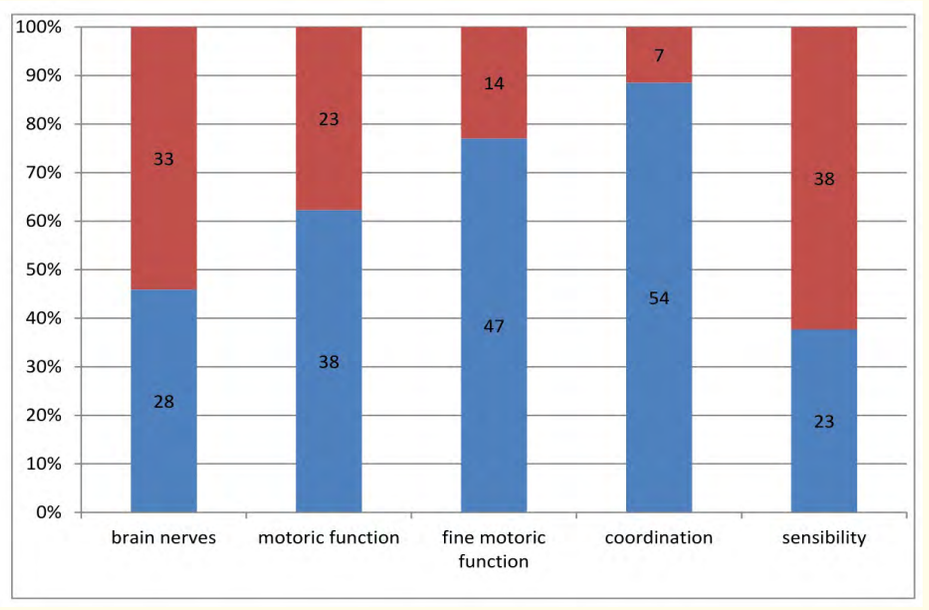

Figure 2: *The neurological examination findings, the lower blue section of the column correspond to the positive findings.*

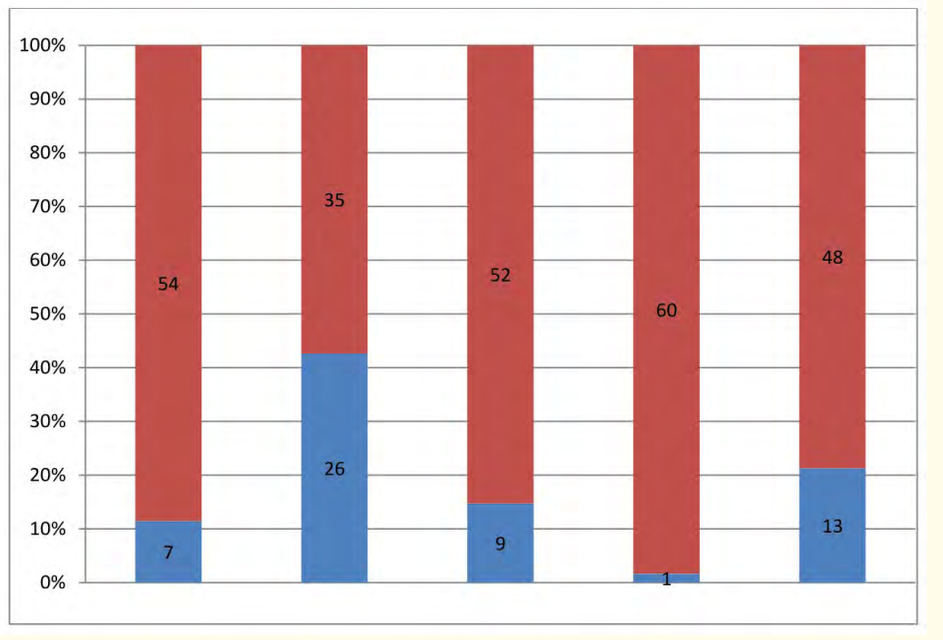

Figure 3: *The neurological examination findings, the lower blue section of the column correspond to the positive findings.*

	MW	STD	Median	Q1	Q3	Min.	Max.
Inattention	3.2	1.6	3	2	4	1	6
Somatic Concern	2.5	1.5	2	1	4	1	6
Disorientation	1.4	1.0	1	1	1	1	6
Anxiety	2.9	1.4	3	2	4	1	6
Expressive Deficit	2.5	1.5	2	1	4	1	6
Emotional Withdrawal	2.3	1.7	1	1	4	1	6
Concept Disorganization	1.2	0.7	1	1	1	1	6
Lack of Inhibition	1.3	0.8	1	1	1	1	6
Feelings of Guilt	1.1	0.3	1	1	1	1	3
Memory Deficit	2.7	1.5	3	1	4	1	6
Agitation	2.1	1.4	1	1	3	1	6
Inaccurate Self - Appraisal	2.4	1.5	2	1	3	1	6
Depressive Mood	3.1	1.5	3	2	4	1	6
Hostility/Uncooperative	1.5	1.1	1	1	2	1	6
Decreased Initiative	2.3	1.7	1	1	3	1	7
Suspiciousness	2.2	1.5	1	1	3	1	7
Fatiguability	3.6	1.6	3	3	5	1	7
Hallucinatory Behavior	1	0	1	1	1	1	1
Motor Retardation	2.3	1.4	2	1	3	1	6
Unusual Thought Consent	1.1	0.7	1	1	1	1	6
Blunted Affect	1.6	1.1	1	1	2	1	6
Excitement	2.4	1.6	2	1	3	1	7
Poor Planning	2.4	1.8	1	1	4	1	6
Liability of Mood	2.3	1.5	2	1	3	1	6
Tension	2.8	1.5	3	2	4	1	6
Comprehension Deficit	1.6	1.4	1	1	1	1	6
Speech Disorders	1.4	1.2	1	1	1	1	6

Table 1: *NBRS - descriptive statistical data of the individual parameters.*

The median of the NBRS score total is 57.4 + - 25.2 (median = 49, Q1 = 36, Q3 = 76, minimum = 27, maximum = 133). Similar to Lime (2002), 23 of the 27 parameters are placed into four groups: cognition / energy (nine individual parameters), metacognition (six individual parameters), body-related complaints (five individual parameters) and language (three parameters) The same four groups were used in this study and the data are shown in Table 2. A theoretical minimum of 9 and a maximum of 63 points would be attainable for orientation in Group 1, similarly in Group 2 a theoretical minimum of 6 and a maximum of 42 points, in Group 3 a theoretical minimum of 6 and a maximum of 35 points and in Group 4 a theoretical minimum of three and a maximum of 21 points.

	Group 1 (9 – 63)	Group 2 (6 – 42)	Group 3 (5 – 35)	Group 4 (3 – 21)
Average	20.8	11.7	13.6	5.4
STD	9.6	6.6	6.6	3.3
Median	19	10	13	4
Q1	12	6	8	3
Q3	26	15	19	6
Minimum	9	6	5	3
Maximum	44	32	30	18

Table 2: *Parameters four subgroups of the NBRS.*

Marburg Competence Scale (MKS)

The descriptive statistical data of the individual parameters are listed in Table 3. Short formulations are selected for the individual items, for more details see the appendix. Overall, a mean value of 78.2 + - 27.4 (median 82, Q1 = 54, Q3 = 103, minimum = 18, maximum = 120) for the motorized subscore (questions 1 - (Median 39, Q1 = 21, Q3 = 48, minimum = 03, maximum = 60) and a mean value of 43.0 +

for the cognitive subscore (question 16-30) with a maximum of 60 points - 13.6 (median 46, Q1 = 30, Q3 = 55, minimum = 18, maximum = 120) is achieved. The return rate is 48 out of 61 patients (78.7%).

Problems in…	MW	STD	Median	Q1	Q3	Min.	Max.
Preparing a meal	2.4	1.4	3	1	4	0	4
Dressing	2.6	1.2	3	2	4	0	4
Brushing teeth	3.1	1.0	4	2	4	1	4
Bodily hygiene	2.4	1.3	3	1	4	0	4
Writing a message	2.5	1.5	3	1	4	0	4
Using a phone	3.1	1.0	3	2	4	0	4
Safe movement in traffic	2.2	1.3	2	1	3	0	4
Going shopping alone	2.1	1.5	2	1	3	0	4
Using public transport	1.9	1.5	2	0	3	0	4
Speaking	3.0	1.3	4	2	4	0	4
Driving a car	1.9	1.5	2	0	3	0	4
Leisure activities	1.7	1.2	2	1	2	0	4
Office work	2.7	1.4	3	1	4	0	4
Participation in group activities	2.3	1.2	2	1	3	0	4
Physical work	1.6	1.2	1	1	2	0	4
Remembering names	2.9	1.1	3	2	4	0	4
Control of emotions	2.7	1.1	3	2	3	1	4
Design of the daily routine	2.7	1.1	3	2	3	0	4
Remembering important things	2.8	1.3	3	1	4	0	4
Development of self-initiative	2.8	1.2	3	2	4	0	4
Accepting criticism	2.7	1.0	3	2	3	0	4
Reading and understanding	3.0	1.3	4	2	4	0	4
Keeping temper in check	2.6	1.2	3	1	3	0	4
Learning something new	2.7	1.2	3	2	4	0	4
Following the current day's happenings	3.2	1.1	4	2	4	1	4
Showing affection	3.3	1.0	4	2	4	1	4
Understanding complex thoughts or explanations	3.0	1.2	3	2	4	0	4
Asking another person for help	3.0	1.1	3	2	4	0	4
Perception of injury to other people	3.1	1.1	3	2	4	0	4
Remaining employed	2.8	1.1	3	2	4	0	4

Table 3: *Parameter MKS self-evaluation.*

Discussion

Our results show that a wide range of behavioral deficits can be identified in the early outpatient rehabilitation phase (in the first six months after the stroke). By studying the results one can see that the highest degree of severity coincides with other studies: rapid fa-

tigue, attention deficit, depressive mood, and anxiety. The latter items achieve a relatively high but not a maximum value with an average of 2.9 points [15,31]. Deficits such as unusual thoughts, hallucinations and feelings of guilt played a subordinate role in the investigated patient collective. In with a published study of SHT patients, the severity of behavioral disorders is quite comparable, but the spectrum differs in some important points [32]. Consistent with other studies disturbances in attention are frequently observed in both groups of patients. On the other hand, disturbances of conceptual formation, increased excitability, and deficits of planning thought play a subordinate role. Thus it can be seen that a wide range of deficits can also be found in the early post-acute rehabilitation phase even after stroke, in which severity similar to behavioral deficits after a traumatic brain injury is found. In contrast to the TBI patients rapid fatigue, as well as fear and depression after stroke are among the leading symptoms, followed by disturbances of the attention functions. Therefore, the therapeutic treatment of these deficits should not be referred to, as is usually the case in other studies on rehabilitation [3,31,33,34]. An early targeted behavioral diagnosis and therapy is necessary in order to achieve the best possible rehabilitation and quality of life for the patients. Behavioral deficits are known to increase as a result of the growing confrontation with the environment and expectations. The early onset of therapy is also of great importance here, so that chronification of the deficits and social isolation of patients are minimized [32]. The assessment of everyday motor and cognitive competences from the patient's view was carried out with the aim of assessing the changes in participation. A maximum of 120 points can be scored for 30 items, in each case a maximum of 60 points in the field of motor skills (item 1 - 15) and cognition (item 16 - 30). Overall, an average of approximately two-thirds of the maximum number of points was reached, with the mean value of the first (motor) subscore being an average of 36 below the second (cognitive) subscore with an average of 43. On average, rather poor values (score <= 2) are indicated when using public transport and the ability to drive, the ability to pursue leisure activities, and the negative maximum in physical ability. On average good scores (score> = 3) are for the area of brushing, talking, remembering names, following the current day´s happenings and the ability to show affection. Patients showed a particular limitation in their ability to work, which is certainly linked to the high rate of rapid fatigue, as well as their mobility (restrictions on the use of public transport and the management of their own cars) which the patients view as burdensome. This experience is perceived as a substantial threat to a patient's independence [15]. Interestingly, the restriction of leisure activities is also significantly impaired with an average score of 1.7 points, which, together with the mobility restrictions, will have a detrimental effect on social reintegration. Since behavioral deficiencies are of crucial importance for social, family and professional reintegration, they deserve special consideration during treatment planning in the early rehabilitation phase. It should be assumed that the early inclusion of individually adapted neuropsychological and behavioral therapy as well as the therapeutic co-operation of the social and family environment could contribute to a significant improvement in the reintegration of these patients.

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Volume 5 Issue 6 April 2017