Impairments and disabilities in patients treated by exercise therapists

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Abstract

This study provides a description of the patient population of exercise therapists (Cesar and Mensendieck). The study focuses on impairments and disabilities as diagnosed by the exercise therapists. Data were recorded by 48 Cesar therapists on 1020 patients, and by 52 Mensendieck therapists on 1088 patients. Impairments were recorded in nearly all patients. The interrelationship among impairments was analyzed. Four dimensions of highly interrelated impairments were found for Cesar therapy; for Mensendieck therapy three more or less similar dimensions were identified. Disabilities were registered in less than half of the patients. Only one dimension of interrelated disabilities was identified, in both Cesar and Mensendieck therapy.

Keywords: Exercise Therapy; ICIDH; Impairments; Disabilities.

Introduction

Exercise therapy according to Cesar and Mensendieck are both concerned with the treatment and prevention of disorders and abnormalities of movement and posture. The treatment consists of an exercise program that stimulates an active, individual motor learning process. Exercises have a specific aim in relation to the patient's problems. For example, this aim can be improvement of posture and movement, pain relief, strengthening of muscles, relaxation, respiration or daily activities. Exercise therapists have a system or method that stresses the pedagogical aspects of the learning process.
The treatment in Cesar and Mensendieck therapy show some differences. These differences are expressed in the nature of the exercises (Cesar: dynamic; Mensendieck: static) and the instruction (Cesar: verbal instruction and demonstration; Mensendieck: verbal instruction). Although there are some differences in treatment, both professions treat the same kind of patients.[1-4]
The present insight into the characteristics of patients treated by exercise therapists is based upon two survey studies.[1,2] These studies showed that about one-third of the indications for referral to exercise therapy were postural anomalies, about one-third were dorsopathies, about one-sixth were neck, shoulder or head symptoms and complaints, and about one-sixth were other diagnoses. Pain – and more specifically back pain – was the most frequently indicated complaint of the patients. The medical diagnoses related to back problems can be divided into two categories. The first category consists of specific back complaints, this is a group with a clear diagnosis such as herniation of the nucleus pulposus of an intervertebral disk, osteochondropathy or scoliosis. The second category consists of unspecific back complaints such as lumbago, hypertonic muscles, postural anomaly or low-back pain.
The main purpose of this study is to further the knowledge of the patient population of exercise therapists in the Netherlands. In this the emphasis lays on the results of the exercise therapist's diagnostic assessment. The basic assumption is that the medical diagnosis as recorded by physicians on the patient's referral does not contain sufficient information to enable the exercise therapist to commence treatment. Consequently, before starting treatment, exercise therapists need to examine the patient in order to acquire further information on the patient's condition. The examination of the exercise therapist focuses on the patient's postural and movement habits and must give direction to treatment. The examination includes general information on the patient, anamnesis and an assessment of the patient's general condition. The examination also includes a static inspection and an inspection during movement. If required for the diagnosis, orthopaedic and neurological tests are also conducted.
The exercise therapy diagnosis (Cesar or Mensendieck) summarises the results of the examination by the exercise therapist. The International Classification of Impairments, Disabilities and Handicaps (ICIDH) is considered an adequate system to classify the data concerning the exercise therapy diagnosis.[5] The ICIDH contains three distinct and independent classifications each relating to a different level: impairments, disabilities and handicaps.[6] An impairment is defined in the ICIDH as 'any loss or abnormality of psychological, physiological or anatomical structure or function'. A disability is defined in the ICIDH as 'any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being'. A handicap is defined as 'a disadvantage for a given individual, resulting from an

impairment or a disability, that limits or prevents the fulfilment of a role that is normal (depending on age, sex and social and cultural factors) for that individual'. An example of an impairment is a restricted range of motion in the knee joint. It is possible, but not necessary, that this impairment results in a disability, e.g. a disability of locomotion. Together, this may lead to a handicap of mobility. The diagnostic assessment in Cesar and Mensendieck therapy is mainly at the level of impairment and disability. The assessment of handicap is a less appropriate task for these professions because both exercise therapies mainly aim at treatment at the level of impairments and disabilities.[5]

The goal of the present study is to describe and analyze the exercise therapy diagnosis, as well as general characteristics and medical diagnoses of patients treated by exercise therapists. With regard to the exercise therapy diagnosis, it is expected that more than one impairment and/or disability is represented in a single patient. In order to reduce the rather complex data, the relationship between impairments and disabilities is analyzed. These analyses are expected to yield dimensions of highly interrelated impairments and dimensions of highly interrelated disabilities.

Methods

Materials

The data for this research were collected by 48 Cesar therapists and 52 Mensendieck therapists, selected on the basis of a random sample from the lists of practice addresses. These lists were made by the professional associations of both professions. Table I shows gender, age and setting of the participating therapists.

Table I. Characteristics of the therapists.

	Cesar (N=48)	Mensendieck (N=52)
gender:		
- male	1 (2.1%)	
- female	47 (97.9%)	52 (100%)
mean age (yr)	32.5	31.9
setting:		
- primary health care	43 (89.6%)	45 (86.5%)
- institutional care	5 (10.4%)	7 (13.5%)

The recording period was from January 1992 until March 1993. Data were recorded for 1020 patients by Cesar therapists and 1088 patients by Mensendieck therapists. Not all patients applying for treatment during the recording period were recorded, but a selection of them (on average 21 per therapist). However, in principle every new patient was considered for recording, which was done on a standard registration form.

The registration form

The registration form[3] consisted of three parts: 1) general data, 2) Cesar or Mensendieck diagnosis and 3) treatment data. The first two parts of the form were filled in at the start of the treatment, the last part at its end.

The 'general data' consisted of patient data (age, sex, living situation, education and occupation) and referral data (the referrer and the reasons for referral). The reasons for referral, as given by the referrer, was coded using the International Classification of Primary Care.[7] A maximum of four reasons for referral could be indicated.

The diagnostic observations of the exercise therapists – the so-called Cesar or Mensendieck diagnosis – were coded using the International Classification of Impairments, Disabilities and Handicaps, the ICIDH.[6] The Cesar or Mensendieck diagnosis have two parts: impairments and disabilities.

In preceding research, the reliability of the assessment of impairments and disabilities was tested. The results of that research indicate that reliability of the assessment of impairments and disabilities was satisfactory.[5]

Under the final heading, data were recorded with respect to the treatment. Treatment goals, type of treatment and the extent of achievement of treatment goals were recorded. These data will be presented in a separate article.

Analysis

The exercise therapists were asked to record all impairments found in their clinical examination. A large number of different combinations of impairments could thus be indicated. In order to summarize the large amount of information, impairments were divided into major categories. In combining the impairments, attention was paid to two aspects. Firstly, the expected treatment of impairments within a major category should be as similar as possible. Secondly, the major groups may not be too small. The classification was discussed with a group of experienced exercise therapists.

The next step in summarizing the information was to analyze the interrelationships between major categories of impairments and between major categories of disabilities. In this analysis PRINCALS[8-10] was used. PRINCALS (principals components analysis by means of alternating least squares) is a non-linear variant on the classical principal component analysis. The most important difference between PRINCALS and the classical method is that, in using this method, discrete variables can be analyzed. Principal components analysis is basically intended to transform a number of variables into a smaller number of new variables (*dimensions*). A measure for the amount of variation that is ascribed to a particular dimension is the *Eigenvalue*. The number of dimensions to which the variables can be transformed is related to the Eigenvalues of the dimensions. In the present study, the standard was that the Eigenvalue of a dimension must be larger than 1 divided by the number of variables.[8] The number of variables in this case is the number of major categories in analysis. The relation of a variable with a dimension is expressed in the *component loading*. In the present study, only major categories with a component loading higher than .50 or less than -.50 are derived.

The analysis of disabilities was carried out in the same way as the impairments. In the first place the different disabilities were subdivided into six major categories;

these categories were analyzed for interrelationships using PRINCALS.
Logistic regression analysis was used to test differences in the occurrence of the major groups of impairments and disabilities among men and women and within the various age groups. In this analysis gender and age were used simultaneously as independent variables.

Results

General

Table II gives an overview of the general characteristics of the patients. In patients treated by both Cesar and Mensendieck therapists, about two-thirds were women. The average age of patients treated by Cesar therapists is 33.4 years (S.D. 17.9) and that of the Mensendieck group is 34.1 years (S.D. 17.5). No significant age differences were found between male and female patients, in both samples. About two-thirds of the patients are insured under health insurance. The majority of the patients lived at home and had no specialized form of housing (i.e. nursing home, old peoples home). About one-tenth of the patients in both samples lived in a one-person household.

Table II. Characteristics of the patients.

	Cesar (N=1020) %	Mensendieck (N=1088) %
gender:		
- male	32.7	33.0
- female	67.3	67.0
age group (yr)		
- 0-19	21.3	17.8
- 20-39	46.2	46.9
- 40-64	25.3	28.0
- => 65	7.2	7.3
insurance:		
- health insurance funds	65.5	66.5
- private health insurance	32.5	31.6
- no insurance	.1	–
- not registered	2.0	1.9
housing:		
- private households	94.1	96.8
- other	4.9	2.7
- not registered	–	.5
households:		
- one person	10.1	12.5
- with others	87.7	86.2
- not registered	1.2	1.3

Referrals

The majority of the patients were referred by their GP, 76% of the patients treated by Cesar therapists and 69% of the patients treated by Mensendieck therapists. The medical specialist was the referrer of 22% and 28% of the patients, respectively. The three medical specialisms with the largest share in this were neurology, orthopaedics and rheumatology. For patients treated by Cesar therapists the percentages were 7%, 7% and 2%, respectively (the percentages refer to all patients and not only those referred by medical specialists). For patients treated by Mensendieck therapists the percentages were 14%, 7% and 3%, respectively.
Table III shows the top-ten of indications for referral. The most frequently reported indications for referral are those related to back problems.

Impairments

Impairments were recorded in nearly all patients. An average of 6.2 impairments were recorded per patient after the examination by Cesar therapists and an average of 6.3 impairments per patient by Mensendieck therapists. Table IV gives an overview of the occurrence of impairments. In particular, impairments of posture (especially those related to the back), pain, restricted range of joint motion, hypertone muscle and impairments of muscle strength occur frequently. There were only slight differences in occurrence of impairments in patients treated by Cesar therapists and those by Mensendieck therapists. The largest difference between occurrence of impairments was with impairments of muscle strength; these were less frequently registered by Mensendieck therapists.

Table III. Indications for referral (top-10).*

Cesar (N=1020)	%	Mensendieck (N=1088)	%
1. low back symptoms/complaints	20.7	1. acquired deformities of spine	21.8
2. back symptoms/complaints	19.8	2. low back symptoms/complaints	18.6
3. deviation of posture	16.3	3. back symptoms/complaints	17.8
4. acquired deformities of spine	16.2	4. deviation of posture	14.5
5. neck symptoms/complaints	6.0	5. back pain with radiation symptoms	9.9
6. back pain with radiation symptoms	5.1	6. syndromes of cervical spine	6.9
7. neck/shoulder symptoms/complaints	4.2	7. neck symptoms/complaints	4.7
8. shoulder symptoms/complaints	3.7	8. osteoarthritis of spine	3.4
9. osteoarthritis of spine	2.6	9. tension headache	3.3
10. tension headache	2.5	10. hyperventilation	2.8

*) Indications for referral were coded with the ICPC. A maximum of four indications could be indicated.

Table IV. Impairments.*

	Cesar (N=1020) %	Mensendieck (N=1088) %
Postural impairments	**87.7**	**90.3**
Kyphosis	56.5	54.0
Lordosis	49.7	57.4
Scoliosis	42.7	49.2
Impairment of pelvic/-torsion	32.8	35.3
Other impairments of posture	13.5	11.5
Impairments of joint motion	**53.4**	**55.9**
Hypermobility	6.9	6.3
Restricted range of joint motion	49.4	51.4
Impairments of control of voluntary movements	**16.3**	**17.9**
Impairments of gait	11.8	15.5
Impairments of coordination	6.7	5.8
Impairments of muscle tone and length	**62.1**	**64.9**
Deviation of muscle tone (increased/decreased)	51.9	52.4
Deviation of muscle length	29.8	32.3
Impairments of muscle strength	**49.4**	**28.0**
Sensory impairments	**18.0**	**21.5**
Numbness (including paraesthesia)	16.6	20.2
Impairments of propriocepsis	3.7	2.6
Pain	**71.7**	**77.9**
Respiratory impairments	**13.8**	**12.8**
Short breath	4.7	3.8
Hyperventilation	6.7	6.5
CARA	2.6	2.4
Other respiratory impairments	3.4	2.9
Psychological impairments	**9.2**	**14.5**
Impairment of sleep	5.9	13.1
Impaired concentration	5.3	5.2
Generalized impairments	**27.7**	**30.9**
Fatigue	25.1	25.9
Dizziness	5.2	8.8
Miscellaneous	**24.7**	**25.0**
Impairment of circulation	5.3	4.3
Obesity	12.8	12.6
Psychomotor impairments	2.0	1.4
Other impairments	10.0	9.8

*) Impairments are subdivided into major groups. The percentages of patients within these groups are printed **bold**.

There were significant differences in the occurrence of impairments among men and women and within the various age groups (see appendix 1).

The testing of the interrelationships of impairments was carried out with PRINCALS. This was done for the major categories of impairments. The category 'miscellaneous impairments' was excluded from the analysis. The results of the analyses are shown in Table V. The ten major categories could be reduced to four dimensions for patients treated by Cesar therapists and to three dimensions with Mensendieck therapists.

The following relations were found in the patients treated by Cesar therapists. The first dimension consists of postural impairments: impairments of the range of joint motion, of muscle tone and length, of muscle strength, and pain. The second dimension consists of psychological impairments and general impairments. The respiratory impairments were just under the .50 level of the component loading on this dimension. The third dimension consisted entirely of impairments of control of voluntary movements, and the fourth dimension of sensory impairments.

The results of the analysis with the patients treated by Mensendieck therapist showed similar results with some minor differences. (It should be noted that the opposite signs in the analysis in Cesar and Mensendieck therapy are meaningless). The first dimension of the analysis with the patients treated by Mensendieck therapist consists of impairments of the range of joint motion, of muscle tone and length, and pain. Postural impairments were just under the .50 level of the component loading on the first dimension. The category impairment of muscle strength is not related to this dimension; in the patients treated by Cesar therapists muscle is related to this dimension. The second dimension is identical to that in the patients treated by Cesar therapists, and consists of psychological impairments and general impairments. The respiratory impairments were just under the .50 level of the component loading on this dimension. Impairments of control of voluntary movements and impairments of muscle strength combine together on the third dimension. No fourth dimension was found in Mensendieck therapy.

Disabilities

Disabilities were less frequently recorded than impairments. Cesar therapists recorded at least one disability in 42% of their patients. Mensendieck therapists recorded a disability in 44% of the patients. Table VI shows the occurrence of disabilities. Disabilities in body movement/control (i.e. lifting, bending) were most frequently indicated. The occurrence of disabilities recorded by Cesar therapists differed only slightly from those recorded by Mensendieck therapists. A disability of exercise tolerance/physical endurance was recorded more often by the Cesar therapists.

Table V. Results of the principle components analysis (PRINCALS) with impairments.*

Cesar (N=1020)	component loadings			
	dimension 1	dimension 2	dimension 3	dimension 4
Postural impairments	.55	−.32	−.23	−.14
Impairments of joint motion	.62	.17	−.02	.31
Impairments of control of voluntary movements	.12	.35	.79	−.02
Impairments of muscle tone and length	.53	.25	−.36	.10
Impairment of muscle strength	.56	.26	.20	.41
Sensory impairments	.26	.33	.18	−.73
Pain	.51	.09	−.21	−.40
Respiratory impairments	−.47	.49	−.35	.01
Psychological impairments	−.27	.65	−.15	−.01
Generalised impairments	.03	.66	−.14	.08
Eigenvalue	.19	.16	.11	.10

Mensendieck (N=1088)	component loadings		
	dimension 1	dimension 2	dimension 3
Postural impairments	−.49	.29	−.18
Impairments of joint motion	−.61	−.18	.08
Impairments of control of voluntary movements	−.17	−.48	.55
Impairments of muscle tone and length	−.56	.03	−.40
Impairment of muscle strength	−.33	−.33	.58
Sensory impairments	−.40	−.36	−.11
Pain	−.55	−.08	−.31
Respiratory impairments	.44	−.46	−.24
Psychological impairments	.20	−.57	−.32
Generalised impairments	.03	−.67	−.27
Eigenvalue	.18	.16	.12

*) Component loadings higher than or equal to .50 (positive or negative) are underlined.

Table VI. Disabilities.*

	Cesar (N=1020) %	Mensendieck (N=1088) %
Disabilities in locomotion	**12.3**	**13.7**
Walking	8.9	9.8
Climbing stairs	9.4	8.3
Cycling	9.1	7.8
Disabilities in basic motor skills	**31.5**	**32.4**
Body transfer	11.3	10.4
Lifting	20.2	17.9
Bending	19.2	16.5
Picking up /grasping/reaching	12.9	10.5
Sitting for long periods	18.0	18.4
Standing for long periods	20.7	19.7
Keeping balance	10.2	6.5
Disability in exercise tolerance	**24.8**	**14.6**
Disabilities in household activities	**20.5**	**17.9**
Disabilities in profession	**23.2**	**22.4**
Disabilities in sports/hobbies	**23.9**	**22.2**

*) Disabilities are subdivided into six major groups. The percentages of patients within these groups are printed **bold**.

Table VII. Results of the principle components analysis (PRINCALS) with disabilities.*

Cesar (N=1020)	component loadings
	dimension 1
Disabilities in locomotion	−.66
Disabilities in basic motor skills	−.82
Disability in exercise tolerance	−.77
Disabilities in household activities	−.83
Disabilities in profession	−.81
Disabilities in sports/hobbies	−.80
Eigenvalue	.62

Mensendieck (N=1088)	component loadings
	dimension 1
Disabilities in locomotion	−.64
Disabilities in basic motor skills	−.80
Disability in exercise tolerance	−.63
Disabilities in household activities	−.77
Disabilities in profession	−.74
Disabilities in sports/hobbies	−.74
Eigenvalue	.52

*) Component loadings higher than or equal to .50 (positive or negative) are underlined.

There were significant differences in the occurrence of disabilities among men and women and within the various age groups (see appendix 2). In both populations disabilities occurred more frequently in female than in male patients, and in the older age groups.
The analysis of the interrelationships between disabilities was tested for the 6 major categories (see Table VII). The results indicated that all six major categories of disabilities are highly interrelated and combine into a single dimension. This result was found in both Cesar and Mensendieck therapy.

Discussion

This study presents a description of the patient population within Cesar and Mensendieck therapy. As far as basic characteristics of the patient population is concerned the present investigation confirms data from earlier studies.[1,2] About two-thirds of the patients were women and most of the patients were aged between 20-39 years. The majority of the patients were referred by their GP. The percentage of patients referred by medical specialists was higher in the patients treated by Mensendieck therapists than by Cesar therapists (28% vs 22%). The historical sympathy of neurologists toward Mensendieck therapy may play a role in this, because the difference is mainly caused by the number of referrals by neurologists.
Most of the indications for referral are related to back problems. In physical therapy, back problems are indication for referral in about one-quarter of the patients.[9] Clearly, exercise therapists deal with these problems more than physical therasts.
Indications for referral generally do not contain enough information for the exercise therapist to commence treatment. The additional information is gathered in the clinical examination by the exercise therapist; the result of this assessment is the exercise therapy diagnosis. A primary distinction between the referral indication and the exercise therapy diagnosis is that more attention is given to the consequences of problems or diseases. The exercise therapy diagnosis is formulated in terms of the ICIDH: impairments and disabilities.
Impairments were recorded in nearly all patients. Impairments of posture (especially those related to the back), pain, restricted range of joint motion and a deviation of muscle tone occurred most frequently. Disabilities were recorded in less than half of the patients. Disabilities in basic motor skills (lifting, bending, standing for long periods) and disabilities in other activities (household, profession, sports) occurred most frequently.
It was expected that more than one impairment or disability be represented in a single patient; this expectation was confirmed. The average of 6 impairments recorded per patient in a classification scheme that consisted of 30 impairments showed the necessity of data reduction. At first the impairments were clustered into major groups. Analysis of the interrelation between the major groups of impairments showed that some combinations of impairments were more likely to occur than others. Four dimensions of highly interrelated impairments were found in the patients treated by Cesar therapists, and three dimensions in those treated by Mensendieck therapists. These dimensions can be interpreted as follows. Firstly, a dimension with musculo-skeletal problems was identified. Secondly, there is dimension with generalized impairments (especially fatigue) and with psychological impairments. The third dimension consisted of impairments of control of voluntary movements (for Mensendieck therapy combined with impairments of muscle strength). Only for Cesar therapy a fourth dimension with sensory impairments could be distinguished.
The patient population of both therapies have much in common. However, a notable difference between the impairments registered by both methods therapists was found; namely, impairments of muscle strength. An impairment of muscle strength was registered in 49% of the patients by Cesar therapist and in only 28% by Mensendieck therapists. Furthermore, in Cesar therapy impairments of muscle strength are related to other musculoskeletal problems, while in Mensendieck therapy it is related to impairments of control of voluntary movements. This difference might be the result of differences in the approach of the two methods. Mensendieck therapy is aimed at alerting the patient to proprioceptive information from muscles, tendons and joints, the exercises used by the Mensendieck therapist are designed for this purpose. The focus lays on the cognitive aspects of the motor learning process. In Cesar therapy the exercises are more intended to train certain movements. In this more attention is paid to the autonomic phase of the motor learning process. The Cesar therapists does this by building the intended posture or movement into complex and combined exercises, after training the intended movement or posture apart.[3,4] The differences in approach between the two methods can result in a different perception of impairments of muscle strength. A similar difference between Cesar and Mensendieck therapy was found with the occurrence of a disability in exercise tolerance. This was also recorded more frequently by Cesar than by Mensendieck therapists.
Disabilities showed a strong interrelationship: when a disability was recorded the other disabilities were frequently recorded also. It was not possible to distinguish different dimensions of disabilities. For this reason, and the fact that disabilities were recorded in less than half of the patients, it is concluded that impairments are more important than disabilities in the characterisation of patients in the field of exercise therapy. This does not mean that disabilities are not important in exercise therapy: especially in outcome research improvement at the level of disabilities might be very important. However, from a diagnostic point of view, exercise therapists seem to emphasize impairments rather than disabilities.

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References

1. Hasper HC, Janssen BY, Lievaart WM. Cesar en rugklachten. Verslag van het 2e fase onderzoek naar de resultaten van de oefentherapie Cesar bij rugklachten (in Dutch). Den Dolder: Stichting opleiding Bewegingstherapie Cesar. 1990.
2. Balm MFK, Lange CJ de. Oefentherapie Mensendieck: Een inventariserend onderzoek naar de patiëntenpopulatie binnen de eerstelijnsgezondheidszorg (in Dutch). Utrecht: NVOM, 1988.
3. Balm MFK, Gijsbers EKW. Oefentherapie-Mensendieck en oefentherapie-Cesar: het beïnvloeden van houdings- en bewegingsgewoonten bij pijn (in Dutch). In: Matti H, Menges LJ, Spierdijk J, editors. Pijninformatorium. Alphen a/d Rijn: Samson Stafleu: 1993; PB4500.
4. Hasper HC. Vijftig jaar bewegingsleer Cesar (in Dutch). Den Dolder: Stichting Vormingsfonds Cesar. 1990.
5. Gisbergen, M van, Dekker J. Reliability of the diagnosis of impairments and disabilities by exercise therapists. J Rehabil Sciences 1992; 3: 67-73.
6. World Health Organisation. International Classification of Impairments, Disabilities and Handicaps. Geneva: WHO, 1980.
7. Lamberts H, Wood M. International Classification of Primary Care (ICPC). New York: Oxford University Press, 1987.
8. Geer JP van de. Multivariate analysis of categorical data: applications. London: Sage Publications, 1993.
9. Kerssens JJ, Curfs EC. Extramurale fysiotherapie (dissertation, in Dutch). Utrecht: NIVEL, 1993.
10. SPSS. Categories. Chicago, IL: SPSS Inc., 1990.

Appendix 1. The occurrence of impairments by gender and age.

Cesar	gender		age group (yr)			
	male %	female %	0-19 %	20-39 %	40-64 %	=>65 %
Postural impairments[1,2]	89.2	86.8	88.3	92.7	85.9	61.6
Impairments of joint motion[2]	54.4	52.8	44.4	54.4	58.8	54.8
Impairments of control of voluntary movements[2]	19.8	14.5	18.2	11.2	18.4	37.0
Impairments of muscle tone and length[2]	64.6	61.0	50.5	68.8	64.3	45.2
Impairments of muscle strength[1]	44.4	51.9	45.8	49.2	52.2	56.2
Sensory impairments[2]	18.6	17.7	4.7	20.0	27.5	13.7
Pain[2]	68.8	73.0	45.8	78.9	83.1	64.4
Respiratory impairments[1,2]	12.3	14.5	9.3	11.2	19.2	23.3
Psychological impairments[1,2]	8.4	9.6	7.5	7.5	12.2	16.4
Generalized impairments[1,2]	24.3	29.4	12.6	30.3	35.3	32.9
Obesity[1,2]	11.7	13.3	5.6	14.6	16.9	11.0
Miscellaneous[1,2]	12.9	10.5	7.5	6.2	14.9	42.5

Mensendieck	gender		age group (yr)			
	male %	female %	0-19 %	20-39 %	40-64 %	=>65 %
Postural impairments[1,2]	91.4	89.7	94.8	92.9	90.1	63.3
Impairments of joint motion[2]	58.2	54.7	45.3	53.8	63.4	65.8
Impairments of control of voluntary movements[2]	22.3	15.8	17.7	14.2	17.8	39.2
Impairments of muscle tone and length[1,2]	71.3	61.8	57.3	69.0	68.0	44.3
Impairments of muscle strength[2]	27.6	28.2	24.0	27.4	29.4	32.9
Sensory impairments[2]	23.7	20.5	4.7	21.3	32.3	21.5
Pain[2]	76.6	78.6	46.9	85.2	84.8	81.0
Respiratory impairments[1,2]	10.9	13.7	10.4	10.5	16.5	20.3
Psychological impairments[1,2]	14.5	14.6	6.3	12.8	21.5	20.3
Generalized impairments[1,2]	20.9	35.7	13.0	31.4	38.6	41.8
Obesity[1,2]	11.4	13.2	8.3	12.4	15.2	13.9
Miscellaneous[1,2]	10.6	11.1	7.3	8.7	12.9	27.8

[1]) Difference by gender significant ($p<.05$)
[2]) Difference by age significant ($p<.05$)

Appendix 2. The occurrence of disabilities by gender and age.

Cesar	gender		age group (yr)			
	male %	female %	0-19 %	20-39 %	40-64 %	=>65 %
Disabilities in locomotion[1,2]	8.4	14.2	7.3	9.1	13.2	59.5
Disabilities in basic motor skills[1,2]	28.2	33.0	16.1	31.4	37.3	58.2
Disability in exercise tolerance[1,2]	18.0	28.2	8.9	11.4	15.8	43.0
Disabilities in household activities[1,2]	9.9	25.7	7.0	17.8	25.5	57.5
Disabilities in profession[2]	21.3	24.3	9.3	23.2	30.2	38.4
Disabilities in sports/hobbies[2]	20.4	25.7	14.5	23.9	27.1	41.1
Mensendieck	gender		age group (yr)			
	male %	female %	0-19 %	20-39 %	40-64 %	=>65 %
Disabilities in locomotion[1,2]	11.0	15.0	4.7	8.2	13.3	57.5
Disabilities in basic motor skills[1,2]	31.5	32.8	17.8	28.8	37.6	67.1
Disability in exercise tolerance[1,2]	13.6	15.1	16.8	19.8	30.6	60.3
Disabilities in household activities[1,2]	7.2	23.1	2.6	17.2	24.1	36.7
Disabilities in profession[2]	24.8	21.3	6.3	26.2	27.7	16.5
Disabilities in sports/hobbies[2]	22.3	22.3	12.0	23.1	26.7	24.1

1) Difference by gender significant ($p<.05$)
2) Difference by age significant ($p<.05$)

Botulinum toxin and rehabilitation

report on a symposium December 9 1993, University Hospital Utrecht, The Netherlands

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Introduction

To exchange experiences and determine the state of affairs regarding Botulinum-A-toxin (BTX-A) within rehabilitation medicine, an evening-symposium concerning its applicability was organised.
Botulism has been recognized since the 18th century. The anaerobic organism responsible, Clostridium botulinum, was isolated and its paralysing neurotoxin (BTX-A), in its pure form, was obtained in 1946.
Clinically low dose BTX-A, selectively administered, can have a useful effect on some neurological and ophthalmological symptoms. Since the beginning of the 1980s BTX-A is applied in the Academic Medical Centre of Amsterdam.
Other centres have some experience over the last few years. Meanwhile the "National Botulinum Workgroup" (Landelijke Werkgroep Botuline) has been established, in which different centres are represented.

Pharmacological aspects of BTX-A

Although eight immunologically distinct toxins have been identified, only types A, B and E have been linked to cause botulism in humans. For clinical purposes type A is used. The active component, with a molecular weight of 150.000 dalton, is commercially available.
BTX-A binds irreversibly and selectively to presynaptic cholinergic nerve terminals. The toxin is internalized and inhibits the production and release of acetylcholine. Paralysis and a nearly complete decline of end-plate-potentials will occur within a few hours after the injection of botulinum toxin. Therapeutic effects show after a few hours. Because of this denervation, the muscles will become atrophic. Depending on the injected side the paralysing effect remains 6-16 weeks, therefore treatment has to be repeated. Within two days after exposure to the toxin the axon terminal will start to form new synaptic contacts via terminal and nodal sprouting. The new syn-