


The Care Dependency Scale for Rehabilitation (CDS-R)

- an investigation of its psychometric properties and clinical utility -

Juliane Eichhorn-Kissel

Declaration

I hereby declare that this thesis is my own original work and that I have fully acknowledged by name all of those individuals and organisations that have contributed to the research of this thesis. Due acknowledgement has been made in the text to all other material used. Throughout this thesis and in all related publications I followed the guidelines of „Good Scientific Practice“.

Graz, 16.03.2011 

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The Care Dependency Scale for Rehabilitation (CDS-R)

- an investigation of its psychometric properties and clinical utility -

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A thesis submitted for the academic degree of
Doctor of Nursing Science (Dr. rer. cur.)

2011

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OVERVIEW

The experience of physical or psychological limitations can affect every person at one point in their lives. The reasons for this may include, for example, (chronic) diseases, injuries or psychological changes which can induce care dependency. This situation can be prevented or ameliorated by rehabilitative treatment and care. For this reason, nurses have to be aware of the needs and abilities of the persons they care for, and thus require appropriate assessment instruments.

The present doctoral thesis deals with an instrument which should allow the care dependency of patients to be assessed in the rehabilitation setting – the Care Dependency Scale for Rehabilitation (CDS-R). In this context a series of studies were conducted on the psychometric properties of the scale and its clinical utility in rehabilitation.

The first chapter of the doctoral thesis provides an overview of the relationship between chronic diseases, disabilities and care dependency. The meaning of rehabilitation, the relevance of assessment and quality criteria of assessment instruments are described here. Examples of available assessment instruments in rehabilitation, the relevant research gap for this thesis and the overall research aim are presented.

Chapter two provides an insight into the background, architecture, psychometric properties and application of the Care Dependency Scale and its modified version.

Methodological aspects in terms of design, sample, setting, data collection and analysis of the conducted studies are gone into briefly in chapter three.

In chapters four to seven, which were written as articles, reports are presented on the reliability, validity, responsiveness and clinical utility of the Care Dependency Scale in rehabilitation.

Finally, chapter eight gives a brief summary and discussion of the main findings. It concludes by revealing a number of implications and making recommendations for future research and clinical practice.

CONTENTS

Chapter 1	
General introduction	11
Chapter 2	
The Care Dependency Scale	31
Chapter 3	
Methods	41
Chapter 4	
Psychometric testing of the modified Care Dependency Scale for Rehabilitation	47
Chapter 5	
The clinical utility of the Care Dependency Scale in rehabilitation: nurses' perception	67
Chapter 6	
Responsiveness of the Care Dependency Scale for Rehabilitation (CDS-R)	89
Chapter 7	
Comparison of the responsiveness of the Care Dependency Scale for Rehabilitation and the Barthel Index	109
Chapter 8	
General reflections	125
Chapter 9	
Summary	139
Chapter 10	
Zusammenfassung	145
Chapter 11	
Acknowledgements	153

Chapter 12	
Curriculum vitae	159
Chapter 13	
List of publications	163

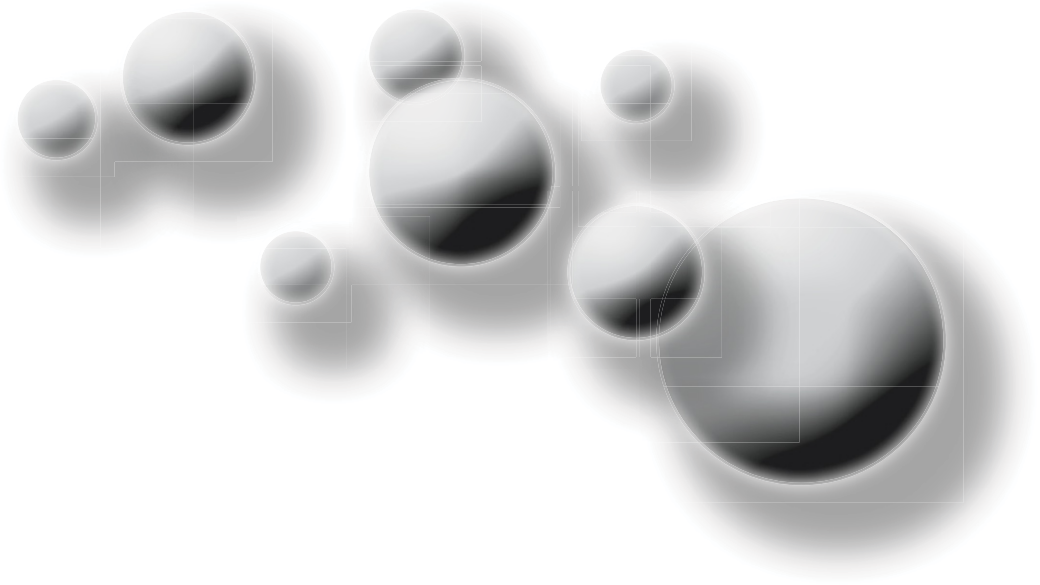
LIST OF ABBRIVATIONS

BI	Barthel Index
CDS	Care Dependency Scale
CDS-R	Care Dependency Scale for Rehabilitation
CI	Confidence Interval
FIM	Functional Independence Measurement
ICC	Intraclass Correlation Coefficient
MDS	Minimum Data Set
N	Absolute number
PA	Percentage Agreement
PAS-R	Pflegeabhängigkeitsskala in der Rehabilitation
RAI	Residential Assessment Instrument
RCT	Randomised Control Trial
SD	Standard Deviation
SEM	Standard Error of Measurement
SVAI	Staff View Assessment Instrument
WHO	World Health Organization



Chapter 1

General introduction



GENERAL INTRODUCTION

The first chapter provides an overview into the relationship between chronic diseases, disabilities and care dependency. Furthermore, the meaning of rehabilitation, the relevance of assessment and quality criteria of assessment instruments will be described. In the last sections of this chapter, examples of available instruments to assess care dependency in rehabilitation and the research gap relevant for the doctoral thesis will be illustrated. Finally, the overall research aim will be presented.

DEMOGRAPHIC CHANGES, CHRONIC DISEASES, DISABILITY AND DEPENDENCY

The experience of physical or psychological limitations can affect every person at one point in their lives, some persons for a shorter and others for a longer period of time. The reasons for this may be either illness or chronic diseases but may also include injuries or psychological changes¹. Serious consequences of these situations are functional and/or psychological impairments or the development of disabilities¹.

Currently an estimated amount of 10 percent people worldwide live with disabilities or impairments¹. According the United Nations² disability applies to those persons *“who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others”*². In contrast, persons with impairments are those who have *“problems in body function or structure such as significant deviation or loss”*³. The most common reasons for impairments or the development of disabilities are, among others, mental impairments, chronic diseases and injuries¹.

In Western Europe, statistical analyses show that every sixth European (44.6 m, 15.7%) of working age (16 – 64 years) suffers from a chronic disease or disability, with significant differences between the European countries⁴. The highest rates were found in Finland (32.2%), and the lowest in Romania (5.8%)⁴. Austria, Norway and Belgium ranged about average in Europe (12.8 – 18.4%)⁴.

However, these high rates around the world can be attributed to several reasons. One reason is found in the rapid population growth, demographic aging and health transition^{1, 5, 6}. Other explanations lie in medical advances related

to increasing survival rates from (poly)traumas or serious diseases like cancer, stroke or cardiovascular diseases, which are often associated with complex functional problems ^{1,7}. According to European statistics ⁴, further frequent reasons for disabilities and functional impairments are orthopaedic diseases and respiratory ailments as well as neurological and psychological problems.

Independent from the causes, disabilities were identified as the main contributors to dependency ⁶. Studies confirm a strong relationship between specific chronic diseases, severe disability and (care) dependency ^{6, 8-10} (see figure 1). This lies in the fact that health care problems can entail a decrease of independency and quality of life and can lead to serious consequences for patients, such

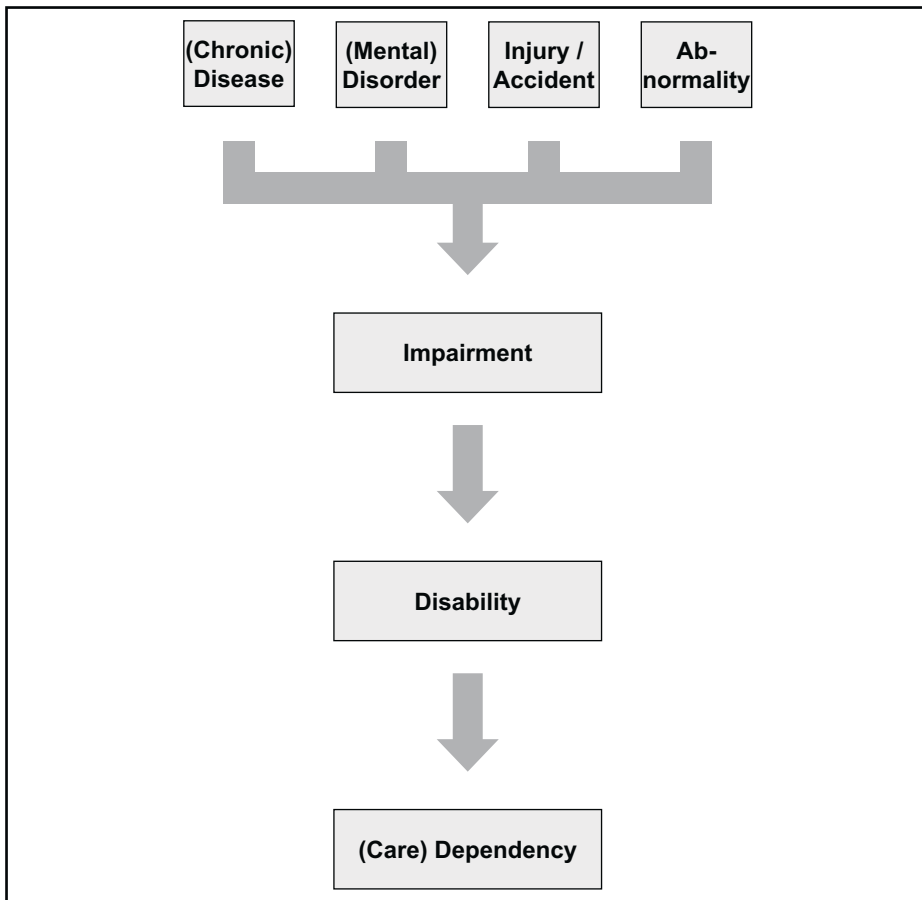


Figure 1: Relationship between chronic diseases, disabilities and care dependency (based on Kearny and Pryor ⁷⁵)

as high psychological burden or the loss of autonomy and self-worth ^{11,12}. Among chronic conditions, dementia, depression, limb impairment, stroke, arthritis and rheumatism are substantial contributors to the development of a (care) dependency from others ⁶.

However, “*much disability is avoidable – by preventing disabling diseases, medical and surgical interventions, and rehabilitation*” ¹³. Since not every disability is avoidable, the reduction and stabilisation of disability-related (care) dependency is an important factor in rehabilitation to ensure patients’ quality of life. (see figure 2)

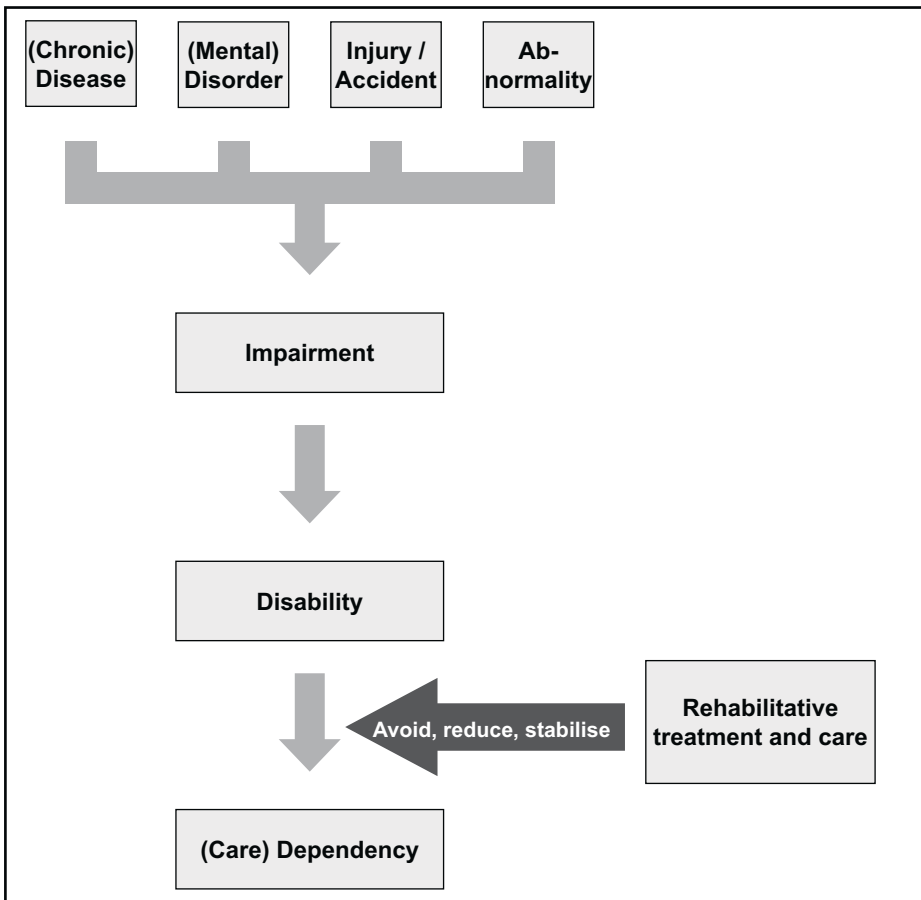


Figure 2: Relationship between chronic diseases, disabilities, care dependency and rehabilitation (based on Keamy and Pryor ⁷⁵)

THE MEANING OF REHABILITATION

According to the World Health Organisation (WHO) ¹⁴ *“rehabilitation of people with disabilities can be defined as a process aimed at enabling them to reach and maintain their optimal physical, sensory, intellectual, psychological and social functional levels. Rehabilitation provides disabled people with the tools they need to attain independence and self-determination”*.

The lives of people with persisting disabilities can be improved by the application of rehabilitative treatment and care, since rehabilitation can effectively support persons by reducing the burden of disability, enhancing opportunities and preventing complications like immobility, pressure ulcer or pain ^{7,15}. The prevention of the aforementioned complications can lead to qualitative benefits for the individual patient as well as to quantitative improvements in terms of financial implications ⁷. Based on these opportunities, the access to rehabilitation can be seen as a basic human right ⁷. For this reason, the World Health Organization (WHO) also focuses its developing and publishing policies more and more on rehabilitation-related topics, as a current action plan demonstrates ¹. The vision of the WHO according to this action plan is that *“all persons with disabilities can live in dignity, with equal rights and opportunities”* ¹.

Based on the described demographic trends and intentions, and in order to avoid or reduce problems associated with disabilities, there has been an overwhelming need for rehabilitation service worldwide ¹ in the last decades.

To fulfil the mentioned expectations and intentions, successful rehabilitation necessitates adequate medical treatment but also patient-centred and comprehensive nursing care.

THE CONCEPT OF (CARE) DEPENDENCY

Main aspects of rehabilitation are the enhancement of people’s well-being and their social and vocational participation as well as the reduction of the impact of handicapping and disabling conditions ¹⁶. Since disability is a main contributor to dependency ⁶, involvement with the phenomenon of (care) dependency is essential in order to understand and improve rehabilitative treatment and care.

To understand the concept of dependency, it has to be recognised that dependency has many faces, such as physical, psychological, emotional, social,

economic, political or environmental ones ¹⁷⁻¹⁹, resulting in the existence of different definitions of dependency in the literature ¹⁹. What many of them have in common is *“that they describe relationships between objects or people in which someone or something has an at least restricted ability to do or be without someone or something else to achieve a desired state of function”* ¹⁹.

A particular form of dependency is care dependency, which shares defining attributes of dependency but has a specific relation to care ¹⁹. Based on the literature, further meanings and aspects of care dependency exists, such as functional limitation, need and self-care deficit ¹⁹. The definition of care dependency, which constitutes the theoretical basis of the present doctoral thesis, is described as follows.

According to Dijkstra ²⁰, nursing care dependency is defined *“as a process in which the professional offers support to a patient whose self care abilities have decreased and whose care demands make him/her to a certain degree dependent”*. In this context the aim of nursing care lies in the restoration of the patient’s ability to perform self-care ²⁰.

Statistical analyses were conducted on prevalence rates of (care) dependency worldwide and revealed that the prevalence of (care) dependency within populations is quite similar globally, ranging only from 4.4 to 5.1 percent by different regions ^{5, 6, 9}. During the next decades, it is expected that most parts of the world will be affected by a growing number of disabled ⁹ and care dependent people.

Especially aging societies will be affected by this phenomenon, since disability and (care) dependency are strongly associated with age ^{13, 21, 22}. Surveys about health and aging, e.g. in Europe, show that 20 percent of the population (65+) of most countries in Europe suffer from some form of disability ^{23, 24}, and the probability of being care dependent and needing long-term care increases with age ²⁴. These surveys also demonstrated that most of the care needs are concentrated in the last years of life ²⁵. The main consumers of care therefore are elderly persons over 80, whose incidence in the European population at the moment is about 4 percent ²⁴.

Demographic calculations assume that the share of elderly (80+) in the total European population will double in the period 2000 to 2030, and that many of them will be care dependent ²⁵. These persons will have fewer children to look

after them due to professional reasons or geographic separation²⁵. Therefore, the development and provision of formalised care, especially in terms of long-term care and rehabilitation, is seen as vitally important to support these people and help them to return or to maintain an active life²⁴⁻²⁶.

Increasing (care) dependency has further widespread implications¹³, e.g. in terms of financial and human resources and burden. Women are generally the most frequent informal carers of care dependent persons¹³. They often experience the care of a relative as problematic and this may result in physical and psychological stress, loss of employment, social opportunities or retirement benefits¹³. Also, increasing dependency rates lead to expenses on the social and health care systems, e.g. in terms of the provision of health care services, funding of pensions and financial resources¹³.

In spite of these significant trends and consequences, (care) dependency is a less frequently studied and still neglected topic in the health care sector compared to e.g. the investigation of prevalence rates of disabilities⁶. This is also true for the field of rehabilitation.

It is obvious that the involvement and understanding of the phenomenon of (care) dependency is to become an important health issue⁶ since it leads to significant consequences for dependent persons, their caregivers and society itself⁶.

To examine aspects related to (care) dependency, e.g. in terms of prevalence rates, the distribution within specific diseases or settings, or improvements and changes, appropriate assessment has to be carried out by health care professionals.

THE MEANING OF ASSESSMENT

“Assessment is a conceptual, problem-solving process of gathering dependable, relevant information about an individual, group, or institution in order to make informed decisions.”²⁷

From a nursing point of view, assessment is valuable and necessary in order to gain essential information for individual care planning and to support the nursing process²⁸. In particular, validated and reliable assessment instruments are relevant in nursing practice and research to assess nursing phenomena²⁹ as

well as to plan and evaluate interventions ²⁸. Consequently, assessment is a fundamental and indispensable part of nursing practice ²⁹.

For these reasons, various assessment instruments are applied in health care institutions, e.g. to identify risks for specific nursing phenomena (e.g. the Braden Scale ³⁰ to identify the risk for pressure ulcer, the Hendrich Fall Risk Model ³¹ to identify the risk for falls). A large number of scales and assessment instruments are available for measuring impairments, activity limitations ¹³ or the need for care. Some of these instruments are used in specific fields of nursing care (Resident Assessment Instrument, Nurses' Observation Scale for Geriatric Patients) or for specific diseases (Alzheimer's Disease Assessment Scale) ³². The availability of such a plethora of scales complicates the decision as to which instrument is suitable for which purpose.

"The assessment of health and health care outcomes requires more than just the choice of measures appropriate to a particular health problem." ³³ For this reason, almost 20 years ago, the Medical Outcomes Trust established specific criteria to evaluate instruments regarding, for instance, their reliability, validity and responsiveness as well as aspects of interpretability and burden ³⁴.

QUALITY CRITERIA OF ASSESSMENT INSTRUMENTS

"An ideal data collection procedure is one that captures a construct in a way that is relevant, accurate, truthful, and sensitive." ³⁵

For evaluating the appropriateness and usefulness of an instrument, several quality criteria exist ³⁶. Major quality criteria of an instrument as generally accepted, are its reliability and validity ^{35, 37}. Apart from these criteria, aspects such as responsiveness and clinical utility ³⁸ are important to guarantee the appropriateness and practicability of an instrument.

Furthermore it has to be considered that the *"evaluation of the properties of an instrument is context specific. An instrument that works well for one purpose or in one setting or population may not do so when applied for another purpose or in another setting or population."* ³⁴ For this reason the investigation of the following described quality criteria has to be investigated for every new setting, patient group and application area ³⁹.

Reliability

The reliability of an instrument expresses “*the consistency with which an instrument measures the target attribute*”³⁵ as well as “*the extent to which the instruments yields the same results on repeated measures*”⁴⁰. The main attributes of a reliable instrument are the stability, internal consistency/homogeneity and equivalence⁴⁰.

The stability of an instrument shows its ability to produce the same results with repeated administration⁴⁰. That means that one observer administers the same instrument to a sample twice³⁵. Afterwards, the obtained scores are compared³⁵. The stability of an instrument is usually estimated by the calculation of correlation coefficients, such as e.g. *Pearson's (r)*^{35,40}. According to Polit and Beck³⁵, correlation coefficients above 0.8 are considered as good.

A further aspect of a reliable instrument is its internal consistency or homogeneity^{35,40}. This aspect indicates whether all items in the instrument measure the same concept⁴⁰. The internal consistency can be estimated e.g. by calculation of *item-correlations*, *split-half-technique* or by means of *Cronbach's alpha*⁴⁰. *Cronbach's alpha* values can be interpreted in a way recommended by Polit and Beck⁴¹, where values greater than 0.9 are required for application of assessment instruments on an individual level.

The third aspect of a reliable instrument is its equivalence, which expresses the degree to which different independent observers agree on their scoring when using the instrument of interest³⁵. To investigate the equivalence of an instrument e.g. the *percentage agreement*, the *intraclass correlation coefficient* as well as *Cohen's kappa* can be calculated³⁵. *Kappa* values can be interpreted as recommended by Landis and Koch⁴², who considered *Kappa* values greater than 0.80 as almost perfect, 0.61 – 0.80 as substantial, 0.41 – 0.60 as moderate and 0.21 – 0.40 as fair. Values under 0.20 were defined as slight agreement between the observers⁴².

Validity

Another major quality criterion of an instrument is its validity, the degree of an instrument to which it measures the aspect that it is supposed to measure³⁵. There exist three main validity aspects – content validity, criterion-related validity and construct validity^{35,40}.

Content validity expresses whether the instrument “*represents the universe of content, or the domain of a given construct*”⁴⁰. There are several approaches to investigating content validity, such as the use of an expert panel³⁵ (*Delphi survey technique*)⁴³.

A second attribute of validity is criterion-related validity. This aspect determines the relationship between the instrument of interest and an external criterion³⁵. Criterion-related validity, particularly concurrent validity, can be determined by investigating the relationship between the scores of an instrument and the scores of another criterion³⁵ e.g. another instrument. An instrument is defined as valid if the scores of the instrument and the external criterion correlate highly with each other³⁵. To test this relationship, correlation coefficients such as *Pearson’s (r)* can be calculated^{35,40}. Correlation coefficients above 0.8 usually are considered as good according to Polit and Beck³⁵.

Construct validity represents another attribute of validity. It reflects the extent to which an instrument measures the underlying theoretical construct by validating the underlying theory and testing hypothesised relationships⁴⁰. To verify the construct validity of an instrument, several techniques are possible, such as the *hypothesis-testing approach, known-groups-technique* or *factor analytical approaches*^{35,40}. Factor analytical techniques aim at identifying clusters of related variables or detecting underlying dimensions of the instrument of interest³⁵.

Responsiveness

A part from aspects like reliability and validity, instruments should also be responsive^{36,38,44}. Responsiveness is defined as the ability of an assessment instrument to detect clinically relevant changes when they occur^{36,37,44-47} as well as to differentiate between patients who improve due to treatment or care and those who do not improve⁴⁸.

Until now, the responsiveness of assessment instruments has been generally less frequently studied than reliability or validity⁴⁶. This might be due to the fact that most well-established assessment instruments were originally developed for an application where changes over time were not of primary interest⁴⁹.

For the verification of responsiveness, several techniques are possible but no golden standard exists so far^{37,44,45}. To detect significant patient changes over time, differences for example between admission and discharge (change scores) can be analysed⁵⁰. In this context descriptive analysis and significance

tests are recommended to identify statistically significant differences^{50,51}. In addition, *effect size* statistics provide a relatively straightforward method of estimating responsiveness⁵² and this seems to be a commonly used procedure⁵³. For calculating the *effect sizes*, several statistical methods are possible, such as the calculation according to Kazis⁵⁴ or Liang⁵⁵. Based on the literature, further statistical analyses are suggested^{37,51,56,57}, e.g. correlation methods or the *effect size* for the *paired-samples t-test* yielding *eta squared* values⁵⁸.

Clinical Utility

An additional important criterion in particular for health care professionals, managers and commissioners to guarantee an easy and appropriate application of an instrument in daily practice is its clinical utility^{38,39,59}. The clinical utility reflects several aspects like costs of procuring, reproducing and retrieving information as well as issues like how to score and interpret the data³⁸. In particular, the issue of time needed to administer and complete an instrument seems to be relevant for daily nursing practice^{38,39,60}. McColl et al.⁶¹, for instance, recommended that an instrument should not take more than 15 minutes to complete, otherwise the assessment could impose a considerable time burden on professionals and would be impracticable in daily practice. According to Harris and Warren³⁸, instruments are clinically useful when they are short and easy to administer, and easy to understand and score. Based on Long and Dixon³⁹, instruments are furthermore practical when they are easy to analyse and to interpret. Instruments which show a high complexity in the process of scoring, application, analysis and interpretation can be very difficult and extremely time-consuming⁶⁰ and might be avoided by professionals. In general, instruments should improve care in terms of assessment, planning and evaluation and should be applicable and useful within the nursing process. Additionally, instruments should be helpful for the communication within the nursing team, in the interdisciplinary context, between units or institutions while optimising the moving, transfer, communication with and discharge of patients.

According to the above mentioned quality criteria, many instruments which are used in rehabilitation are (partly) psychometrically tested. The following section will briefly summarise examples of applied and tested instruments in rehabilitation.

ASSESSMENT INSTRUMENTS IN REHABILITATION

On an international level, several instruments in rehabilitation exist for the assessment and evaluation of patients' functional limitations, needs, self-care deficits, respectively care dependency. Well-known assessment instruments⁶² include the Barthel Index⁶³ and the Functional Independence Measurement (FIM)⁶⁴. Other applied instruments^{62, 65} are the Rehabilitation Activities Profile⁶⁶, the Frenchay Activities Index^{2, 67} and the Northwick Park Dependency Score (NPDS)⁶⁸. A new instrument for the field of rehabilitation is the Care Dependency Scale for Rehabilitation (CDS-R).

LACK OF RESEARCH

Within the following sections, the lack of research related to assessment instruments in rehabilitation as well as regarding to the Care Dependency Scale will be demonstrated.

Lack of research - Instruments in rehabilitation

*"Multi-level assessment across physical, psychological, and social domains is ... particularly necessary, and form the basis for 'comprehensive ... assessment'."*¹³

Several instruments exist in rehabilitation. The Barthel Index, for instance, is probably one of the most frequently used instruments in rehabilitation^{37, 56, 62} to measure a person's abilities and needs regarding the activities of daily living⁶⁹.

In spite of its frequent use, it has to be argued that e.g. the Barthel Index does not provide a comprehensive assessment of care needs, since it pays attention only to physical aspects such as toileting, hygiene and mobility. Psycho-social aspects are not included, such that an assessment of the patient's physical and psycho-social needs is not possible. The lack of consideration of psycho-social needs can be problematic in situations where patients have to deal with severe illness, disability and care dependency on others.

Apart from the lack of comprehensiveness, further disadvantages have to be considered. In terms of its psychometric properties, e.g. the Barthel Index is probably one of the internationally best-validated instruments in rehabilitation⁷⁰. For the German-speaking rehabilitation setting, however, the psychometric quality of this instrument, as well as of other instruments used in rehabilitation, is not comprehensively ensured.

This applies in particular to responsiveness, the ability of an assessment instrument to detect clinically relevant changes^{45, 47}. In spite of this important concern, responsiveness is less frequently studied than reliability or validity⁴⁶, and only a few studies focusing on this issue have been conducted internationally for instruments which are applied in rehabilitation^{37, 51, 56, 62, 65, 71}. This is particularly true for the German-speaking area.

Also, the criterion of clinical utility, which is important for professionals in daily practice, is commonly underemphasised³⁹ and only a few scientific evaluations have been conducted^{72, 73}.

In summary, the provision and application of an instrument which allows a comprehensive, validated and practical assessment of patients' self-care deficits, needs and care dependency is deemed necessary for the field of rehabilitation.

RESEARCH LACK - CARE DEPENDENCY SCALE

One instrument, the Care Dependency Scale might meet the aforementioned requirements and could be a good alternative to existing instruments such as the Barthel Index. Compared to, for instance, the Barthel Index, the Care Dependency Scale focuses not only on physical aspects but also on psycho-social ones. In addition, the scale has been comprehensively tested regarding its psychometric properties. In the German-speaking area, for instance, it has been tested in several settings of nursing care, e.g. in the hospital nursing home and paediatric settings (see chapter 2).

In contrast to its broad testing, the application of the Care Dependency Scale in the field of rehabilitation is quite new. So far, only a few experiences of colleagues in UK are available⁷⁴. Nevertheless, the first positive findings from the UK lead to the conviction that an investigation of the psychometric properties of the Care Dependency Scale in rehabilitation should be undertaken to provide rehabilitation nurses and other health care professionals with an appropriate and proved instrument.

For evaluating the psychometric properties of the scale, several quality criteria have to be investigated. Since the major quality criteria of an instrument are its reliability and validity^{35, 37}, both aspects have to be examined.

Responsiveness constitutes a further quality criterion for an instrument. In regard to responsiveness, no appropriate findings have been available for the Care Dependency Scale up to now. Especially in rehabilitation, this lack is considered to be a problem, since the assessment of the effectiveness of treatments and patient changes is essential⁵³.

The clinical utility also constitutes an important quality criterion of an instrument for the acceptance and application in daily health care practice. With respect to this aspect, only first insights related to aspects of time and understandability⁷³ have been available on the Care Dependency Scale so far. Further aspects related to clinical utility, such as the improvement of care in terms of assessment, planning and evaluation as well as communication, cooperation, move, transfer and discharge, are not available at all. Since no instrument was suitable to evaluate the clinical utility of the scale, an existing questionnaire⁷² had to be modified, applied and tested.

Based on the above-mentioned lack of research, the following research aim was formulated.

AIM

The overall aim of this doctoral thesis is to investigate the psychometric properties and clinical utility of the Care Dependency Scale in the rehabilitation setting using four studies:

Study I focuses on the psychometric properties of the Care Dependency Scale for Rehabilitation (CDS-R) in terms of its homogeneity and equivalence as well as its criterion-related and construct validity.

Study II examines how nurses evaluate the clinical utility of the Care Dependency Scale for Rehabilitation (CDS-R) in daily nursing rehabilitation practice. The second objective of this study was the modification, application and testing of the Staff View Assessment Instrument (SVAI).

Study III aims to determine the responsiveness of the Care Dependency Scale for Rehabilitation (CDS-R) in particular.

Study IV covers the comparison of the responsiveness of the Care Dependency Scale for Rehabilitation (CDS-R) and the Barthel Index.

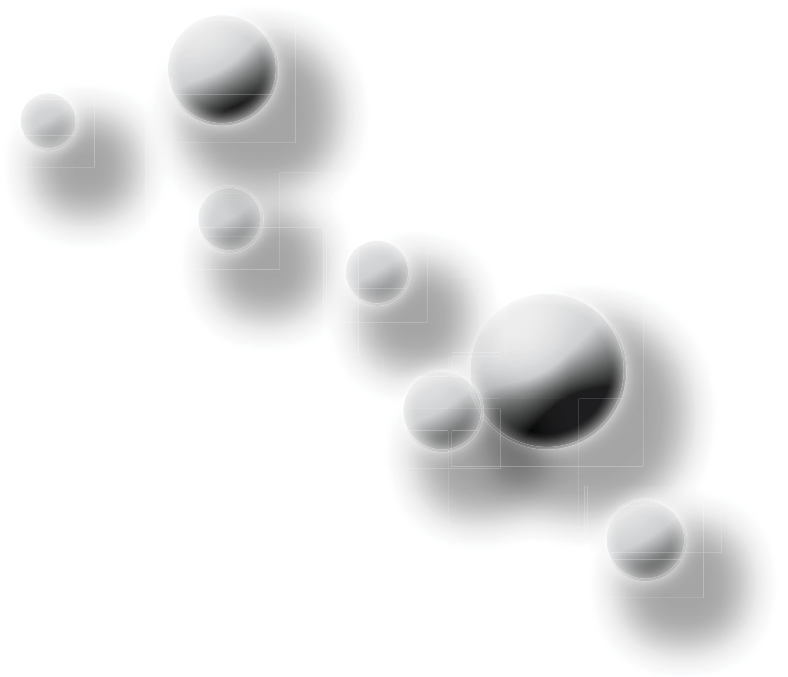
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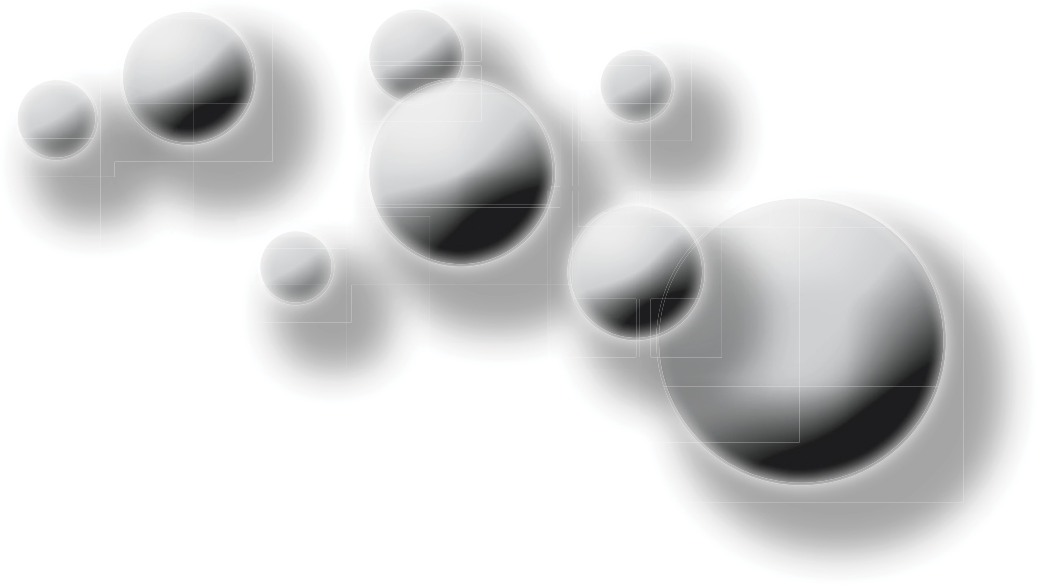
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Chapter 2

The Care Dependency Scale



THE CARE DEPENDENCY SCALE (CDS)

Chapter two provides an overview of the background, architecture, psychometric properties and application of the Care Dependency Scale. Furthermore, the development of the Care Dependency Scale for the rehabilitation setting (CDS-R) will be described.

BACKGROUND

The Care Dependency Scale for Rehabilitation (CDS-R) is a modification of the Care Dependency Scale (CDS), which is a short assessment instrument measuring the care dependency of persons in terms of physical and psycho-social aspects. The Care Dependency Scale was primarily developed for application in long-term and mentally disabled care ¹. Actually the instrument exists also for other settings, such as hospital, nursing homes, geriatric or paediatric settings, and has been translated into 13 languages (among others, Arabic, Dutch, English, German, Japanese and Swedish) and is also available in several versions, for professionals, patients and their relatives ³.

The main aim of the instrument is to provide nursing professionals with an aid for the nursing process and for a systematic assessment of the essential needs of patients ¹. The Care Dependency Scale aims moreover to give an overview of the actual needs of patients, for which reason the scale can be classified as an *Overview-assessment instrument* ². This overview can provide the basis for identifying appropriate nursing interventions and/or assessments of specific conditions ³.

DEVELOPMENT

The Care Dependency Scale was developed in the Netherlands by Dijkstra et al. ¹ using the Delphi-technique and is based on the '*human needs*' by Virginia Henderson ^{4,5}. Henderson's Human Needs were transformed within the development process into 15 items (see table 1). The activity '*breathing normal*' was excluded and '*move and maintain desirable postures*' were divided into the items '*mobility*' and '*body posture*' ¹. To allow nurses to assess communicative aspects of patients, the item '*communication*' was added ¹.

Afterwards, the psychometric properties of the original version were tested in the long-term care setting ⁶⁻⁹. Since the psychometric testing showed positive results, the Care Dependency Scale was implemented in other nursing care

settings. A translation and psychometric testing in other languages followed as well ^{6, 10-21}.

Table 1: *Henderson's Human Needs and the items of the Care Dependency Scale* ¹

	Henderson's Human Needs	CDS-items
1	Breathing normal	-
2	Eat and drink adequately	Eating and drinking
3	Eliminate body waste	Continence
4	Move and maintain desirable posture	Body posture Mobility
5	Sleep and rest	Day and night pattern
6	Suitable clothes – dress and undress	Getting dressed and undressed
7	Maintain body temperature within normal range by adjusting clothing and modifying the environment	Body temperature
8	Keep body clean and well groomed and protect the integument	Hygiene
9	Avoid dangers in the environment and avoid injuring other	Avoidance of danger
10	Communicate with others in expressing emotions, needs, fears, or opinions	Communication Contact with others
11	Workship according to one's faith	Sense of rules and values
12	Work in such a way that there is a sense of accomplishment	Daily activities
13	Play or participate in various forms of recreation	Recreational activities
14	Learn, discover, or satisfy the curiosity that leads to normal development and health and use the available health facilities	Learning ability

ARCHITECTURE

The original Care Dependency Scale contains 15 items (e.g. 'mobility', 'continence', 'communication') which are assessed by means of a 5-point Likert Scale and range from 'completely dependent' to 'almost independent' (see figure 1). Each criteria is defined by an absolute value of 1 ('completely dependent') to 5 ('almost independent'). By adding these values, sum scores between

15 and 75 points can be obtained, with smaller values indicating higher degrees of care dependency.^{1,3}

	Completely dependent	To a great extent dependent	Partially dependent	To a limited extent dependent	Almost independent
Eating and drinking	○	○	○	○	○
Continence	○	○	○	○	○
Body posture	○	○	○	○	○
Mobility	○	○	○	○	○
Day and night pattern	○	○	○	○	○
Getting dressed and undressed	○	○	○	○	○
Body temperature	○	○	○	○	○
Hygiene	○	○	○	○	○
Avoidance of danger	○	○	○	○	○
Communication	○	○	○	○	○
Contact with others	○	○	○	○	○
Sense of rules and values	○	○	○	○	○
Daily activities	○	○	○	○	○
Recreational activities	○	○	○	○	○
Learning ability	○	○	○	○	○

Figure 1: The Care Dependency Scale (CDS)

PSYCHOMETRIC PROPERTIES

The psychometric properties of the Care Dependency Scale have been comprehensively tested in nursing homes and hospitals, and in the fields of geriatrics and paediatrics. The results of these studies, which were conducted internationally, indicated that the scale is reliable and valid^{6, 10-24}.

For the German-speaking area, for instance, the reliability and validity of the Care Dependency Scale was tested in the hospital, geriatric, nursing home and community care and paediatric settings (see table 2 and 3)^{12, 16, 17, 19-21}.

Investigations of homogeneity led to *Cronbach's alpha* values between 0.91 to 0.98 (see table 2), which demonstrates a high internal consistency^{25, 26}. To investigate the equivalence of the scale in different settings, *Cohen's kappa* was calculated with values between 0.39 - 0.89 and 0.24 - 0.79 in terms of the stability of the scale. According to the classification of Landis and Koch²⁷, the *Kappa* values can be interpreted as a fair to substantial agreement between the raters.

Several investigations regarding the validity of the scale were conducted for the German-speaking area as well (see table 3)^{12, 16, 17, 21}. To analyse the criterion-related validity of the scale, the sum scores of the Care Dependency Scale were correlated with external criteria, such as data of the *Pflege Personal Regelung*

according to *Sozialgesetzbuch (SGB XI)*, sum scores of the Barthel Index and values of Visual Analogue Scales. To evaluate the correlation between these instruments and the Care Dependency Scale, *Pearson's (r)* was calculated with r between 0.65 and 0.89, which demonstrates medium to strong positive correlations ^{25, 26, 28}.

Table 2: Reliability of the German version of the CDS ^{12, 16, 17, 21}

	Homogeneity Cronbach's alpha	Interrater-reliability Cohen's kappa	Stability Cohen's kappa
Community care	0.96	0.41 - 0.64	0.24 - 0.71
Geriatrics	0.98	0.40 - 0.76	-
Hospital	0.95 - 0.98	0.50 - 0.70	-
Nursing home	0.94, 0.97	0.39 - 0.63	0.46 - 0.79
Paediatrics	0.91	0.57 - 0.80	-
Rehabilitation	-	-	-
Palliativ/Hospice	-	-	-

Table 3: Validity of the German version of the CDS ^{12, 16, 17, 21}

	Content validity	Criterion-related validity Pearson's (r)	Construct validity
Community care	+	-0.65	-
Geriatrics	+	+	-
Hospital	+	0.72 - 0.89	one-factor solution
Nursing home	+	-0.69	one-factor solution
Paediatrics	+	-0.86	one-factor solution
Rehabilitation	-	-	-
Palliative / Hospice	-	-	-

To verify the construct validity of the Care Dependency Scale in several settings, factor analyses were carried out and, in particular, principal components analyses. This kind of analysis has been used in several studies ^{12, 17, 21}, resulting in one-factor solutions (see table 3).

In general, all previously conducted investigations demonstrate that the Care Dependency Scale is a reliable and valid instrument. Missing investigations include testing the scales' responsiveness and clinical utility. Furthermore, the scale has not yet been tested in the rehabilitation and palliative/hospice setting.

To summarise the multiple psychometric tests made on the scale, the Care Dependency Scale can be recommended for daily nursing practice and for nursing research in different settings and various languages.

APPLICATION

The Care Dependency Scale should be used by graduate nurses to gain insight into the actual needs and abilities of a patient on the basis of observation and care of the patient by assessing her/his actual needs and resources. Interviewing patients or their relatives is not intended and statements regarding previous or potential abilities of a patient are not the focus of the assessment. It is recommended to get to know the patients for a minimum of 24 to 72 hours before the initial assessment is carried out. ³

THE CARE DEPENDENCY SCALE FOR REHABILITATION (CDS-R)

The Care Dependency Scale for Rehabilitation (CDS-R) is based on the Care Dependency Scale and was modified for the field of rehabilitation by adding the item '*ability to cope (psychological/emotional)*' ²⁹. This item was added to the Care Dependency Scale as part of an implementation process in a British rehabilitation centre by a British interdisciplinary expert group. This group consisted among others of nurses, therapists and psychologists and discussed aspects of how to define dependency in the rehabilitation setting ²⁹. This led to the conviction that one important aspect of working with rehabilitation patients was missing, namely the aspect '*ability to cope*'. Especially in situations where people suffer from chronic diseases and long-term illness, it seems important for patients to feel empowered to manage their problems themselves or, if necessary, with support ²⁹.

The resulting Care Dependency Scale for Rehabilitation (CDS-R) measures 16 aspects by means of a 5-point Likert Scale. Due to the integration of a further item, sum scores between 16 and 80 points can be obtained, with smaller values implying higher degrees of care dependency.

In general, it can be stated that up to now the application of the Care Dependency Scale in the field of rehabilitation has been quite new and only a small amount of experience from colleagues in UK is available on this subject.

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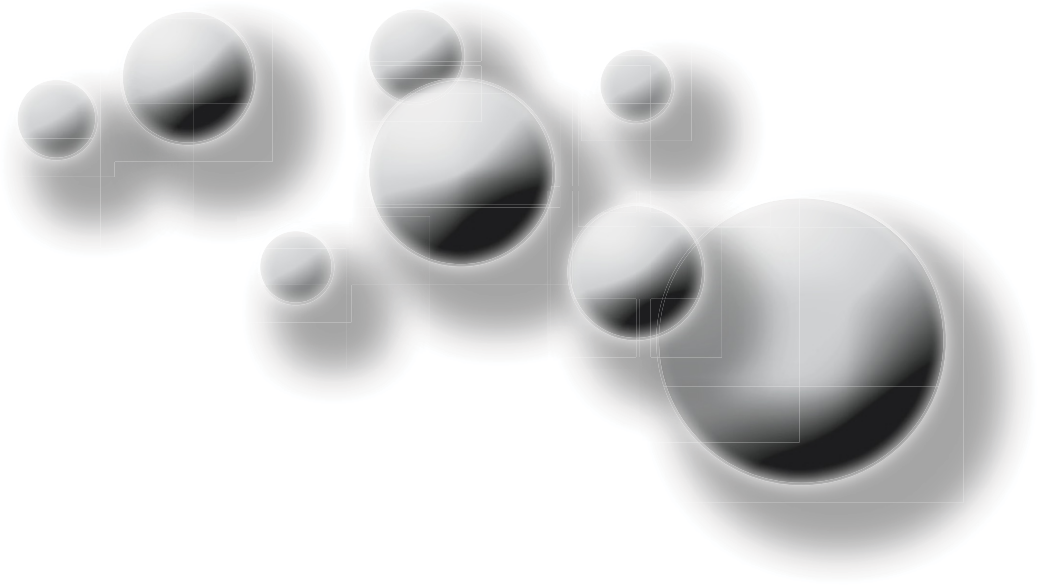
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Chapter 3

Methods



METHODS

The following table gives an overview of the methodological issues of studies I to IV regarding study design, sample and setting, data collection procedure and analysis. Detailed information is available from chapter 4 to 7.

Table 1: Methodological overview study I to IV

	Study I	Study II
Topic	Psychometric properties of the CDS-R (Reliability and validity)	Clinical utility of the CDS-R and psychometric testing of the Staff View Assessment Instrument (SVAI)
Design	Cross-sectional	Cross-sectional
Setting	1 Austrian rehabilitation centre (specialised on neurology and orthopaedics)	3 Austrian health care institutions (specialised on geriatric, neurological and orthopaedic rehabilitation)
Sample	1197 patients and 42 nurses	118 nurses
Data collection	During 6 months in 2007-2008, patients were assessed at one point of time with the CDS-R independently by a different set of two randomly selected nurses	During 2 weeks in September/October 2009, nurses evaluated the clinical utility of the CDS-R with the SVAI
Data analysis	<p>Internal consistency: Calculating Cronbach's alpha and the corrected item correlation</p> <p>Equivalence: Calculating Cohen's kappa, percentage agreement, intraclass correlation coefficient and standard error of measurement</p> <p>Criterion-related validity: Calculating Pearson's (r) and the determination coefficient</p> <p>Construct validity: <i>Principal components analysis</i></p>	<p>Clinical utility CDS-R: Descriptive statistics and content-analysis</p> <p>Internal consistency SVAI: Calculating Cronbach's alpha and the corrected item correlation</p> <p>Construct validity SVAI: <i>Principal components analysis</i></p>

Study III	Study IV
Responsiveness of the CDS-R	Comparison of the responsiveness of the CDS-R and the Barthel Index
Longitudinal	Longitudinal
1 Austrian rehabilitation centre (specialised on neurology and orthopaedics)	1 Austrian rehabilitation centre (specialised on neurology and orthopaedics)
1564 patients and 42 nurses	1542 patients and 42 nurses
During 6 months in 2007-2008, patients were assessed with the CDS-R after admission and before discharge	During 6 months in 2007-2008, patients were assessed with the CDS-R and the Barthel Index after admission and before discharge
<p>Responsiveness CDS-R:</p> <p>Descriptive analyses</p> <p>Calculating effect sizes according to Kazis and Liang</p> <p>Conducting paired-samples t-test</p> <p>Performing Mann-Whitney U and Wilcoxon Signed-Rank Test</p>	<p>Responsiveness CDS-R and Barthel Index:</p> <p>Calculating effect sizes according to Kazis and Liang</p>

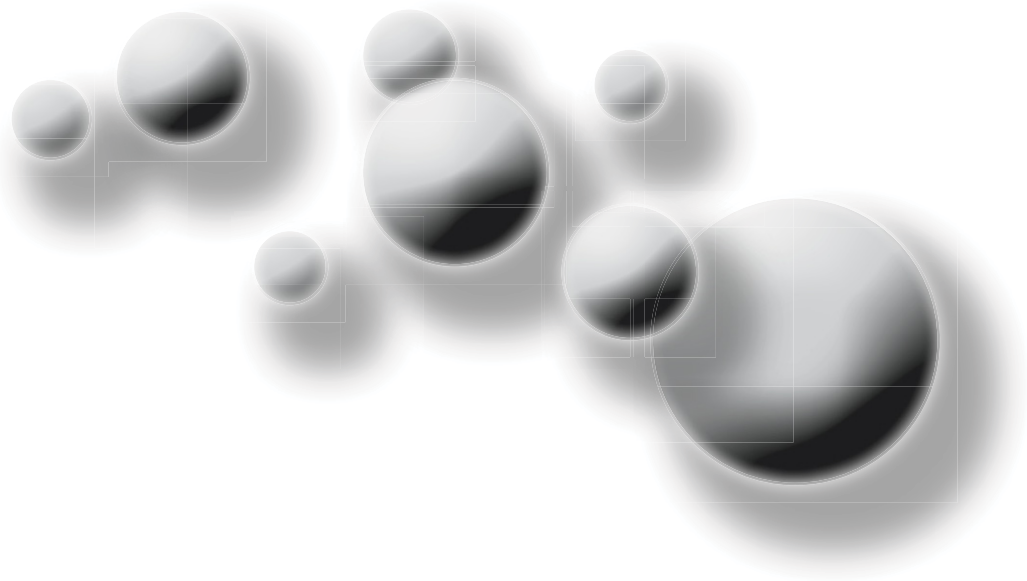


Chapter 4

Psychometric testing of the modified Care Dependency Scale for Rehabilitation

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Published in: *Clinical Rehabilitation* 2010, 24: 363-372.



ABSTRACT

Objective: To determine the psychometric properties of the modified Care Dependency Scale for Rehabilitation.

Design: All patients were assessed independently by a different set of two randomly selected nurses.

Setting and subjects: A convenience sample consisting of 1197 patients and 42 nurses was recruited in an Austrian rehabilitation centre specialised on the treatment and care of neurological and orthopaedic patients.

Measures: The Care Dependency Scale for Rehabilitation and the Barthel Index.

Data analysis: To estimate aspects of reliability, *Cronbach's alpha*, *Cohen's kappa*, *percentage agreement*, *intraclass correlation coefficient* (ICC) and *standard error of measurement* (SEM) were calculated. To evaluate the construct-validity, a factor-analysis was conducted. Criterion-related validity was examined by comparing data of the modified Care Dependency Scale for Rehabilitation with the Barthel Index and *Pearson* calculation.

Results: The calculation of *Cronbach's alpha* yielded values of 0.97. *Kappa* values were between 0.89 and 0.96, values of *percentage agreement* between 96% and 99%, ICC values between 0.94 and 0.99, and SEM values between 0.08 and 0.17. *Pearson (r)* was 0.88. The factor analysis revealed a one-factor solution.

Conclusion: The modified Care Dependency Scale for Rehabilitation shows a high internal consistency, as well as a high level of equivalence. Furthermore, criterion-related validity and construct validity have shown satisfying results.

INTRODUCTION

Individual nursing care is based on determining where people are (in)dependent or need support from others. Assessment instruments can help nursing professionals to evaluate these aspects¹⁻⁵ and gain essential information for individual care planning. Therefore, assessment instruments are a fundamental part of nursing practice⁶. In particular, validated and reliable assessment instruments are relevant in nursing practice and research to assess nursing phenomena⁶ as well as plan and evaluate interventions.

However, there is a lack of psychometrically tested and practical instruments for the assessment of care (in)dependency in the rehabilitation setting. Some instruments have been developed for application in special fields of nursing care (Resident Assessment Instrument, Nurses' Observation Scale for Geriatric Patients) or specific diseases (Alzheimer's Disease Assessment Scale)⁷. Other instruments (Barthel Index, Functional Independence Measurement) focus mainly on physical aspects such as toileting, hygiene or mobility. Psychosocial aspects are rarely included, despite the fact that they are very relevant in situations where people have to deal with illness, disability and dependency from others.

One instrument, the Care Dependency Scale (CDS), includes various physical and psycho-social aspects and allows to assess patients' care (in)dependency in a comprehensive way. It was developed in the Netherlands by Dijkstra et al.⁸ and is based on the *'human needs'* according to Virginia Henderson^{9,10}. The original version was developed for application in geriatric and mentally disabled care. The Care Dependency Scale contains 15 items which are assessed by means of a 5-point Likert Scale ranging from *'completely dependent'* to *'almost independent'*. The instrument exists in 13 languages (e.g. Arabic, Dutch, English, German) and in several versions, for professionals, patients and relatives. According to the Care Dependency Scale, care dependency is defined *"as a process in which the professional offers support to a patient whose self care abilities have decreased and whose care demands make him/her to a certain degree dependent"*⁶. In this context the aim of nursing care is the restoration of the patient's ability to perform self-care⁶.

The Care Dependency Scale has been comprehensively tested with regard to its psychometric properties in nursing homes, geriatrics, hospitals and paediatrics. The results of these studies, which were conducted worldwide, indicated that the Care Dependency Scale is reliable and valid^{2, 11-20}.

The application of the Care Dependency Scale in the field of rehabilitation is new and only a few experiences are available on this subject. In addition, the patient population in rehabilitation differs from that in hospitals or nursing homes. Therefore, a scientifically supported implementation and investigation of the scale in rehabilitation seemed necessary and important.

As part of the implementation process, an English interdisciplinary expert group consisting of nurses, therapists and psychologists discussed the aspect of how (in)dependence could be defined in the rehabilitation setting²¹. This work pointed out that one important aspect of working with rehabilitation patients was missing from the scale, namely the '*ability to cope*'. Especially in situations where people suffer from chronic diseases and long-term illness it seems important for patients to feel empowered to manage their problems themselves or, if necessary, with support²¹. These points of discussion were also confirmed by Austrian rehabilitation professionals.

As a consequence, the Care Dependency Scale was modified by adding the item '*ability to cope (psychological/emotional)*', which should integrate the ability of rehabilitation patients to deal with their health and disability situation and to optimise the scale for the rehabilitation setting.

To confirm the Care Dependency Scale as an assessment tool and research instrument for rehabilitation, an investigation of its psychometric properties has been deemed necessary. This is because a further item had been integrated into the scale and that the rehabilitation setting differs from other settings.

The aim of the study was therefore to determine the performance of the modified Care Dependency Scale in assessing the care dependency of rehabilitation patients. Based on this research aim, the psychometric characteristics of the Care Dependency Scale for Rehabilitation were evaluated and the following question was formulated: Is the Care Dependency Scale for Rehabilitation a reliable and valid instrument to assess the care dependency of patients in rehabilitation?

METHODS

Sample and setting

A convenience sample was recruited in an Austrian rehabilitation centre specialising in the treatment and care of neurological and orthopaedic patients. The average rehabilitation stay of the patients is between four and six weeks. During the period of data collection, 1627 patients were treated in five different wards. Participants selected for this study had to meet the inclusion criteria of having given their informed consent, being adults (age ≥ 18 years), having no cognitive impairment and being able to understand the German language. 428 patients were excluded from the study because they were either under 18 or were not sufficiently fluent in German. Because of restrictions imposed by the ethical committee it was not possible to include cognitively impaired patients. Missing values occurred in 2 cases and were excluded from calculation. In total, all eligible patients (N=1197) were assessed by 42 trained nurses, who had a work experience of 4 - 34 years.

Research instrument

The modified Care Dependency Scale for Rehabilitation is based on the Care Dependency Scale and was modified for the field of rehabilitation by adding the item '*ability to cope (psychological/emotional)*'. The resulting modified Care Dependency Scale for Rehabilitation measures 16 aspects by means of a 5-point Likert Scale (see figure 1). Due to the integration of a further item, sum scores between 16 and 80 points can be obtained, with smaller values implying higher degrees of care dependency.

The modified Care Dependency Scale for Rehabilitation is to be completed to gain insight into the actual needs and abilities of a patient on the basis of observation and the work with the patient. It is not intended to interview patients with regard to their care dependency.

For the application in the German-speaking area, the new item '*ability to cope*' was translated into German. Its linguistic meaning and relevance in rehabilitation care was discussed with nurses experienced in rehabilitation.

	Completely dependent	To a great extent dependent	Partially dependent	To a limited extent dependent	Almost independent
Eating and drinking	○	○	○	○	○
Continence	○	○	○	○	○
Body posture	○	○	○	○	○
Mobility	○	○	○	○	○
Day and night pattern	○	○	○	○	○
Getting dressed and undressed	○	○	○	○	○
Body temperature	○	○	○	○	○
Hygiene	○	○	○	○	○
Avoidance of danger	○	○	○	○	○
Communication	○	○	○	○	○
Contact with others	○	○	○	○	○
Sense of rules and values	○	○	○	○	○
Daily activities	○	○	○	○	○
Recreational activities	○	○	○	○	○
Learning ability	○	○	○	○	○
Ability to cope	○	○	○	○	○

Figure 1: *The Care Dependency Scale for Rehabilitation*

Study design and data collection

The design of the study was cross-sectional. For data-collection reasons, the modified Care Dependency Scale for Rehabilitation was integrated into an Austrian rehabilitation centre's electronic documentation system.

To ensure that the use of the instrument was professional and adequate, all nurses were trained by the first author in a 2.5-hour group-workshop. The workshop dealt with topics regarding the importance of assessments as well as the development, architecture and use of the Care Dependency Scale/modified Care Dependency Scale for Rehabilitation in nursing practice. In addition, case scenario exercises were performed. Written information about the application of the modified Care Dependency Scale for Rehabilitation was also provided.

After a practice phase, all nurses were informed about the study design and the data collection procedure. Then the data collection process started. Over a six-months period (September 2007 – February 2008), patients who met the inclusion criteria were assessed regarding their care (in)dependency. Via observation and during work with the patient, relevant information was ascertained. Based on this investigation, two randomly available nurses scored, independently from each other, the patient at a certain point of time according to the modified Care Dependency Scale for Rehabilitation and the Barthel Index. The assessment was performed during the middle of the rehabilitation stay (week

2 or 3). As instructed by the first author of the study, the nurses decided at random to evaluate a patient and were not aware of each others' assessments. For practical reasons there was no specific pattern concerning the constitution of the rater pairs. Data were finally electronically transmitted into SPSS 16.0.

Ethical considerations

Ethical approval for this study was granted. The study was conducted with the cooperation of the nurses and their nursing director in the participating institution. All nurses and responsive adult patients (18+) in the rehabilitation centre were fully informed via oral presentation and/or written information. Since the Care Dependency Scale is copyrighted, the permission to use and modify the scale was obtained from the copyright holder.

Data analysis

A statistical analysis was performed by using SPSS version 16.0 for Windows (Chicago, IL, USA).

The baseline characteristics of the rehabilitation patients were analysed using descriptive statistics. To describe the care dependency of patients, average values between the two assessments were analysed. In order to evaluate the modified Care Dependency Scale for Rehabilitation in terms of reliability and validity, the following aspects were calculated:

Internal consistency was estimated by calculation of *Cronbach's alpha* and the corrected item correlation. Differentiated data analyses were conducted to evaluate internal consistency with and without the new item '*ability to cope*'. *Cronbach's alpha* values were interpreted as recommended by Polit and Beck²², who require values more than 0.90 for application of assessment instruments on an individual level.

To investigate the equivalence of the modified Care Dependency Scale for Rehabilitation, the following statistical methods were applied: *Cohen's kappa*, *percentage agreement* (PA), *intraclass correlation coefficient* (ICC) and the *standard error of measurement* (SEM). A differentiated data analysis was also conducted to evaluate a possible difference regarding the equivalence of the scale in assessing dependent or independent patients. *Kappa* values were interpreted as recommended by Landis and Koch²³, who considered *Kappa* values higher than

0.80 as almost perfect, 0.61 – 0.80 as substantial, 0.41 – 0.60 as moderate and 0.21 – 0.40 as fair. Values under 0.20 were defined as slight agreement.

Criterion-related validity, particularly the concurrent validity, was determined by investigating the relationship between the modified Care Dependency Scale for Rehabilitation scores and the Barthel Index scores. To test this relationship, *Pearson’s (r)* and the *determination coefficient* were calculated.

To verify the construct validity of the modified Care Dependency Scale for Rehabilitation, a factor analysis was carried out. In particular, a *principal components analysis* was applied, which aimed at detecting underlying dimensions of the modified Care Dependency Scale for Rehabilitation and the correlation of each item to the respective dimensions²⁴. This kind of analysis has also been used in previous studies^{2, 14, 20}, thus allowing a comparison with the current one. Furthermore, differentiated data analyses were conducted to evaluate the construct validity of the scale with and without the new item ‘*ability to cope*’.

RESULTS

Sample characteristics

The study sample was composed of 1197 patients. 643 were female (53.7%). The average age was 60.5 (SD=14.8), ranging from 19 to 95 years. 428 of the patients (35.8%) were treated on neurological and 766 (64.0%) on orthopaedic units. The main diagnoses of all assessed patients were diseases of the musculoskeletal (coxarthrosis, gonarthrosis), circulatory (cerebral infarction, stroke) and nervous systems (Parkinson’s disease, multiple sclerosis) as well as injuries and consequences of external causes (fracture of femur).

Table 1: Patients’ characteristics (N=1197)

	Care Dependency				N
	Male		Female		
	Mean	SD	Mean	SD	
Neurology	69.9	15.8	71.0	13.5	428
Orthopaedics	78.6	2.9	76.8	6.4	766
All patients	75.0	11.2	75.2	9.5	1197

The average care dependency of the rehabilitation patients was 75.1 (SD=10.3), ranging from 16 to 80 points. The majority was almost independent (n=1069, 89.5%), with only 72 (6.0%) of the patients scoring as *completely to partially dependent*. The size of the circles in figure 2 indicates the frequency of scores and demonstrates that most patients in the sample were independent from nursing care. Neurological patients were slightly more dependent than orthopaedic patients (see table 1), but not on a statistical significant level. Significant gender differences could not be found.

Psychometric characteristics of the modified Care Dependency Scale for Rehabilitation

For the modified Care Dependency Scale for Rehabilitation, *Cronbach's alpha* with and without the new item was 0.97. The *corrected item-total correlation* for all items was between 0.63 and 0.88. Corresponding values could be obtained without the item '*ability to cope*' (0.62 – 0.88).

Interrater agreement and reliability measures are shown in table 2. *Kappa* values of the single items were between 0.89 and 0.96. The *Kappa* value of the total scale was 0.82, without the item '*ability to cope*' it was also 0.82. *Percentage agreement* (PA) was between 96.9% and 99.3%. PA of the total scale was 85.6%, without '*ability to cope*' 85.7%. Similar values were also obtained when *Cohen's kappa* and *percentage agreement* were calculated separately regarding the two categories *dependent* ('*totally dependent*', '*to a great extent dependent*', '*partially dependent*') and *independent* ('*to a limited extent dependent*' and '*almost independent*'). Only *percentage agreement* within the category *independent* was slightly higher than in the category *dependent*. ICC values were between 0.94 and 0.99. SEM values were between 0.08 and 0.17 and indicating how close the scores are.

Results of the interrater agreement are also visible in figure 2, which shows the difference between two raters using the modified Care Dependency Scale for Rehabilitation for rehabilitation patients on scale level and distribution of the care dependency. Limits of agreement were -2.51 to 2.51. Two obtained modified Care Dependency Scale for Rehabilitation sum scores for one patient ranged within -2.51 to 2.51 for 95% of patients. In 5% of the two obtained modified Care Dependency Scale for Rehabilitation sum scores, clinically relevant differences up to 20 points occurred.

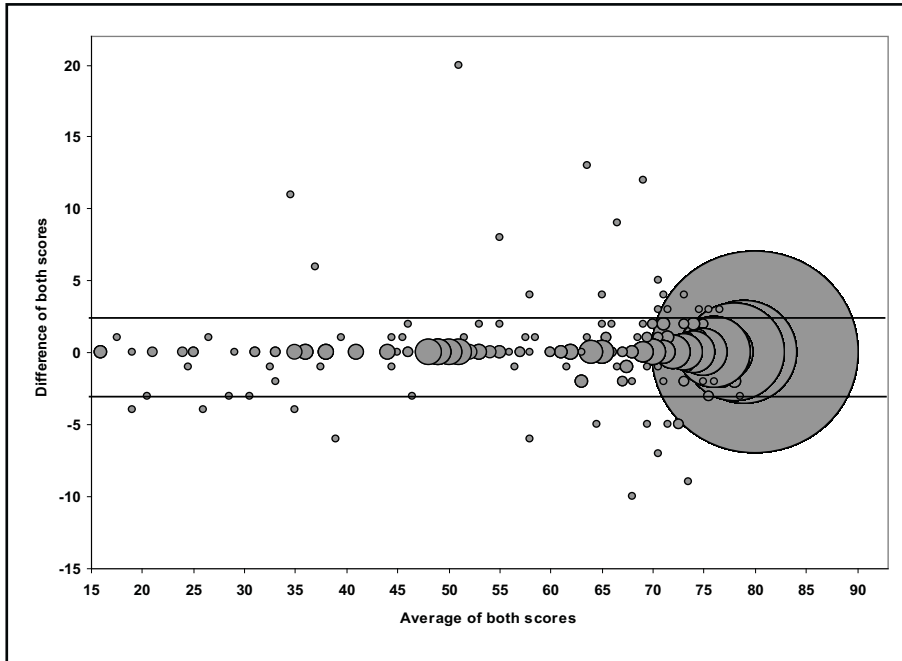


Figure 2: Difference between two raters using the modified Care Dependency Scale for Rehabilitation for patients on scale level and distribution of the care dependency

The correlation of the modified Care Dependency Scale for Rehabilitation scores and the Barthel Index scores was $r=0.88$. The *determination coefficient* r^2 was 0.77. When correlating the Barthel Index scores with the corresponding modified Care Dependency Scale for Rehabilitation items ('*nutrition*', '*continence*', '*body posture*', '*mobility*', '*hygiene*', '*getting dressed and undressed*'), *Pearson's (r)* was 0.89 and $r^2=0.79$.

In order to verify the construct validity of the modified Care Dependency Scale for Rehabilitation with and without the item '*ability to cope*', a *principal components analysis*^{25, 26} was carried out. The suitability of data for factor analysis was checked in advance. Inspection of the *correlation matrix* shows the presence of all coefficients above 0.3. The *Kaiser-Meyer-Oklin* values were 0.97, which is above the recommended value of 0.6²⁵. The *Bartlett's Test of Sphericity* showed statistical significance, which supports the factorability of the *correlation matrix*²⁵.

Table 2: Measuring agreement between two raters using the modified Care Dependency Scale for Rehabilitation for patients on single item level (N=1197)

	Cohen's kappa	PA (in%)	ICC(1,1) (95% CI)	SEM
Eating & drinking	0.93	98.3	0.97 (0.96 to 0.97)	0.14
Continence	0.93	98.6	0.98 (0.98 to 0.98)	0.11
Body posture	0.95	97.4	0.98 (0.97 to 0.98)	0.13
Mobility	0.94	96.9	0.96 (0.96 to 0.97)	0.17
Day & night pattern	0.91	97.7	0.96 (0.96 to 0.96)	0.12
Getting dressed & undressed	0.93	97.7	0.98 (0.98 to 0.98)	0.13
Temperature	0.94	99.3	0.98 (0.98 to 0.98)	0.08
Hygiene	0.93	97.9	0.98 (0.98 to 0.98)	0.12
Avoidance of danger	0.95	98.2	0.99 (0.99 to 0.99)	0.10
Communication	0.89	96.1	0.95 (0.94 to 0.95)	0.15
Contact with others	0.93	98.4	0.98 (0.98 to 0.98)	0.09
Sense of rules and values	0.90	97.7	0.94 (0.94 to 0.95)	0.15
Daily activities	0.93	97.0	0.97 (0.97 to 0.98)	0.15
Recreational activities	0.96	98.7	0.98 (0.98 to 0.99)	0.10
Learning ability	0.90	97.2	0.96 (0.96 to 0.97)	0.15
Ability to cope	0.95	98.4	0.97 (0.97 to 0.97)	0.12
Sum score	0.82	85.6	0.99 (0.99 to 0.99)	0.91

PA – percentage agreement

ICC – intraclass correlation coefficient

SEM – standard error of measurement

CI – confidence interval

Principal components analysis revealed the presence of one component with *eigenvalue* exceeding 1 with a variance of 72.9%, respectively 73.2% without 'ability to cope'. Inspection of the screeplots demonstrated a break after the first component. The values of the *Rotated Component Matrix* are shown in table 3. From a theoretical point of view, a differentiation between physical and psychosocial components is possible¹⁴. Consequently, two-component analyses were conducted. The two-component solution explained a total of 78.3% of the variance, with component 1 contributing 47.4% and component 2 30.8%. As table 3 illustrates, factor 1 has the highest *eigenvalue*. Factor extraction demonstrates that all 16 items of the modified Care Dependency Scale for Rehabilitation had high loadings on the first factor. None of the items had a factor loading lower

Table 3: Rotated Component Matrix, eigenvalues and percentage of variance of the modified Care Dependency Scale for Rehabilitation with and without 'ability to cope' (N=1197)

	CDS-R (16 items)		CDS-R (without 'ability to cope')	
	Component 1	Component 2	Component 1	Component 2
Mobility	0.85	0.31	0.86	-
Hygiene	0.85	0.36	0.86	0.34
Getting dressed & undressed	0.84	0.45	0.85	0.33
Body posture	0.84	0.33	0.84	0.32
Avoidance of danger	0.76	0.46	0.77	0.45
Daily activities	0.75	0.49	0.76	0.47
Continence	0.74	0.45	0.75	0.44
Eating & drinking	0.72	0.51	0.73	0.49
Temperature	0.71	0.52	0.72	0.54
Recreational activities	0.71	0.56	0.72	0.51
Day & night pattern	0.65	0.43	0.65	0.43
Communication	-	0.84	-	0.86
Contact with others	0.45	0.80	0.46	0.80
Sense of rules/values	0.50	0.73	0.51	0.71
Learning ability	0.56	0.69	0.58	0.67
Ability to cope	0.55	0.66	-	-
Eigenvalue	7.59	4.93	7.47	4.34
% Variance	47.43	30.83	49.83	28.90

than 0.4 within factor 1. Five items ('communication', 'contact with others', 'sense of rules and values', 'learning ability', 'ability to cope') had also a loading of ≥ 0.4 in factor 2. Similar results could be obtained by excluding the item 'ability to cope' within the factor analysis (see table 3).

DISCUSSION

The results of the study indicate that the modified Care Dependency Scale for Rehabilitation has a high level of internal consistency and equivalence. Furthermore, strong evidence for criterion-related validity and satisfying results regarding construct validity are ascertainable.

The internal consistency was determined by means of *Cronbach's alpha*. Based on the recommendation of Polit and Beck ²², values regarding internal

consistency should be 0.90 and more to allow application on an individual level. The *Cronbach's alpha* values within this study were 0.97, which is very high and allows assessing patients on an individual level. This can be explained by the number of 16 items, which might have an influence on the calculation of *Cronbach's alpha*. This result is comparable with previous studies in the German-speaking area, which showed values between 0.91 and 0.98^{2, 11, 18-20}. In addition, the *corrected item-total correlation* ranged between 0.63 and 0.88, indicating that all items correlate with the total score^{25, 27}. These results demonstrate that all items contribute to determining the construct care dependency of rehabilitation patients.

The *Kappa* values of the single items within the study were between 0.89 and 0.96. The *Kappa* value of the total scale was 0.82 and without the item 'ability to cope' was 0.82. These values can be interpreted as recommended by Landis and Koch²³, who considered *Kappa* values higher than 0.80 as almost perfect. According to this classification, the *Kappa* values showed almost perfect agreement between raters. In addition, complete agreement was determined in more than 96% of all assessments. The ICC values also demonstrated a high level of interrater reliability. The SEM values were between 0.08 and 0.17, indicating how close the scores are, or in other words, the degree of relative (dis-)agreement. Although interrater reliability was comparably high across all items, it appeared that agreement was highest for 'body temperature' and 'contact with others', whereas agreement for the item 'mobility' was worst. However, differences were regarded as being of minor clinical relevance. Results indicate that the modified Care Dependency Scale for Rehabilitation has an excellent level of equivalence and the interpretation of the items, even of the new item 'ability to cope', seems to be clear for nurses in practice. This result is comparable to those of previous studies in others settings conducted in Canada, Germany, Italy, Norway, Spain and The Netherlands, which showed *Kappa* values between 0.39 and 0.91^{12, 15, 16, 19, 20}.

Pearson's (r) of 0.88/0.89 demonstrate strong positive correlations²⁵ for the modified Care Dependency Scale for Rehabilitation with the Barthel Index, which means that a lower Barthel Index goes along with higher care dependency. The *determination coefficients* of 0.77/0.79 were also high. Adequate results were obtained in previous studies^{2, 13, 20} and provide the evidence for the criterion-related validity of the modified Care Dependency Scale for Rehabilita-

tion. This supports the assumption that physical limitations influence the level of care dependency.

Practitioners might ask in which way the modified Care Dependency Scale for Rehabilitation differs from the Barthel Index, which is easy and commonly used in rehabilitation practice. In other words, why should they use the modified Care Dependency Scale for Rehabilitation instead of the Barthel Index? First, in comparison to the Barthel Index the modified Care Dependency Scale for Rehabilitation includes physical as well as psycho-social aspects and therefore allows a more comprehensive assessment. Even in situations where people have to deal with chronic illness, disability and dependency from others, it is important to focus on patients' psycho-social needs and resources. Rehabilitation practice is particularly characterised by situations related to chronic illness, disability and dependency. Because of the consideration of items related to those aspects, professionals can be supported in a focused assessment of patients' psycho-social needs and resources. The modified Care Dependency Scale for Rehabilitation offers such an assessment for rehabilitation care, especially with the integration of the item '*ability to cope*'. It enables professionals and health care managers to analyse not only physical, but also psycho-social needs and resources. Consequently, the selection of appropriate interventions as a basis for a comprehensive and qualitative nursing care is possible. Nursing professionals also mentioned that the modified Care Dependency Scale for Rehabilitation was easy to use and not more time-consuming than the Barthel Index.

The high loadings of items within the factor analysis indicate that all items, even the new item '*ability to cope*', have a positive orientation towards the defined care dependency concept. Theoretically expected clusters of physical and psycho-social aspects could not be clearly distinguished, eliminating the need for constructing subscales. This result supports the theoretical framework of the modified Care Dependency Scale for Rehabilitation based on Henderson's theory. According to Henderson, physical and psycho-social needs are inseparable¹⁰. The modified Care Dependency Scale for Rehabilitation meets this demand and supports a comprehensive assessment.

Based on the investigated aspects, it can be stated that the modified Care Dependency Scale for Rehabilitation is a reliable and valid instrument for the assessment of patients' care dependency in rehabilitation. The psychometric evaluation of the modified Care Dependency Scale for Rehabilitation without

the item '*ability to cope*' also demonstrates satisfying results regarding its psychometric properties. Therefore, the modified Care Dependency Scale for Rehabilitation can be recommended for comparisons of patients' care dependency between different settings. Furthermore, an application of the modified Care Dependency Scale for Rehabilitation for move, transfer and discharge of patients as well as the communication with other nursing settings is possible. The item '*ability to cope*' merely needs to be excluded for such purposes.

Practitioners might ask, why they should use the rehabilitation version of the Care Dependency Scale instead of the original version: From a statistical point of view the difference regarding the psychometric properties is indeed small. But from a practical point of view the integration of the item '*ability to cope*' is seen as necessary and important for a comprehensive assessment and nursing care in rehabilitation. To confirm this point by integrating the nursing practitioners' perspectives, further studies are recommended.

In terms of reliability it can be added that the observer agreement was high. This can be explained by the special training of the nurses, consisting of a 2.5-hour workshop. For the moment we can assume that the 2.5-hour workshop might have had a great influence on the level of agreement between the rater. Therefore it may be a good idea to evaluate the influence of the training-programme with regard to the equivalence of the scale. Because this study includes only one rehabilitation centre, it might also be advisable to integrate other rehabilitation centres with different foci (e.g. oncology or pulmonology). It might furthermore be advisable to integrate cognitively impaired patients, who often show a high level of care dependency ¹. The fact that the sample consists mainly of independent patients might have had a particular influence on the agreement between the rater. Therefore it is recommended to conduct this study with a higher number of care-dependent patients. Nevertheless, it can be argued that a high agreement between the rater was also obtained when *Cohen's kappa* and *percentage agreement* were calculated separately regarding the two categories *dependent* and *independent*.

Despite these limitations the modified Care Dependency Scale for Rehabilitation showed a high level of internal consistency and equivalence within this study. Furthermore, strong evidence for criterion-related validity and satisfying results regarding construct validity are ascertainable. Based on these psychometric properties, the modified Care Dependency Scale for Rehabilitation can provide the basis for a reliable and valid, but also an individual, patient-centred

and comprehensive assessment in daily nursing practice. Based on this assessment, the planning of interventions, the evaluation of and the communication about patients' care dependency in rehabilitation is possible. Therefore the modified Care Dependency Scale for Rehabilitation can be recommended for the application in daily nursing practice and as a tool for management and research to analyse and compare the care dependency of rehabilitation patients.

To estimate the practicability and usefulness of the modified Care Dependency Scale for Rehabilitation with regard to these aspects, further studies are needed.

Clinical message

The CDS-R can be recommended for the application in daily nursing practice and as a tool for management and research to analyse and compare the care dependency of rehabilitation patients.

ACKNOWLEDGEMENTS

The authors would like to thank the participating rehabilitation centre, including staff and patients.

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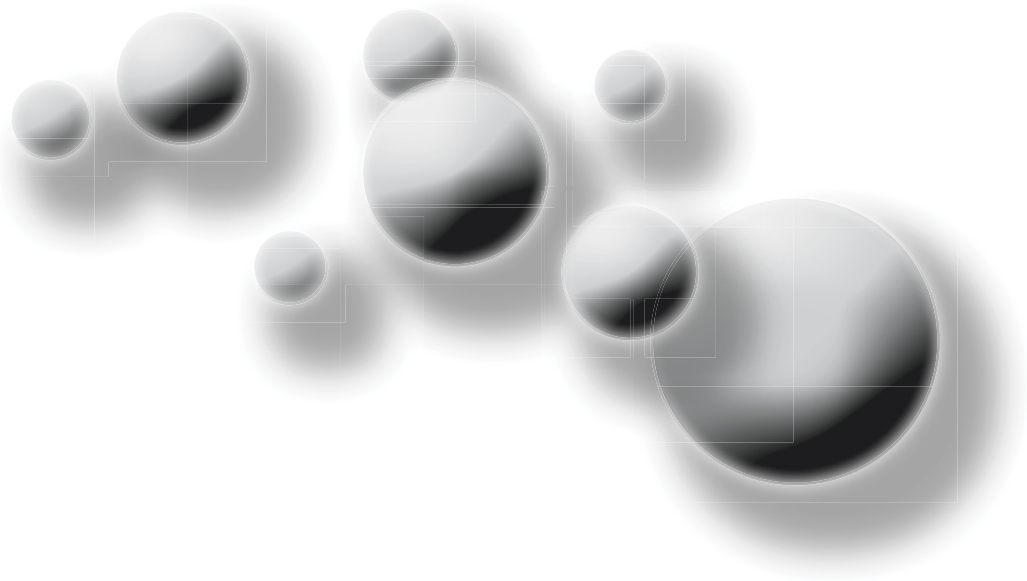


Chapter 5

The clinical utility of the Care Dependency Scale in rehabilitation: nurses' perception

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Published in: *Journal of Research in Nursing*, 15 (6): 547 - 561.



ABSTRACT

Increasing costs within health care require an efficient use of time and staff in order to appropriately satisfy patients' needs. The application of valid and reliable instruments enables nurses to determine patient's care needs. However, to ensure acceptance in nursing practice, assessment instruments must not only be reliable and valid, but also practical and useful. One such instrument for rehabilitation is the Care Dependency Scale for Rehabilitation (CDS-R). The scale has been used in rehabilitation, but so far it has not been evaluated from the nurses' perspective. Therefore, the study aims to determine how nurses evaluate the clinical utility of the CDS-R. In this context the application and testing of a Staff View Assessment Instrument (SVAI) was deemed necessary, and this constitutes the second aim of the study. Informed nurses from several Austrian rehabilitation units were asked to complete the SVAI to evaluate the CDS-R. Ethical approval was obtained. Results indicate that the SVAI enables evaluation of the clinical utility of the CDS-R. Most nurses agree that the CDS-R is a clinically useful instrument, improves communication and cooperation within the nursing team and is easy and quick to use/analyse/interpret. It might therefore be recommended for application in daily nursing practice.

INTRODUCTION

The basis for successful and effective rehabilitation is found not only in adequate medical treatment, but also in patient-centred and comprehensive nursing care. Reducing dependency and supporting or recovering independency is of vital importance in this context to help dependent and disabled persons return to an active life ¹⁻⁷.

In this context, the application of assessment instruments which are reliable and valid can help nursing professionals in assessing where a person is (in) dependent or needs support from other persons ^{4, 6, 8} as a basis for individual care planning. However, for acceptance and application in daily nursing practice, assessment instruments must be more than simply reliable and valid; for health care practitioners, managers and commissioners, measurement instruments must satisfy further criteria as well. Issues like feasibility, practicality or practicability as well as clinical utility or clinical usefulness have to be taken into account and are described in the literature ⁹⁻¹³. One commonly used term is clinical utility, which will be used within this study.

Clinical utility, and its synonyms, reflects several aspects such as costs of procuring, reproducing and retrieving information as well as issues such as how to score and interpret the data ¹⁰. The issue of time needed to administer and complete an instrument seems to be relevant within this framework ^{10, 12, 13}. McColl et al. ¹³ recommended that assessment instruments should not take more than 15 minutes to complete. Otherwise the assessment could impose a considerable time burden and would be impracticable in clinical practice ¹³. According to Harris and Warren ¹⁰, instruments are clinically useful when they are short and easy to administer, and easy to understand and score. Long and Dixon ¹² indicate that instruments are practical when they are easy to analyse and interpret. Instruments which show a high complexity in the process of scoring, application, and analysis as well as interpretation can be very difficult and extremely time-consuming to use ¹³. In addition, instruments should improve care in terms of assessment, planning and evaluation, and should be applicable and useful within the nursing process. Instruments should be helpful for communication within the nursing team or between various professions, units or institutions, to optimise, for example, the move, transfer and discharge of patients.

	Completely dependent	To a great extent dependent	Partially dependent	To a limited extent dependent	Almost independent
Eating and drinking	○	○	○	○	○
Continence	○	○	○	○	○
Body posture	○	○	○	○	○
Mobility	○	○	○	○	○
Day and night pattern	○	○	○	○	○
Getting dressed and undressed	○	○	○	○	○
Body temperature	○	○	○	○	○
Hygiene	○	○	○	○	○
Avoidance of danger	○	○	○	○	○
Communication	○	○	○	○	○
Contact with others	○	○	○	○	○
Sense of rules and values	○	○	○	○	○
Daily activities	○	○	○	○	○
Recreational activities	○	○	○	○	○
Learning ability	○	○	○	○	○
Ability to cope	○	○	○	○	○

Figure 1: The Care Dependency Scale for Rehabilitation (CDS-R)

One instrument which could fulfil these requirements within the rehabilitation setting is the Care Dependency Scale (CDS) ¹⁴. The CDS is a short assessment instrument measuring care dependency regarding physical and psychosocial aspects and can support communication within the nursing and interdisciplinary team. The CDS is also applicable in various care settings, which can facilitate the move, transfer and discharge of patients. In addition, the scale has been successfully tested regarding its psychometric properties in several settings and languages ^{4, 6, 15-17}.

The CDS seems to be particularly appropriate for rehabilitation care since a new item was integrated: '*ability to cope (psychological/emotional)*'. This modified version of the CDS is called the Care Dependency Scale for Rehabilitation (CDS-R) (see figure 1), and has been successfully tested regarding its psychometric properties ¹⁵. Due to the integration of psycho-social aspects, especially the new item '*ability to cope*', the CDS-R supports a comprehensive measurement of patients' care (in)dependency and may meet the requirements of rehabilitative measurement better than other instruments (e.g. Barthel Index, Functional Independence Measurement). These instruments, which are commonly used in rehabilitation practice, pay attention mainly on physical aspects like toileting, hygiene or mobility. Psychosocial aspects are rarely included, despite the fact that they are very relevant in situations where people have to deal with illness, disability and dependency on others.

Due to this aspect, health care professionals in several countries use the CDS-R in daily rehabilitation practice, but until now there has been no systematical evaluation regarding the clinical utility of this instrument from users' perspective. It is for this reason that we conducted the present study.

In order to evaluate the clinical utility of the CDS-R another assessment instrument is necessary. Since no appropriate instrument was available, an existing questionnaire, designed to evaluate staff views, was modified and refined within this study. The result of this process is a Staff View Assessment Instrument (SVAI). To confirm this SVAI as an evaluation tool and research instrument, we deemed it necessary to investigate its psychometric properties, in order to ensure that the items assessing the construct of clinical utility. The present study covers this issue.

Aims

The study aims to determine how nurses evaluate the clinical utility of the CDS-R in daily nursing rehabilitation practice. A second aim is the application and testing of the SVAI to determine possible underlying dimensions. Based on these research we formulated the following questions:

- Which characteristics are identifiable for the SVAI, and can underlying dimensions be detected?
- How do nurses perceive the clinical utility of the CDS-R in daily nursing rehabilitation practice?
- Which advantages and disadvantages regarding the clinical utility of the CDS-R are seen by nursing practitioners in rehabilitation?

METHODS

Study design and data collection

We performed a cross-sectional study in order to estimate the clinical utility of the CDS-R and the psychometric characteristics of the Staff View Assessment Instrument (SVAI). For this purpose, data were collected in Austrian rehabilitation institutions which had agreed to participate.

Over a period of 2 weeks (September/October 2009), all employed graduated nurses were invited, in writing, to evaluate the clinical utility of the CDS-R with the SVAI. All nurses had been using the CDS-R in daily nursing practice for a minimum of 6 months and were also experienced in the use of other instruments such as the Barthel-Index.

Sample and setting

A convenience sample was recruited in 3 Austrian health care institutions specialising in the rehabilitative treatment and care of neurological, orthopaedic and geriatric patients. At the time of data collection 162 graduated nurses were employed in 18 different units. In total, 118 nurses agreed to participate (73% response rate) and evaluated the CDS-R with the SVAI.

The Staff View Assessment Instrument (SVAI)

The Staff View Assessment Instrument is based on the questionnaire of Hansebo, which was used for the evaluation of the Residential Assessment Instrument / Minimum Data Set (RAI/MDS) ¹⁸. A part of this questionnaire, which refers to evaluation staff views, was translated into German according to Polit and Beck ¹⁹ and back-translated into English. Permission was obtained from the copyright holder.

Following translation of the questionnaire, we conducted a pilot study in three Austrian health care institutions (rehabilitation, geriatrics) to estimate the understandability and appropriateness of the items for nurses in practice. Based on this pilot-study, the wording was changed to improve the understandability for nurses, and judgemental formulations such as *'more'*, *'improve'* or *'increase'* were replaced by *'provide'* or *'support'*. The intention was to avoid a comparison with former situations or assessment instruments, and to allow a neutral evaluation of the CDS-R. *'More info about the patient'* for instance, was changed to

'provides care relevant information'. Four out of ten items were subdivided for a more differentiated formulation and detailed analysis. For example, 'increasing knowledge about the patient' was differentiated into 'provides knowledge of patients' physical needs/resources' and 'provides knowledge of patients' psychosocial needs/resources'. In addition, questions regarding the use, analysis and interpretation of the CDS-R were added to enable the comprehensive evaluation of its clinical utility according to the underlying definition of this concept.

This modified instrument consists of 18 items (see table 2), by which nurses can express their views by means of a 4-point Likert Scale ranging from 'agree at all' to 'don't agree at all'. The key aspects refer to the assessment of patients' care dependency, care planning and nursing documentation as well as the communication and cooperation within the nursing team, and between various professions and institutions.

One question regarding the time needed to complete the scale and three open-ended questions were included. These open-ended questions refer to the advantages and disadvantages of the CDS-R in nursing practice as well as to a comparison of the CDS-R with other used assessment instruments (e.g. Barthel Index, Functional Independence Measure, Jones).

Data analysis

We performed a statistical analysis using SPSS version 17.0 for Windows (Chicago, IL, USA). Baseline characteristics of the nurses were analysed using descriptive statistics.

To determine possible underlying dimensions of the SVAI, we carried out a factor analysis. In particular, a *principal components analysis* was applied, which aimed to detect underlying dimensions of the SVAI and the correlation of each item to the respective dimensions¹⁹. To identify the correct number of dimensions or components a *parallel analysis*, according to Pallant²⁰, was conducted, since *Kaiser's criterion* and the *scree-test* tend to overestimate the number of components²⁰. To determine the internal consistency of the scale or possible underlying dimensions, *Cronbach's alpha* was also calculated. The *corrected item-total correlation* was taken into consideration since *Cronbach's alpha* may be influenced by the number of items²⁰.

Table 1: Results of the principal component analysis (PCA) and parallel analysis (PA) – actual eigenvalue from PCA, percentage of variance, criterion value from PA and standard deviation (SD)

Components number	Actual eigenvalue from PCA	% Variance	Criterion value from PA	SD
1	9.47	52.6	1.74	0.09
2	1.40	7.8	1.60	0.06
3	1.16	6.5	1.47	0.05
4	0.85	4.7	1.37	0.05
5	0.83	4.6	1.29	0.05
6	0.61	3.4	1.20	0.04
7	0.60	3.3	1.13	0.04
8	0.48	2.7	1.06	0.04
9	0.43	2.4	1.00	0.04
10	0.40	2.2	0.92	0.03
11	0.33	1.8	0.87	0.04
12	0.28	1.5	0.80	0.03
13	0.26	1.4	0.74	0.03
14	0.25	1.4	0.68	0.03
15	0.20	1.1	0.62	0.03
16	0.18	1.0	0.57	0.03
17	0.16	0.9	0.51	0.04
18	0.13	0.7	0.43	0.04

We analysed data regarding clinical utility in three steps. First, we carried out a descriptive statistical analysis, using SPSS to analyse baseline characteristics of the nurses and the distribution of the closed questions. Second, content-analysis was performed by two researchers to analyse the qualitative statements to open-ended questions for the appearance of patterns and relevant themes¹⁹. Based on agreement, these categorised data were entered into SPSS. In this context missing values were excluded, thus the total number N varies for the different identified categories and the percentages were calculated only for those nurses who responded to the respective question.

Ethical considerations

Ethical approval for this study was granted by the Ethics Committee of the Medical University of Graz, Austria. The study was carried out with the cooperation of the nurses and their nursing directors. All nurses were fully informed about the study via written information.

RESULTS

Sample characteristics

The study sample was composed of 118 nurses. More than 90% of them were female (N=100) and their mean age was 34 (SD=9.1). The work experience in nursing was between 1 and 34 years, with an interquartile range from 3 to 14 years and a median value of 8.0.

Characteristics of the Staff View Assessment Instrument

In order to detect underlying dimensions of the SVAI and to identify the correlation of each item to the respective dimensions, we carried out a *principal components analysis*^{20, 21}. The suitability of data for factor analysis was checked in advance. Inspection of the *correlation matrix* shows the presence of coefficients of as minimum 0.3. The *Kaiser-Meyer-Olkin* values were 0.91, which is above the recommended value of 0.6²⁰. *Barlett's Test of Sphericity* showed statistical significance, which supports the factorability of the *correlation matrix*²⁰. *Principal components analysis* revealed the presence of three components with *eigenvalue* exceeding 1 (see table 1). These three components explained 66.9% of the variance. Inspection of the screeplot demonstrated a significant break after the first component.

To identify the correct number of components, a *parallel analysis* was also carried out, following Pallant²⁰, and the results are shown in table 1. The comparison of the *principal components* values with the values of the *parallel analysis* showed that only one *eigenvalue* of the *principal components analysis* was larger than the criterion value of the *parallel analysis* (see table 1). Furthermore, most of the items within the *Component Matrix* load quite strongly on the first component (0.64 – 0.83)²⁰. These results support the decision from the screeplot to retain only one factor for further investigation²⁰.

Therefore, internal consistency was only checked on scale-level. For the SVAI, Cronbach's alpha was 0.95. The corrected item-total correlation for all items was between 0.64 and 0.80.

Table 2: Evaluation of the CDS-R in % on single-item level (N=118)

The CDS-R ...	Agree at all	Agree	Do not agree	Do not agree at all	Mean
provides care relevant information	25.0	61.2	13.8	0	1.9
provides knowledge of patients' physical needs/resources	21.4	63.2	14.5	0.9	2.0
provides knowledge of patients' psycho-social needs/resources	21.6	50.0	25.9	2.6	2.1
helps to monitor care (in)dependency	29.1	56.4	13.7	0.9	1.9
is basis for care planning	17.2	45.7	31.9	5.2	2.3
enables individual and structured care planning	19.8	40.5	36.2	3.4	2.3
supports performance and evaluation of care	22.6	58.3	18.3	0.9	2.0
enables exact nursing documentation	22.2	45.3	31.6	0.9	2.1
increases the quality of care via individual care planning	19.8	36.2	41.4	2.6	2.3
supports planning and evaluation of nursing interventions regarding psycho-social aspects	23.7	47.5	26.3	2.5	2.1
supports nurses' communication on care (in)dependency	22.0	56.8	20.3	0.8	2.0
supports nurses' communication on nursing interventions	21.2	44.1	33.9	0.8	2.1
supports team cooperation on nursing care	16.2	53	29.1	1.7	2.2
supports interdisciplinary work and communication	8.5	42.4	39.8	9.3	2.5
supports inter-institutional communication	7.8	35.3	44.8	12.1	2.6
facilitates patient move/transfer/ discharge	16.4	37.9	34.5	11.2	2.4
easy and quick to use	14.4	54.2	29.7	1.7	2.2
easy and quick to analyse/ interpret	15.3	44.9	37.3	2.5	2.3
Average	19.1	48.5	29.1	3.3	2.2

Clinical utility of the CDS-R

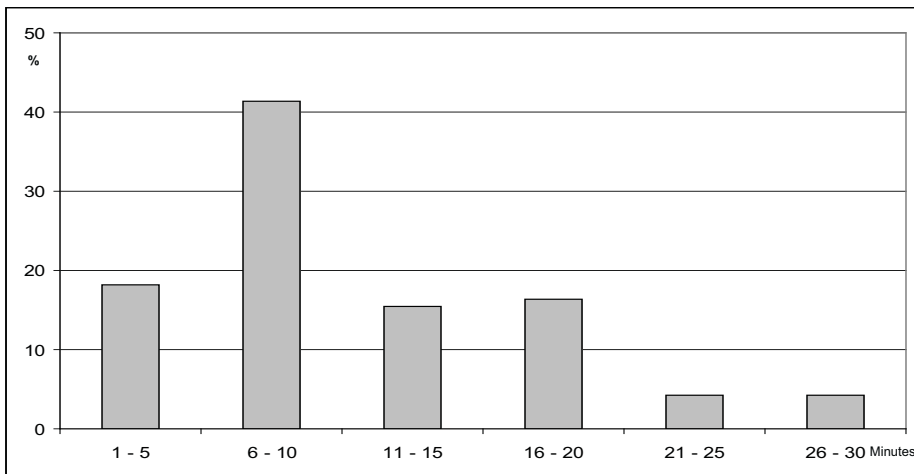
Analysis of the closed questions

Based on the results of the factor analysis, the analysis of the closed questions was performed on scale- and single-item-levels.

The calculation of average values of all single-item scores shows that approximately 20% of the nurses strongly agreed regarding the stated aspects, whereas almost 50% agreed. In contrast, around 30% of the nurses disagreed and approximately 3% strongly disagreed (see table 2). The result demonstrates that the distribution of the 'agree'-answers is more pronounced than on the 'don't-agree'-side. This result is supported by calculating the mean of all items, where a value of 2.2 could be obtained.

The results of the SVAI-single items are also shown in table 2. Some 25% of the nurses and more 'agreed at all' that the CDS-R 'provides care relevant information' and 'helps to monitor care (in)dependency'. In 12 out of 18 items, around one half of the nurses and more 'agreed' regarding the stated aspects. Around 11% of the nurses strongly disagreed that the CDS-R 'supports inter-institutional communication' and 'facilitates patient move/transfer/discharge'.

Figure 3: Time needed to complete the CDS-R, in minutes



Summarising the SVAI-criteria 'agree' and 'agree at all' as well as 'do not agree' and 'do not agree at all', the distribution of the evaluation regarding the stated aspects is shown in figure 2. In 17 out of 18 items the agreement prevails.

More than 80% of the nurses agreed especially regarding the aspects that the CDS-R:

- provides care relevant information;
- helps to monitor care (in)dependency;
- provides knowledge of patients' physical needs/resources;
- supports performance and evaluation of care.

In comparison, the disagreement prevails regarding the aspect that the CDS-R 'supports inter-institutional communication'.

A further aspect was the participants' estimation of the time necessary to complete the CDS-R. On average, a value of 12 minutes was obtained (SD=6.8), and 75% of the nurses did not take longer than 15 minutes to complete the CDS-R. Further results are shown in figure 3.

Analysis of the open-ended questions

The results of the open-ended questions are shown in tables 3 to 5. Nurses regarded the aspect that the CDS-R allows them to consider and integrate the psycho-social aspects of patients' care (in)dependency as the main advantage (see table 3).

- 'The psychological and emotional background of the patient is considered.'
- 'The CDS-R focuses on the communication and psychological constitution and needs of a patient.'

Table 3: Advantages of the CDS for Rehabilitation (CDS-R) (N=82)

Category	%	n
Consideration / integration of psycho-social aspects	42.7	35
Supports nursing assessment, planning, evaluation and documentation	30.5	25
Improvement of communication / exchange of information	26.8	22
Quick and easy to use / understand	15.9	13
Comprehensive and individual assessment instrument	14.6	12
Performance indicator / improved determination of constant attendance allowance	8.5	7
Continuity in assessment of changes	7.3	6

As main disadvantages, the time and documentation requirements as well as the disagreement between nurses in terms of assessment and interpretation of the CDS-R-items were named (see table 4).

- *'Additional writing effort'*
- *'Different opinions regarding single CDS-R items'*

Table 4: Disadvantages of the CDS for Rehabilitation (CDS-R) (N=72)

Category	%	n
Time and documentation requirements	33.3	24
Disagreement between raters in terms of assessment / interpretation	31.9	23
Complicate, too complex	26.4	19
No Austrian-wide application	18.1	13
Imprecise / not significant regarding assessment and planning	9.7	7

In comparison with other assessment instruments, especially the Barthel Index and Jones, several advantages of the CDS-R could be identified. Around 45% of the nurses who answered that question stated that the CDS-R was more differentiated, significant and precise than other instruments, as well as more comprehensive and individually focused regarding the assessment of patients' care (in)dependency. Around 11% of the nurses who answered stated the contrary opinion (see table 5).

- *'The CDS-R considered the cognitive and psychological side better in comparison to the Barthel Index and Jones.'*
- *'CDS-R more comprehensive, since also psycho-social aspects included.'*

Table 5: Comparison with other assessment instruments in rehabilitation (Barthel Index, Jones, FIM) (N=78)

Category	Yes, the CDS-R is ...		No, other instruments are ...	
	%	n	%	n
... more differentiated, significant and precise	46.2	36	11.5	9
... more comprehensive and individual	44.9	35	1.3	1
... more time-consuming	9.0	7	1.3	1
... nationally/internationally better known	5.1	4	3.8	3
... easier to interpret	1.3	1	5.1	4

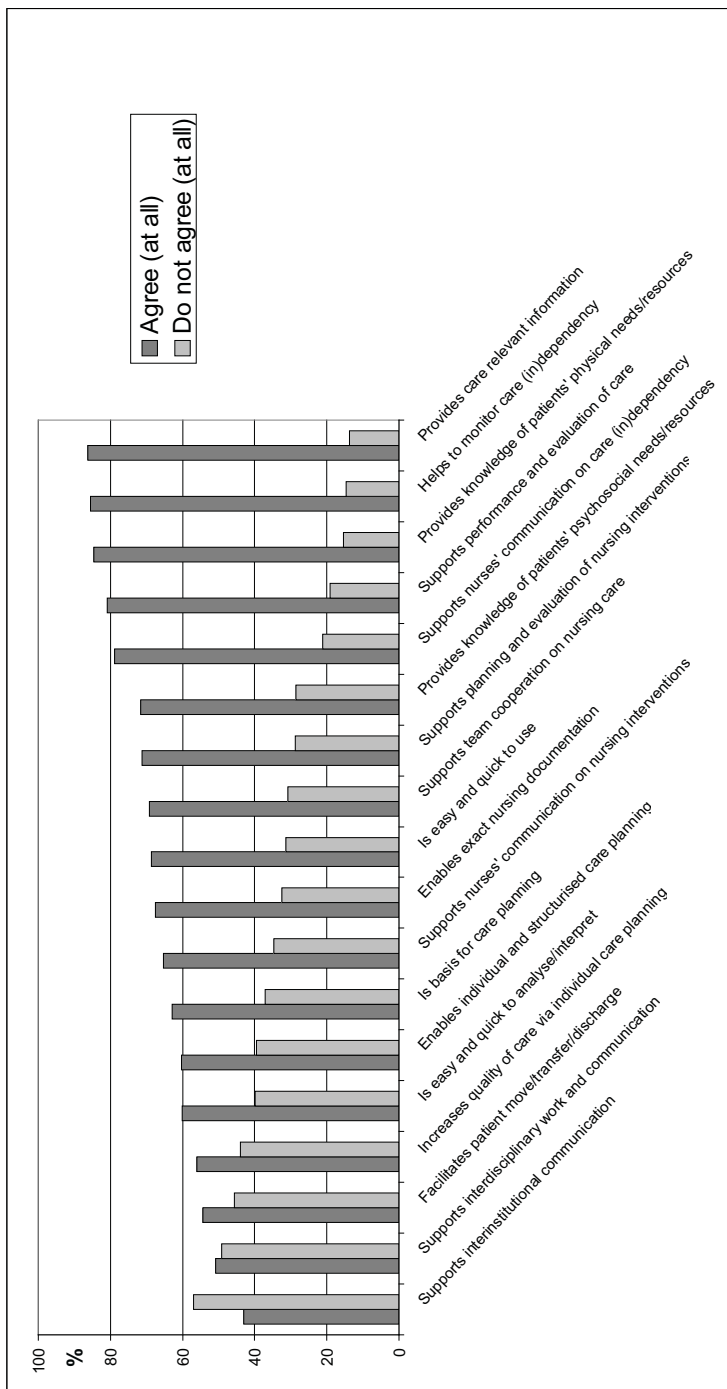


Figure 2: Distribution of agreement vs. non-agreement in% on single-item-level

DISCUSSION

The results of the study indicate that the SVAI contains items which refer to the construct of clinical utility and therefore enables an evaluation of the clinical utility of the CDS-R. Furthermore, the analysis shows positive results regarding the clinical utility of the CDS-R.

Characteristics of the SVAI

To determine possible underlying dimensions of the SVAI, a factor analysis was carried out. *Principal components analysis* and *parallel analysis* were applied. Theoretically expected clusters or underlying dimensions of the SVAI could not be clearly distinguished within these analyses. In addition, most of the items within the *Component Matrix* load quite strongly on the first component (above 0.4)²⁰. These results supports the decision from the screeplot to retain only one factor for further investigations²⁰. It can therefore be concluded that the SVAI contains no underlying dimensions and an analysis of the data is possible on scale-level.

Internal consistency was determined by means of *Cronbach's alpha*. Based on the recommendation of Pallant²⁰, *alpha* values should be above 0.7. According to Polit and Beck¹⁹, *alpha* values should be 0.90 and more to allow the application of a scale on an individual level. The *Cronbach's alpha* values within this study were 0.95, which is very high and allows assessment of nurses' views on an individual level. This high *alpha* value may be explained by the number of 18 items, which might have an influence on the calculation of *Cronbach's alpha*. Since Cronbach's *alpha* is influenced by the number of items, the *corrected item-total correlation* was also taken into consideration²⁰. The values of the *corrected item-total correlation* ranged between 0.64 and 0.80, which is very high and indicates that all items correlate with the total score of the scale^{22, 23}. These results demonstrate that all items contribute to determining the underlying construct of clinical utility. For these reasons it can be concluded that the SVAI can be considered as reliable in terms of internal consistency.

Based on these investigations, the SVAI seems to be suitable for evaluating the clinical utility of the CDS-R.

Clinical utility of the CDS-R

In relation to clinical utility, a main issue is the necessity for instruments to be quick to use. Mc Coll et al¹³ recommended that assessment instruments should not take more than 15 minutes to complete. The results of the study show that the nurses need only an average of 12 minutes, and around 75% not longer than 15 minutes. It can be concluded therefore that the CDS-R conforms to the recommendations of Mc Coll et al¹³ in being quick to use. This may be due to the clear and structured architecture of the CDS-R, with only 16 items. However, within the open-ended questions 24 out of 118 nurses (20%) named the time and documentation requirements as disadvantages of the scale. It was suspected that these nurses had needed longer to complete the CDS-R. Nevertheless, only seven out of these 24 nurses needed more than 15 minutes to complete the CDS-R. Therefore, another explanation seems likely. For the authors, unit-specific circumstances could be conceivable, such as the high work load caused by several patient documentation systems. In this context the implementation of a further assessment instrument, such as the CDS-R, might be seen as an additional time burden, in spite of the fact that it is in itself not very time-consuming.

A further important requirement for a practical instrument is that it must be also easy to use, analyse and interpret. Around one third of the nurses disagreed regarding these aspects. The reasons for this could not be clearly distinguished. One possible explanation might be the fact that these institutions had not used the CDS-R before. Further investigation to identify problems and barriers could enhance an easy application, analysis and interpretation of the CDS-R. In contrast to this result, almost 70% of the nurses perceived the CDS-R as being easy to use. This may be explained by the initial training programme and the uncomplicated understandability of the CDS-R-items, which are based on the 'human needs' of Hendersons' nursing theory²⁴, which is well known in Austrian nursing settings. Also, approximately 60% of the nurses perceived the CDS-R as easy to analyse and interpret. There may be several possible explanations for this positive result. First of all, the attribution of numerical values to the criteria of the CDS-R supports easy analysis and interpretation of the data. The possibility of calculating sumscores-values promotes easy and quick interpretation. It can also be argued that users know how to interpret CDS-R-values, since this is included in the initial training programme. Furthermore, we received oral feedback that the opportunities offered by the easy descriptive statistical analysis are highly appreciated by the nurses and especially by their

nursing managers and head nurses. Therefore it is confirmed that the CDS-R is indeed perceived as easy to use, analyse and interpret.

Another aspect of a clinically useful instrument lies in the improvement of care in terms of assessment, planning, documentation and evaluation. The results confirm these points and demonstrate that nurses recognise the CDS-R as an instrument which provides care-relevant information, helps to monitor care (in)dependency, knowledge of patients' physical needs/resources and supports performance and evaluation of care. The consideration and integration of psycho-social aspects is seen as a big advantage by the nurses (see table 3), owing to the fact that the CDS-R is the sole instrument currently providing this opportunity within the Austrian rehabilitation setting. Only around a quarter of all nurses disagreed regarding these aspects (see table 2). This disagreement may be explained by unit-specific circumstances, such as the parallel use of several assessment instruments (e.g. CDS-R and Barthel Index). Nevertheless, it can be concluded that the CDS-R is perceived as an instrument which improves care in terms of assessment, planning, documentation and evaluation.

In addition to these aspects, the improvement of communication within the nursing team or between various professions and institutions seemed of central importance in terms of clinical utility. Within this study nurses experienced that the CDS-R *'improves communication and cooperation within the nursing team'*. The nurses themselves explained their view by stating that they appreciated the possibility to use common professional terms. Only a few nurses cited the disagreement between nurses in terms of assessment and interpretation of the CDS-R as main disadvantages. This view, however, can be rebutted by the results of an interrater-study yielding a high level of agreement between the surveyed nurses ¹⁵.

Contrary to the enhancement of communication and cooperation within the nursing team, the improvement of communication within the interdisciplinary team or between institutions could not be clearly identified. Possible explanations might be found in Austrian institutional structures, since current nursing practice is not characterised by an interdisciplinary use of assessment tools. It is, however, known from British users ²⁵ that the CDS-R is very helpful for interdisciplinary assessment and communication.

CONCLUSION

We conclude that the CDS-R is perceived as clinically useful for nurses in rehabilitation practice. In comparison with other instruments, such as the Barthel Index and Jones, the CDS-R is regarded as more differentiated, significant and precise as well as more comprehensive and individual in assessing patients' care (in)dependency in rehabilitation. This may be due to the integration of psycho-social aspects within the CDS-R and the nursing focus of the scale.

Nevertheless, further research is recommended owing to the main limitations of this study, namely the inclusion of only three institutions. We recommend that the CDS-R, as well as its original version, the CDS, is evaluated in other institutions and nursing settings, such as the hospital, nursing home and community care settings. In addition, the SVAI should be tested in other settings and with a larger sample. Generally, more research in the field of clinical utility seems to be important, since this aspect is often underemphasised and rarely described in the scientific literature ¹².

Key points

Our results indicate that the SVAI enables to evaluate the clinical utility of the CDS-R. The Care Dependency Scale for Rehabilitation (CDS-R) is perceived by nurses in rehabilitation practice as:

- quick and easy to use, analyse and interpret;
- a tool which can improve care in terms of assessment, planning;
- documentation and evaluation;
- a tool which can improve communication within the nursing team;
- a practical and useful assessment instrument.

ACKNOWLEDGEMENTS

The authors acknowledge the support of the participating rehabilitation centres and staff as well as the team of the Institute for Medical Informatics, Statistics and Documentation of the Medical University Graz, Austria.

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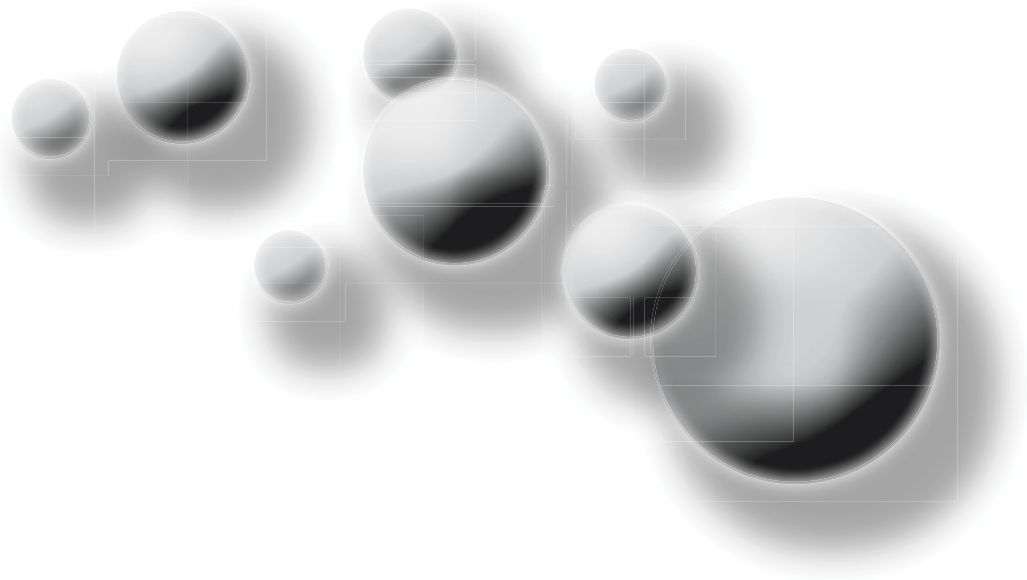


Chapter 6

Responsiveness of the Care Dependency Scale for Rehabilitation (CDS-R)

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under review



ABSTRACT

Around 10% of Western Europe's population suffer from a disability which can entail a decrease of independency and quality of life. However, the lives of these people can be improved by rehabilitative treatment and care. Changing the degree of dependency from dependent to independent is essential in rehabilitation, as is the assessment of these changes. To perform such kind of measurements, assessment instruments have to be responsive. In spite of this concern, responsiveness of assessment instruments is studied to a small extent only. This also applies to the Care Dependency Scale (CDS-R), a short assessment instrument measuring the care dependency of patients regarding physical and psycho-social aspects. In this longitudinal-study, the responsiveness of the CDS-R, in general and related to different disease-groups, should be determined. Therefore, a convenience sample of 1564 patients was recruited in an Austrian rehabilitation centre, and during six months (2007-2008) patients were assessed with the CDS-R after admission and before discharge. Responsiveness was determined by descriptive analysis, calculation of *effect sizes* and significance tests. Differences between admission and discharge occurred on a statistically significant level for patients who changed. The calculation according to Kazis yielded values of 0.24/0.49 for patients who changed, and 0.86/1.46 according to Liang. *Eta squared* was 0.10/0.19 for patients who changed. Responsiveness-analyses related to different disease-groups showed constantly large *effect sizes* for patients with musculoskeletal-disorders. These results provide a first insight into the topic and indicate that the CDS-R can detect patient-changes over time and discriminate between patients who change under rehabilitation or not. These aspects argue for the responsiveness of the scale, wherefore the CDS-R seems to be appropriate for the assessment of treatment/health-care effectiveness and the evaluation of individual patient-changes. Nevertheless further research is recommended to confirm the level of responsiveness of the scale in general and for different disease-groups.

INTRODUCTION

Around 10% of Western Europe's population suffer from the experience of a disability, which can be attributed to increasing survival rates from (poly)traumas or serious diseases like cancer and stroke associated with complex problems and functional deficits ¹. These problems entail a decrease of independency and quality of life and can lead to serious consequences like high psychological burden or the loss of autonomy and self-worth ^{2,3}.

However, the lives of people with persisting disabilities can be improved by the application of rehabilitative treatment and care, since rehabilitation can effectively support persons by reducing the burden of disability, enhancing opportunities and preventing complications like immobility, pressure ulcer or pain ^{1,4}. In addition, qualitative benefits for the individual patient as well as quantitative improvements in terms of financial advantages can be obtained by rehabilitation ¹.

Successful rehabilitation necessitates not only adequate medical treatment but also patient-centred and comprehensive nursing care. Changing the degree of dependency from dependent to independent, reducing impairment as well as improving functioning and activity is of vital importance in this context ¹.

For that reason, the assessment of treatment and health-care effectiveness is an essential aspect in rehabilitation ⁵ and widely seen as central for good clinical practice ⁶. Assessment instruments allow health-care practitioners and researchers to measure the effectiveness of treatment and care on the basis of measuring intra-individual changes over time ^{7,8}.

To perform such kind of measurements and to discriminate between relevant and irrelevant clinical changes as well as to quantify the amount of a change, assessment instruments have to be reliable and valid, but also responsive ⁷⁻¹⁰. In this context, responsiveness is defined as the ability of an assessment instrument to detect clinically relevant changes when they occurred ⁸⁻¹³ as well as to differentiate between patients who improve due to treatment or care and those who do not improve ¹⁴.

In spite of these important concerns, the responsiveness of assessment instruments is generally less frequently studied than its reliability or validity ^{8,10}. This might be due to the fact that most well-established assessment instruments were originally developed for an application where changes over time were not of primary interest ¹⁵.

This also applies to the Care Dependency Scale ¹⁶, which is a short assessment instrument measuring the care dependency of a patient regarding physical and psycho-social aspects. The Care Dependency Scale has been demonstrated to be valid and reliable in several settings, languages and versions ¹⁷⁻³⁰ and is therefore used in clinical practice. Especially in rehabilitation, nurses started to use the scale in its modified version to document, show and analyse patient changes over time in terms of care dependency. But until now, there exists no scientific evidence for the ability of the scale to assess changes, or in other words, for the responsiveness of the Care Dependency Scale in this setting.

For this reason the aim of the study was to investigate the responsiveness of the Care Dependency Scale for Rehabilitation (CDS-R) in general as well as related to different disease-groups. Based on this research aim, the following questions were formulated:

- Is the CDS-R able to detect clinically relevant changes regarding the care dependency of patients in rehabilitation over time?
- Is the CDS-R able to differentiate between patients who change due to treatment and care and those who do not change?
- Regarding the responsiveness of the CDS-R, are there differences related to various disease-groups?

METHODS

Study design

A longitudinal study was carried out in an Austrian rehabilitation centre.

Sample and setting

A convenience sample of 1564 patients was recruited in an Austrian rehabilitation centre. The centre consists of five wards which are specialised on the treatment and care of orthopaedic and neurological patients. At the time of data collection, 1627 patients were treated in the rehabilitation centre with an average rehabilitation stay of between four and six weeks. Participants selected for this study had to meet the inclusion criteria of having given their informed consent, being adults (age ≥ 18 years), having no cognitive impairment and being able to understand the German language. 61 patients were excluded from the study because they did not fulfil the inclusion criteria. Due to restrictions of the ethical committee the inclusion of cognitively impaired patients was not possi-

ble. Missing values occurred in 2 cases and were excluded from calculation. In total, all eligible patients (N=1564) were assessed by 42 trained nurses, using the CDS-R.

Data collection

Before data collection, all nurses were trained by the first author to ensure the professional and adequate application of the instrument. After a practice phase of six months, all nurses were informed about the data collection procedure. The following data collection process was performed over a period of six months in 2007 – 2008. All patients who consented and met the inclusion criteria were assessed with the CDS-R after admission and before discharge (week 4 - 6) of the rehabilitation stay. The data were then electronically transmitted into SPSS 18.0 for Windows (Chicago, IL, USA).

Instrument

The Care Dependency Scale for Rehabilitation (CDS-R) is based on the Care Dependency Scale ¹⁶, which is a short overview-assessment instrument ³¹, and was modified for the field of rehabilitation by adding the item '*ability to cope (psychological/emotional)*' ^{32,33}. The CDS-R measures 16 aspects by means of a 5-point Likert Scale (see figure 1). These aspects are assessed on the basis of carer's observation and the work with the patient. By adding the single-item scores, sum scores between 16 and 80 points can be obtained, with smaller values implying higher degrees of care dependency. Based on discussions with nurses and experts in the field of rehabilitation as well as analysis of patients' records, a clinically relevant change occurs when the sum-score of the CDS-R changes by 4 points and more.

The psychometric properties and clinical utility of the CDS-R were examined by Eichhorn-Kissel et al. ^{19,34}. The investigation of homogeneity yielded *Cronbach's alpha* values above 0.9. Analysis of the interrater-agreement showed high *Kappa* values (0.89 - 0.96) as well as high *percentage agreements* (96% - 99%). The correlation of the CDS-R with an external criterion, the Barthel Index ³⁵, provides evidence for the criterion-related validity of the scale. The performed factor analysis revealed a one-factor solution. Based on these investigations, the CDS-R showed a high level of internal consistency and equivalence as well as satisfying results in terms of its validity. ¹⁹ Analysis of the clinically utility in rehabilitation showed that the scale is a useful instrument, which

improves the communication and cooperation within the nursing team and is furthermore easy and quick to use, analyse and interpret ³⁴.

	Completely dependent	To a great extent dependent	Partially dependent	To a limited extent dependent	Almost independent
Eating and drinking	○	○	○	○	○
Continence	○	○	○	○	○
Body posture	○	○	○	○	○
Mobility	○	○	○	○	○
Day and night pattern	○	○	○	○	○
Getting dressed and undressed	○	○	○	○	○
Body temperature	○	○	○	○	○
Hygiene	○	○	○	○	○
Avoidance of danger	○	○	○	○	○
Communication	○	○	○	○	○
Contact with others	○	○	○	○	○
Sense of rules and values	○	○	○	○	○
Daily activities	○	○	○	○	○
Recreational activities	○	○	○	○	○
Learning ability	○	○	○	○	○
Ability to cope	○	○	○	○	○

Figure 1: The Care Dependency Scale for Rehabilitation

Statistical analysis

A statistical analysis was performed by using SPSS version 18.0. Baseline characteristics of rehabilitation patients were analysed using descriptive statistics.

Since there is no golden standard for the verification of the responsiveness of an instrument, several techniques are possible ^{9, 11, 12}. To detect significant changes regarding the care dependency of rehabilitation patients over time, the first step was to analyse differences between admission and discharge sum-scores of the CDS-R (change scores) ³⁶. In this context, descriptive analysis as well as the *Wilcoxon Signed-Rank Test* ³⁷ were used to identify statistically significant differences.

In addition, *effect size* statistics provide a relatively straightforward method of estimating responsiveness ³⁸ and seem to be a commonly used statistical procedure, especially for assessment instruments with multiple items ⁵. For calculating the *effect size*, several statistical methods are possible. *Effect size*, e.g. according to Kazis ³⁹, is calculated by taking the mean change of a variable (difference of care dependency between admission and discharge) divided by the

standard deviation of that variable (SD of care dependency at admission) ^{12, 39}. For calculating the *effect size* according to Liang ⁴⁰, the mean change of a variable is divided by the standard deviation of the mean change ^{12, 40}. Since there are some controversial discussions about which standard deviation should be used ¹², both methods of *effect size* calculation were applied within this study. According to *Cohen's arbitrary criteria* the calculated *effect sizes* can be interpreted in that way that larger *effect size* values indicate greater responsiveness of an instrument ^{5, 41}. Values of 0.2 can be interpreted as of small, 0.5 as of medium and 0.8 as of large effect ⁴¹.

Based on the literature, further statistical analyses were suggested in the context of responsiveness-calculation ^{6, 12, 42, 43}, e.g. correlation methods or the *effect size* for the *paired-samples t-test* yielding *eta squared* values ³⁷. As recommended by Cohen ⁴⁴, *eta squared* can be interpreted as of small effect for values of 0.01, as of moderate for values of 0.06 and as of large effect for values of 0.14 and more ^{37, 44}.

To determine if the CDS-R is able to differentiate between patients who change due to treatment or care and those who do not change, group comparisons were performed on the basis of the identified change scores. Based on these identified groups of changers and non-changers ⁴³ *p-values* were calculated. Gyatt et al. ⁴⁵, for instance, used the *p-value* as an index of responsiveness because responsive assessment instruments should be able to differentiate between different groups ^{12, 45}. Since the data within this study are not distributed normally, the *Mann-Whitney U Test* was performed to identify statistically significant differences.

In accordance with Wallace et al. ⁴³, the collected data were analysed based on different patient groups ⁴³. The patient groups were constituted as non-changers, patients who changed and patients who changed on a clinically relevant level. Within this study a clinically relevant change was defined to occur when the sum-score of the CDS-R changes by 4 points and more in a positive or negative direction.

Ethical considerations

Ethical approval was obtained from the Ethics Committee of the university. The study was conducted with the cooperation of the nurses and their nursing director. All nurses of the rehabilitation centre were fully informed about the study via

oral presentation and written information. After admission, the nurses informed all patients who met the inclusion criteria about the study and provided them with additional written information. Nurses and patients consented in written form. The scale was completed for each patient, then the data were made anonymous and electronically transmitted to the researchers. Since the scale is copyrighted, the permission to use the scale was obtained from the copyright holder.

RESULTS

Sample characteristics

The study sample was composed of 1564 rehabilitation patients. 855 of them were female (54.7%) and the average age of all patients was 61.1 (SD=14.8), ranging from 19 to 95 years. The main diagnoses of all assessed patients were diseases of the musculoskeletal (e.g. coxarthrosis, gonarthrosis) (53.1%), circulatory (e.g. cerebral infarction, stroke) (16.2%) and nervous systems (e.g. M. Parkinson, multiple sclerosis) (13.8%) as well as injuries and consequences of external causes (e.g. fracture of femur) (12.7%).

The majority of patients were almost independent (n=1367, 87.4%). In 1024 of all patients (65.5%), no change of care dependency sum-score values during their rehabilitation stay was visible. In 540 of all patients (34.5%), a sum-score change between 1 and 35 points occurred, but only in 155 cases a clinically relevant change of 4 points and more could be detected. Demographical aspects of these different patient groups are shown in table 1. Between the group of changers and non-changers statistically significant differences related to age and gender could be found. Especially in terms of age, a difference of about 10 years between the group of non-changers and patients who changed on a clinically relevant level was noticeable.

Responsiveness of the CDS-R

In order to determine if the CDS-R is able to detect clinically relevant changes, the first step was to analyse differences between admission and discharge (change scores). Furthermore, *effect size* statistics were performed.

The mean care dependency scores after admission and before discharge as well as the mean change scores are presented in table 2. When looking at dif-

Table 1 Demographic and clinical characteristics of different patient groups

All patients	All patients (N=1564)	Patients without changes (N=1024)
Mean age	61.1 (SD= 14.8)	58.4 (SD= 14.8)
Gender, women	54.7% (N=855)	52.0% (N=532)

Table 2 Sum-scores, change scores and responsiveness statistics for the CDS-R based on different patient groups

	All patients (N=1564)		Patients without changes (N=1024)	
	Mean	SD	Mean	SD
CDS-R admission	74.1	11.4	75.8	9.2
CDS-R discharge	74.7	11.1	75.8	9.2
CDS-R change scores	1.1	2.7	0.0	0.0
Significance of the difference*	<0.001		1.000	
Effect size according to Kazis	0.10		-	
Standardized response mean according to Liang	0.41		-	
Effect size for paired-samples t-test (Eta squared values)	0.03		-	

* Based on Wilcoxon Signed-Rank Test; † Based on Mann-Whitney U Test

Table 3 Change scores and responsiveness statistics for the CDS-R based on different disease and patient groups

	Change score			Effect size according to Kazis	
	All patients	Changer	Changer ≥ 4	All patients	Changer
Diseases of the musculoskeletal system N=831 / changer=256 (30.8%)	0.72	2.3	6.3	0.15	0.38
Diseases of the circulatory system N=253 / changer=116 (45.8%)	2.2	4.8	8.1	0.13	0.28
Diseases of the nervous system N=216 / changer=72 (33.3%)	1.32	3.97	7.6	0.09	0.24
Injuries and fractures N=198 / changer=71 (35.9%)	1.05	2.9	5.6	0.09	0.21

Patients with changes (N=540)	Patients with clinically significant changes ≥ 4 (N=155)
66.1 (SD= 13.5)	68.1 (SD= 13.2)
59.8% (N=323)	54.2% (N=84)

Patients with changes (N=540)		Patients with clinically significant changes ≥ 4 (N=155)		Significance of the difference †
Mean	SD	Mean	SD	
69.1	13.3	60.4	18.8	<0.001
70.7	12.8	64.2	14.7	<0.001
3.2	3.7	7.2	4.9	<0.001
<0.001		<0.001		
0.24		0.49		
0.86		1.46		
0.10		0.19		p<0.001

Changer ≥ 4	Standardized response mean according to Liang			Effect size for paired-samples t-test (Eta squared values)		
	All patients	Changer	Changer ≥ 4	All patients	Changer	Changer ≥ 4
0.78	0.42	0.96	1.54	0.05	0.16	0.34
0.53	0.52	0.94	1.46	0.07	0.14	0.27
0.51	0.39	0.81	1.24	0.01	0.02	0.01
0.41	0.56	1.42	4.36	0.04	0.11	0.21

ferences between admission and discharge, a change-score of averagely 1.1 points for all patients could be obtained. In comparison, patients who changed during rehabilitation showed a change score of averagely 3.2 points in a positive or negative direction, and patients who changed on a clinically relevant level even 7.2 points (see table 2). Differences between admission and discharge were on a statistically significant level for all patients who changed. The calculation of *effect size* statistics were conducted on the basis of the determined patient-groups of all patients, patients who changed and patients who changed on a clinically relevant level. The results of the *effect size* calculation according to Kazis³⁹ are visible in table 2. The calculation yielded a value of 0.10 for the group of all patients, 0.24 for patients who changed and 0.49 for patients who changed on a clinically relevant level. In comparison, the *standardized response means* according to Liang⁴⁰ were between 0.41 and 1.46 for the different patient groups. *Effect sizes* for the *paired-samples t-test* were calculated as well³⁷, with an *eta squared* value of 0.03 for the group of all patients. For the group of patients with changes, *eta squared* was 0.10 and for the groups of patients who changed on a clinically relevant level 0.19 and thus clearly higher (see table 2).

The second aspect of this study was to determine if the CDS-R is able to differentiate between patients who change due to rehabilitative treatment or care and those who do not change. For this purpose, group comparisons related to the mean sum- and change-scores were performed. The results of this analysis are shown in table 2. The differences between the groups of changers and the group of non-changers were on a statistically significant level at the times of admission and discharge as well as in terms of change-scores. When calculating the *effect sizes*, patients with changes showed significantly higher values than all other patients (see table 2).

The third aspect of the study was to determine the responsiveness of the CDS-R related to different disease-groups. The results are presented in table 3. When looking at differences between admission and discharge, the highest change-score showed patients with diseases of the circulatory system. The calculation of the *effect size* according to Kazis³⁹ for the group of patients who changed on a clinically relevant level yielded values between 0.41 and 0.78, with highest values for patients with diseases of the musculoskeletal-system. In comparison, the *standardized response means* according to Liang⁴⁰ were between 1.24 and 4.36 for patients who changed significantly, with the highest value for patients

with injuries and fractures. The *effect sizes* for the *paired-samples t-test* were calculated as well, with highest *eta squared* values for patients with diseases of the musculoskeletal and circulatory systems.

DISCUSSION

The evaluation of treatment and care requires assessment instruments which are able to detect clinically relevant changes³⁸ as well as to differentiate between patients who improve due to treatment or care and those who do not improve. The results of this study indicate that the CDS-R is able to detect such changes as well as to differentiate between patients who change and patients who do not change during rehabilitation.

To identify if the scale is able to detect clinically relevant changes, *effect sizes* were calculated. According to *Cohen's arbitrary criteria*⁴¹, *Kazis' effect sizes* can be considered as of small effect for all patients and patients who changed as well as of moderate effect for patients who changed on a clinically relevant level. Additionally the *standardized response means* according to Liang⁴⁰ were calculated and demonstrate much higher values than the *effect sizes* according to Kazis³⁹. When interpreting the results based on Cohen⁴¹, the interpretation leads to another conclusion. Based on this classification, the values can be considered as of large effect for all patients who changed.

Since there was no clear answer related to the level of *effect sizes*, *eta squared* values were calculated as well. As recommended by Cohen⁴⁴, *eta squared* can be interpreted for the group of all patients as of small effect. For the group of patients who changed on a clinically relevant level, an *eta squared* value of 0.19 can be interpreted as of large effect. In general it is obvious that within these three statistical procedures an increase of the change-scores is related to an increase of *effect size* values, which demonstrates the responsiveness of the scale.

In addition to *effect sizes* statistics, significance tests were conducted as well. According to the calculation of the *Wilcoxon Signed-Rank Test*, the differences between admission and discharge were on a statistically significant level. Therefore it can be concluded that the CDS-R is able to detect changes over time due to rehabilitative treatment and care by means of care dependency sum-score values.

The above-named statistical procedures showed the ability of the CDS-R to detect clinically relevant changes. Nevertheless, the level of responsiveness could not be clearly distinguished. In that context, the arguments of Hevey and McGee³⁸ have to be discussed which recommend to interpret *effect size* values with caution. “*The effect size statistics itself cannot tell us everything about the aspects we want to know about the clinical significance*”³⁸ and is furthermore often related to the time of assessment, the phase of rehabilitation or specific populations^{12,43}. Therefore, further investigations in other rehabilitation settings seem to be important in order to receive more insights relating to the *effect sizes*. Also, examining responsiveness in a competitive way with other assessment instruments, like Putten et al. suggest⁶, seems to provide the best indication of relative responsiveness. Therefore a comparison with other assessment instruments, like the Barthel Index or the FIM, might provide more information about the responsiveness of the Care Dependency Scale in the rehabilitation setting.

Putten et al.⁶ considered furthermore that the responsiveness of an instrument seems to be disease-dependent. For this reason, detailed analyses were performed for different disease-groups. In this context patients who changed on a clinically relevant level showed clearly higher values than those who did not. Constantly large *effect size* values could be identified for patients with diseases of the musculoskeletal-system. Within the other disease-groups the level of responsiveness was quite high as well. Nevertheless, for the other disease-groups a clear assignment to a specific level of responsiveness was not possible. Therefore a statistical point of view seems to suggest that the CDS-R is more promising in its responsiveness for patients with diseases of the musculoskeletal-system and therefore more recommendable for orthopaedic units. Nevertheless, high *effect size* values could be also obtained for the other disease-groups. This fact argues for the responsiveness of the scale independently from the disease-group, which would allow to apply the CDS-R for assessing patient changes in different rehabilitation settings. To confirm this assumption, further investigations related to different disease-groups seem to be important, especially due to the fact that the samples in terms of specific diseases were quite small.

In this context further limitations of this study have to be mentioned. Like the analysis of the study sample showed, the proportion of the care-independent group was quite high. Relevant clinical changes for this patient group could

not be expected. Only a part of the rehabilitation patients experienced care dependency due to disabilities, severe acute or chronic diseases. For this patient group the application of the CDS-R seems to be very useful, like discussions with health-care practitioners showed. In particularly colleagues in the UK, who work with highly care-dependent patients, described the CDS-R as a useful instrument for the comparison of patient changes, whether weekly, between admission and discharge or from admission to readmission³³. They furthermore highlighted the possibility of the CDS-R not only to give information about rehabilitation needs and changes by analysing sum-scores, but also on an item-by-item basis³³. Due to these insights, it is recommended to conduct this study in rehabilitation units or centres with a higher number of care-dependent patients who have a higher likelihood of changing under rehabilitation than independent patients. In addition, it seems to be important to analyse differences and *effect sizes* on single item level. This is especially due to the fact that one point difference, e.g. in terms of eating and drinking or mobility, could imply a significant clinical change, but does not really constitute a relevant difference on a sum-score-level.

The results of the study are furthermore limited by the cut-off point of ≥ 4 points which defines a clinically relevant change. This cut-off point was based on the experiences of healthcare practitioners and analyses of patient records and may differ due to several user perspectives. Other healthcare practitioners might define a clinically relevant change by means of another cut-off point. Wallace et al.⁴³ also discussed this aspect within their study and highlighted the issue of defining a clinically relevant difference, especially since there is no golden standard for it. For this reason, investigations regarding the matter of clinical changes as experienced by healthcare practitioners or patients would be recommended in order to gain more insights into the aspects of the ability of the CDS-R to detect such changes.

CONCLUSIONS

In spite of its limitations, this study provides a first and valuable insight into the aspect of responsiveness for the Care Dependency Scale in the rehabilitation setting. The results indicate that the scale has indeed the ability to discriminate between patients who change under rehabilitation and patients who do not. Furthermore, the results indicate that the scale is able to detect clinically relevant changes in terms of care dependency over time by means of care de-

pendency sum-score values. Therefore, the CDS-R seems to be an appropriate instrument for the assessment of treatment and health-care effectiveness as well as to measure intra-individual changes in terms of care dependency of different rehabilitation groups. Nevertheless further research is recommended to confirm the level of responsiveness of the scale in general and for different rehabilitation groups.

ACKNOWLEDGEMENTS

The authors acknowledge the support of the participating rehabilitation centre and staff as well as the team of the Institute for Medical Informatics, Statistics and Documentation of the Medical University of Graz, Austria.

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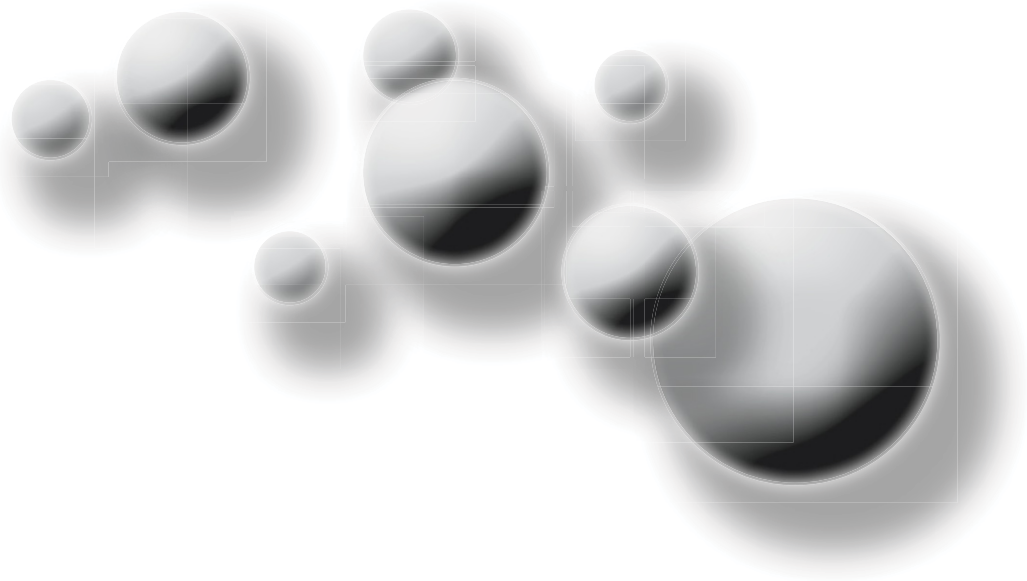


Chapter 7

Comparison of the responsiveness of the Care Dependency Scale for Rehabilitation and the Barthel Index

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Accepted for publication in: *Clinical Rehabilitation* 2011



ABSTRACT

Objective: The aim of the study is to compare the responsiveness of the Care Dependency Scale for Rehabilitation (CDS-R) and the Barthel Index in rehabilitation.

Design: A longitudinal study was performed over 6 months (2007-2008) where patients were assessed using the scales after admission and before discharge.

Setting and subjects: A convenience sample of 1542 patients was recruited in an Austrian rehabilitation centre.

Measures: The Care Dependency Scale for Rehabilitation and the Barthel Index

Data analysis: Responsiveness was determined by descriptive analysis, significance tests and calculation of *effect sizes*.

Results: For the group of all patients, the calculation according to Kazis yielded values of 0.10 for both instruments. For the group of patients who showed clinically relevant changes, values of 0.50 were obtained for the Care Dependency Scale for Rehabilitation and 1.06 for the Barthel Index. For the group of all patients, the calculation according to Liang yielded values of 0.42 for the Care Dependency Scale for Rehabilitation and 0.34 for the Barthel Index. For the group of patients who showed clinically relevant changes, values of 1.47 were obtained for the Care Dependency Scale for Rehabilitation and 1.92 for the Barthel Index.

Conclusion: The Barthel Index seems to be slightly more responsive than the Care Dependency Scale for Rehabilitation, and both instruments seem to be appropriate for the assessment of patients' changes over time. Nevertheless, the exact level of responsiveness could not be clearly identified for both instruments. To confirm the level of responsiveness, further research is recommended.

INTRODUCTION

The improvement and change of patients' functional status and the increase of independency is one of the main objectives in rehabilitation ^{1,2}. In this context, the assessment of treatments and health care effectiveness plays an essential role and is widely accepted as central to good clinical practice ^{3,4}.

In order to assess treatment and care, we are in need of reliable and valid standardised assessment instruments. The existence of these psychometric properties is beyond controversy and generally seen as indispensable for a good instrument. To assess aspects like improvement or patient changes due to treatment and care, we are furthermore in need of instruments which are responsive, or in other words, which are able to accurately detect clinically relevant changes over time, even if those changes are small ^{5,6}.

In spite of this elementary quality, responsiveness is less frequently studied than an instrument's reliability or validity ^{5,7}. In addition, fewer studies which compare the responsiveness of different instruments have been carried out. Especially in decisions about which instrument should be applied within the institution or a research study, it is important to know which instrument has a higher ability to detect patient changes and differences over time.

Also related to the Care Dependency Scale for Rehabilitation and the frequently used Barthel Index, responsiveness has only been studied to a limited extent and no comparison between both instruments has been made until now.

For this reason, the present study was conducted aiming to compare the responsiveness of the Care Dependency Scale for Rehabilitation with the Barthel Index. In this context the following question should be answered: Which instrument is most appropriate in rehabilitation for evaluating patient changes over time?

METHODS

Study design and data collection

To determine aspects of responsiveness, a longitudinal study was performed in an Austrian rehabilitation centre specialising in the treatment and care of neurological and orthopaedic patients. Before data collection, all nurses were trained by the first author in a 2.5-hour group-workshop to ensure the correct use of the

Care Dependency Scale for Rehabilitation. At this point of time the application of the Barthel Index was well known to the nurses.

After practising the use of the Care Dependency Scale for Rehabilitation for six months, the data collection process scheduled for a period of 6 months was performed in 2007 and 2008. All patients who met the inclusion criteria, which were defined as having given informed consent, being adult (age ≥ 18 years) and being able to understand the German language, were assessed with both instruments after admission and before discharge (week 4 - 6). Owing to restrictions of the ethical committee it was furthermore not possible to include cognitively impaired patients within the study. The absence of cognitive impairment was assessed via clinical expertise (based on the occurrence of orientation in terms of time, location and/or personal identity) and/or documented medical diagnoses (e.g. dementia or Alzheimer's disease).

To perform the study in that way, ethical approval was obtained from the Ethics Committee of the Medical University of Graz. The study was conducted with the cooperation of the nurses and their nursing director. All nurses of the rehabilitation centre were fully informed about the study via oral presentation and written information. After admission, the nurses informed all patients who met the inclusion criteria about the study and provided them with additional written information. Nurses and patients consented in written form. Afterwards, the scales were completed for each patient, then the data were made anonymous and electronically transmitted to the researchers.

Research instruments

The Care Dependency Scale for Rehabilitation and the Barthel Index are short assessment instruments measuring activities in daily living and the need for care. Both instruments have been comprehensively tested regarding their reliability and validity ⁸⁻¹¹.

The Care Dependency Scale for Rehabilitation ⁸ measures 16 aspects by means of a 5-point Likert Scale. Obtainable sum-scores range between 16 and 80 points, with smaller values indicating higher degrees of care dependency. Related to the sum-score of the scale, clinically relevant changes occur when the sum-score changes by 4 points or more. This cut-off point was identified via discussions with nurses and experts in the field of rehabilitation. Additionally,

some patients' records, including their scale values, were reviewed in advance to compare them to changes experienced by the responsible nurses.

The same procedure was applied to the Barthel Index and yielded the conclusion that a clinically relevant change occurs when the sum-score changes by 15 points or more. In comparison to the Care Dependency Scale for Rehabilitation, the original Barthel Index¹² consists of 10 items, which are scored in five-point increments, with possible sum-scores ranging from 0 (totally dependent) to 100 (totally independent)^{11,12}.

Data analysis

A statistical analysis was performed by using SPSS version 18.0 for Windows (Chicago, IL, USA). Baseline characteristics of all included patients were analysed by means of descriptive statistics. To investigate the responsiveness of both instruments, a differentiated data analysis based on different patient groups was performed in accordance with Wallace et al.². The patient groups were constituted as non-changers, patients who changed and patients who changed on a clinically relevant level. A clinically relevant change was defined to occur when the sum-score of the Care Dependency Scale for Rehabilitation changes by 4 points or more in a positive or negative direction, and regarding the Barthel Index by 15 points or more.

For the purpose of verifying responsiveness, calculations of *effect sizes* according to Kazis et al.¹³ and according to Liang et al.¹⁴ were performed. The *effect size* according to Kazis was calculated by taking the mean change of a variable divided by the standard deviation of that variable at the time of admission^{1,13}. For calculating the *effect size* according to Liang et al., the mean change of a variable was divided by the standard deviation of the mean change^{1,14}. The resulting values were interpreted according to *Cohen's arbitrary criteria*, where values of 0.2 are considered as having small effect, 0.5 medium and 0.8 large effect¹⁵. Based on these values and the interpretation according to *Cohen's arbitrary criteria*, a comparison of both instruments was performed within this study.

RESULTS

At the time of data collection, 1627 patients were treated in five different wards. 61 patients were excluded from the study due to their not fulfilling the mentioned

criteria and missing values occurred in 24 cases. Finally, data from 1542 patients could be used for analysis. 839 of these patients were female (54.4%). The average age was 61.0 years (SD=14.8), ranging from 19 to 95 years. 562 of the patients (36.4%) were treated on neurological and 977 (63.4%) on orthopaedic units. Three patients could not be associated to a special unit. The main diagnoses of all assessed patients were diseases of the musculoskeletal (N=818, 53.0%), circulatory (N=249, 16.1%) and nervous systems (N=211, 13.7%) as well as injuries and consequences of external causes (N=198, 12.8%).

According to the Care Dependency Scale for Rehabilitation, after admission the majority of patients obtained sum-scores between 68 and 80 points and could therefore be categorised as almost independent (n=1346, 87.3%). According to the Barthel Index, 1306 patients (84.7%) obtained sum-scores between 85 and 100 points after admission and could therefore be categorised as independent as well.

The mean sum-scores at admission and discharge as well as the change scores are shown in tables 1 and 2. In comparison, table 3 shows patients who changed according to both instruments and those who did not.

Table 3: Patients who changed regarding the Care Dependency Scale for Rehabilitation and the Barthel Index and those who do not

		Care Dependency Scale for Rehabilitation		
		Patients without changes	Patients with changes	Patients who changed ≥ 4
Barthel Index	Patients without changes	955	303	48
	Patients with changes	53	231	50
	Patients who changed ≥ 15	3	16	55

To compare the responsiveness of both instruments in rehabilitation, *effect sizes* were calculated. The results of the *effect size* calculation according to Kazis et al.¹³ are visible in table 4. For the group of all patients, the calculation yielded a value of 0.10 for both instruments. For the group of patients who changed, a value of 0.24 could be obtained for the Care Dependency Scale for Rehabilitation and 0.48 for the Barthel Index. In comparison, for patients who changed on a clinically relevant level, a value of 0.50 could be obtained using the Care Dependency Scale for Rehabilitation and 1.06 for the Barthel Index.

Table 1: Care Dependency Scale for Rehabilitation (CDS-R) sum-scores and change scores for different patient groups

Assessment	All patients (N=1542)		Patients without changes (N=1008)	
	Mean	SD	Mean	SD
CDS-R admission	74.1	11.4	76.7	9.3
CDS-R discharge	74.7	11.0	76.7	9.3
CDS-R change scores	1.1	2.7	0.0	0.0

Table 2: Barthel Index sum-scores and change scores for different patient groups

Assessment	All patients (N=1542)		Patients without changes (N=1258)	
	Mean	SD	Mean	SD
Barthel Index admission	90.9	20.6	94.3	18.3
Barthel Index discharge	92.3	19.3	94.3	18.3
Barthel Index change scores	2.0	5.9	0.0	0.0

Table 4: Responsiveness statistics for the CDS-R, the Barthel Index (BI) and CDS-R items which correspond to the Barthel Index (CDS-R/BI)* (based on different patient groups)

Statistical method	All patients			Patients who changed	
	CDS-R (N=1542)	BI (N=1542)	CDS-R/BI* (N=1542)	CDS-R (N=534)	BI (N=284)
Effect size according to Kazis	0.10	0.10	0.12	0.24	0.48
Standardized response mean according to Liang	0.42	0.34	0.41	0.86	1.14

* Calculation only for those CDS-R items which correspond to the Barthel Index (nutrition, continence, body posture, mobility, hygiene, getting dressed and undressed)

The *standardized response mean* according to Liang et al. ¹⁴ was also calculated. For the group of all patients, the *standardized response mean* was 0.42 for the Care Dependency Scale for Rehabilitation and 0.34 for the Barthel Index (see table 4). In comparison, for the group of patients who changed, a value of 0.86 could be obtained for the Care Dependency Scale for Rehabilitation and 1.14 for the Barthel Index. For patients who changed on a clinically relevant level, the *standardized response mean* was 1.47 for the Care Dependency Scale for Rehabilitation and 1.92 for the Barthel Index.

Comparison of the responsiveness of the CDS-R and the Barthel Index

Patients who changed (N=534)		Patients who changed ≥ 4 (N=153)	
Mean	SD	Mean	SD
69.1	13.3	60.5	14.6
70.7	12.8	64.3	14.5
3.2	3.7	7.2	4.9

Patients who changed (N=284)		Patients who changed ≥ 15 (N=74)	
Mean	SD	Mean	SD
75.6	22.9	57.4	21.6
83.5	21.2	74.1	21.4
11.0	9.6	23.0	12.0

CDS-R/ BI* (N=393)	Patients who changed on a clinically relevant level		
	CDS-R (N=153)	BI (N=74)	CDS-R/BI* (N=71)
0.41	0.50	1.06	0.92
1.15	1.47	1.92	2.21

When comparing both instruments, the calculation of Kazis' *effect size* and the *standardized response mean* yielded higher values for the Barthel Index (see table 4). When calculating Kazis' *effect size* and the *standardized response mean* only for those CDS-R items corresponding to the Barthel Index ('*nutrition*', '*continence*', '*body posture*', '*mobility*', '*hygiene*', '*getting dressed and undressed*'), higher values could be obtained (see table 4).

DISCUSSION

The results of this study indicate that both the Care Dependency Scale for Rehabilitation and the Barthel Index have the ability to detect patient changes during rehabilitation. Compared to the Care Dependency Scale for Rehabilitation, the Barthel Index showed higher *effect size* values and therefore seems to be more responsive.

The requirement for a responsive instrument is the ability to detect clinically relevant changes. Therefore *effect size* statistics were performed. For the group of patients who changed on a clinically relevant level, the calculation of the *effect size* according to Kazis et al.¹³ yielded a value of 0.5 for the Care Dependency Scale for Rehabilitation and 1.06 for the Barthel Index. According to *Cohen's arbitrary criteria*¹⁵, the values of this group can be considered as of moderate effect for the Care Dependency Scale for Rehabilitation and as of large effect for the Barthel Index. When comparing the results concerning the Barthel Index with previous studies, e.g. of Wallace et al.², a value of 0.48 was found for the group of changers. This result is in accordance with the present study and supports its significance. Within other studies, values between 0.37 and 1.19 could be obtained for patient groups with different medical diagnoses^{1, 16, 17}. These studies did not differentiate between groups of changers and non-changers, wherefore the possibility of comparison with the present results is limited.

Calculation according to Liang et al.¹⁴ was also conducted and yielded higher values comparing to Kazis' *effect sizes*. According to *Cohen's arbitrary criteria*¹⁵, values can be considered as of large effect for both instruments regarding the group of clinically relevant changers. When comparing the results concerning the Barthel Index with the study of Wallace et al.², a value of 0.86 was found for the group of changers. Within the study of de Groot et al.¹⁷ values between 0.68 and 0.98 were found. These results can be interpreted as of large effect, which is in accordance with the present study and supports its significance. However, it is obvious that the calculated *standardized response means* related to patients who changed are higher for the Barthel Index than for the Care Dependency Scale for Rehabilitation.

Based on the applied statistical procedures, the level of responsiveness could not be clearly identified for both instruments. Only in terms of the group of patients who changed on a clinically relevant level, a clear assignment to a certain level was possible for the Barthel Index. Generally, within both responsiveness

statistics, the values of the Barthel Index relating to patients who changed were higher than the values of the Care Dependency Scale for Rehabilitation (see table 4), suggesting that the Barthel Index is more promising with regard to responsiveness.

A possible explanation may lie in the different scoring systems. The Care Dependency Scale for Rehabilitation consists of a 5-point Likert Scale. In comparison, the Barthel Index has fewer discriminatory points and is therefore less influenced by observer and scoring errors. For this reason the Barthel Index might be more responsive. Furthermore, the Barthel Index consists of 10 items with possible sum-scores between 0 and 100. The Care Dependency Scale for Rehabilitation, on the other hand, consists of 16 items with possible sum-scores between 16 and 80. A change in terms of one item means a change of 5 points for the Barthel Index and only 1 point for the CDS-R. According to de Groot et al ¹⁷ this situation may influence change scores and the associated standard deviations and could explain the differences within the calculated *effect sizes*.

An additional explanation for different *effect size* values may be attributed to differences regarding the content. The Barthel Index, for instance, is an assessment instrument focusing only on physical aspects. In contrast, the Care Dependency Scale for Rehabilitation focuses on psycho-social aspects as well. This structure might influence responsiveness calculations. According to de Groot et al ¹⁷, relationships between diseases and physical limitations might be stronger than the influence of psycho-social limitations. This could be particularly relevant for the present study, since the sample contains mainly orthopaedic patients. This assumption could be confirmed by the results of the *effect size* calculations performed only for those items of the Care Dependency Scale for Rehabilitation which correspond to the Barthel Index. Like table 4 shows, the values are much higher than the values for the complete scale. This supports the assumption that *effect size* calculations can be related to particular diseases ¹⁻³. For this reason, further investigations in other rehabilitation areas are seen as vitally relevant in order to analyse responsiveness regarding physical and psycho-social aspects.

Further investigations are also recommended due to the limitations of this study. Within this study, the proportion of the care-independent group was quite high and relevant clinical changes could not be expected for this patient group. For this reason, it is recommended to conduct this study in various rehabilitation settings with a higher number of care-dependent patients who have a

higher chance of changing under rehabilitation. The study is also limited since cognitively impaired patients, who often show a high level of care dependency, could not be included. For this reason, the results of this study cannot be applied to this patient group and investigations with cognitively impaired patients are strongly recommended.

The results are furthermore limited by the defined cut-off points of ≥ 4 and ≥ 15 . These cut-off points are based only on the opinions of selected experts and a few case studies and may differ, like Wallace et al. ² described in their study, owing to different user perspectives and experiences. For this reason, investigations in terms of experienced clinical changes are recommended to gain more insights into the responsiveness of both instruments.

Nevertheless, the present study provides a first comparative insight into the responsiveness of the Care Dependency Scale for Rehabilitation and the Barthel Index. The results of this study indicate that both instruments have the ability to detect clinically relevant changes during rehabilitation. Therefore, both instruments seem to be applicable within rehabilitation practice for the assessment of patients' changes over time. At the moment the Barthel Index seems to be more promising with regard to responsiveness, but the *effect size* values for both instruments did not allow a clear assignment to a specific level of responsiveness. For this reason further research in other rehabilitation settings with various patient and disease groups is recommended to confirm the level of responsiveness for both instruments.

Clinical message

- The Barthel Index seems to be slightly more responsive than the Care Dependency Scale for Rehabilitation.
- Both instruments, however, have the ability to detect clinically relevant changes and therefore seem applicable within rehabilitation practice for the assessment of patients' improvement and changes over time.

ACKNOWLEDGEMENTS

The authors acknowledge the support of the participating rehabilitation centre and staff as well as the team of the Institute for Medical Informatics, Statistics and Documentation of the Medical University of Graz, Austria.

FUNDING STATEMENT

This research received no specific grant from any funding agency in the public, commercial, or non-for-profit sectors.

ETHICAL APPROVAL

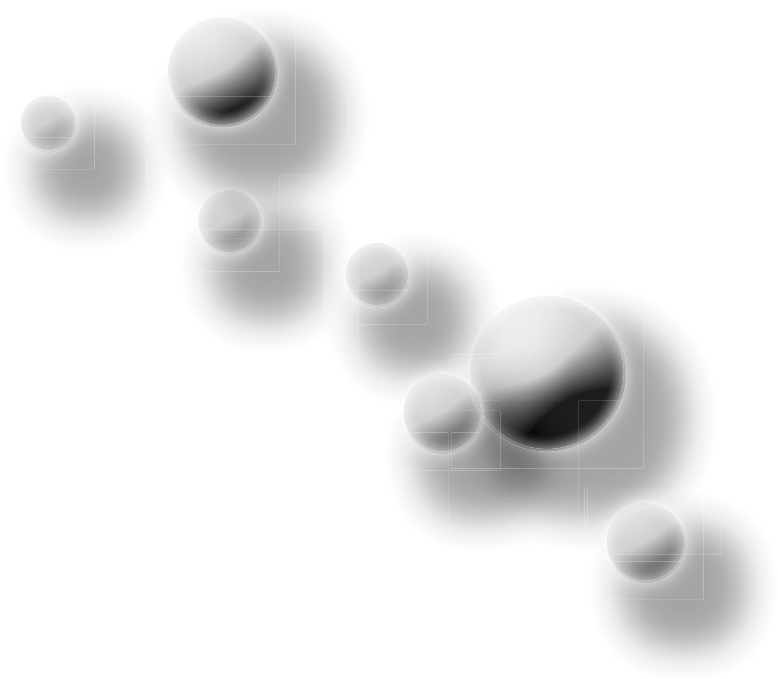
The study was proved by the ethics committee of the Medical University of Graz, Austria (Ethic commission number: 18-274 ex 06/07).

CONFLICT OF INTEREST

None declared.

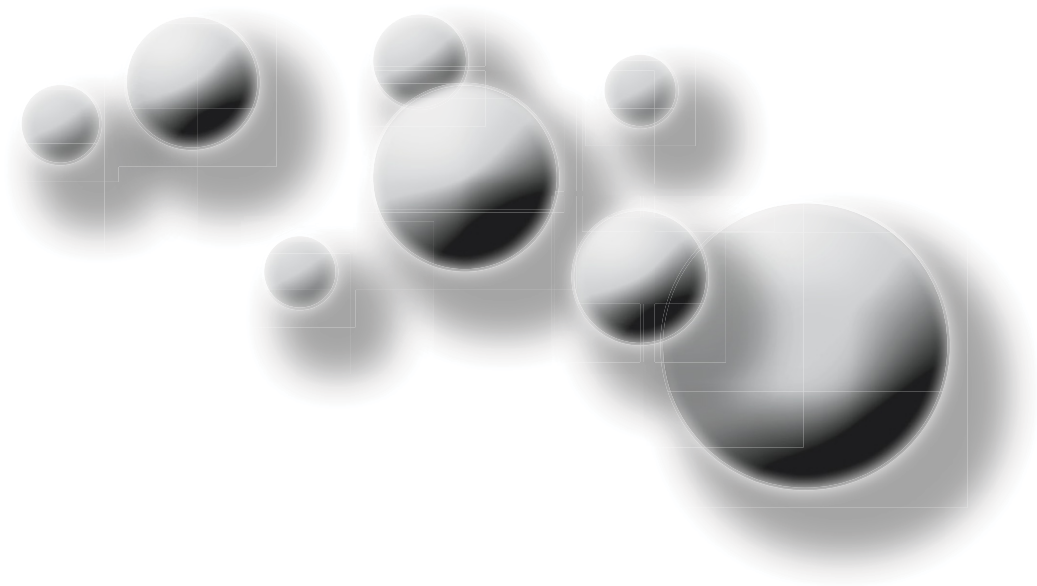
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Chapter 8

General reflections



GENERAL REFLECTIONS

This chapter briefly summarises, concludes and discusses the main findings of the doctoral thesis. Finally, the chapter concludes with implications for future research and clinical practice.

INTRODUCTION

The experience of physical or psychological limitations can affect every person at one point in their lives. The reasons for this may include illness, chronic diseases, injuries or psychological changes ¹. Serious consequences of these situations are functional and/or psychological impairments or the development of disabilities ¹, which are often associated with an increase of (care) dependency ². This situation is avoidable or reducible by prevention, medical and rehabilitative treatment ³ and nursing care. To compensate (care) dependency and to reduce the impact of disabling and handicapping conditions, nurses have to have a comprehensive knowledge of the needs and abilities of the persons they care for. For this reason nurses are in need of appropriate assessment instruments.

This doctoral thesis deals with an instrument for the rehabilitation setting which is meant to be able to assess the care dependency of rehabilitation patients – the Care Dependency Scale for Rehabilitation (CDS-R). The psychometric properties and clinical utility of the Care Dependency Scale in the rehabilitation setting were investigated in a series of studies.

SUMMARY OF THE FINDINGS

The main findings of studies I to IV are summarised in table 1.

Study I emphasises the investigation of the reliability and validity of the CDS-R. For this reason *Cronbach's alpha* was calculated yielded a value of 0.97. *Kappa* values were between 0.89 and 0.96, values of *percentage agreement* between 96% and 99%, ICC values were between 0.94 and 0.99, and SEM values were between 0.08 and 0.17. The correlation of the CDS-R scores with those of the Barthel Index ⁴ leads to a *Pearson (r)* of 0.88. The factor analysis revealed a one-factor solution.

The focus of study II was on how nurses evaluate the clinical utility of the CDS-R in daily nursing rehabilitation practice. The analyses of the closed and open-

Table 1: Methodological overview study I to IV

	Study I	Study II
Topic	Psychometric properties of the CDS-R	Clinical utility of the CDS-R and psychometric testing of the Staff View assessment Instrument (SVAI)
Design	Cross-sectional	Cross-sectional
Setting	1 Austrian rehabilitation centre (specialised on neurology and orthopaedics)	3 Austrian health care institutions (specialised on geriatric, neurological and orthopaedic rehabilitation)
Sample	1197 patients and 42 nurses	118 nurses
Data collection	During 6 months in 2007-2008, patients were assessed at one point of time with the CDS-R independently by a different set of two randomly selected nurses	During 2 weeks in September/October 2009, nurses evaluated the clinical utility of the CDS-R with the SVAI
Data analysis	<p>Internal consistency: Cronbach's alpha: 0.97 Corrected item correlation: 0.63 - 0.88</p> <p>Equivalence: Cohen's kappa: 0.89 - 0.96 Percentage agreement: 96.1% - 99.3% Intraclass correlation coefficient: 0.94 - 0.99 Standard error of measurement: 0.08 - 0.17</p> <p>Criterion-related validity: Pearson's (r): 0.88 Determination coefficient: r^2: 0.77</p> <p>Construct validity: <i>Principal components analysis</i> revealed a one-factor solution</p>	<p>Internal consistency SVAI: Cronbach's alpha: 0.95 Corrected item correlation: 0.64 - 0.80</p> <p>Construct validity SVAI: <i>Principal components analysis</i> revealed a one-factor solution</p> <p>Clinical utility CDS-R: Most nurses agree that the CDS-R is a clinically useful instrument, improves communication and cooperation within the nursing team and is easy and quick to use/analyse/interpret.</p>

Study III	Study IV
Responsiveness of the CDS-R	Comparison of the responsiveness of the CDS-R and the Barthel Index
Longitudinal	Longitudinal
1 Austrian rehabilitation centre (specialised on neurology and orthopaedics)	1 Austrian rehabilitation centre (specialised on neurology and orthopaedics)
1564 patients and 42 nurses	1542 patients and 42 nurses
During 6 months in 2007-2008, patients were assessed with the CDS-R after admission and before discharge	During 6 months in 2007-2008, patients were assessed with the CDS-R and the Barthel Index after admission and before discharge
<p>Differences between admission and discharge: Occurred on statistically significant levels</p> <p>Kazis' effect sizes: 0.24 / 0.49</p> <p>Liangs' standardized response means: 0.86 / 1.46</p> <p>Eta squared values: 0.10 / 0.19</p> <p>Responsiveness-analyses of different disease-groups: Constantly large effect sizes for patients with musculo-skeletal-disorders</p>	<p>Kazis' effect sizes: CDS-R: 0.10 / 0.50 Barthel Index: 0.10 / 1.06</p> <p>Liangs' standardized response means: CDS-R: 0.42 / 1.47 Barthel Index: 0.34 / 1.92</p>

ended questions showed that most nurses agree that the CDS-R is a clinically useful instrument, improves communication and cooperation within the nursing team, and is easy and quick to use, to analyse and to interpret.

Another aspect of study II was the modification, application and psychometric testing of the Staff View Assessment Instrument (SVAI). For the SVAI, *Cronbach's alpha* was 0.95. The *corrected item-total correlation* for all items was between 0.64 and 0.80. The *principal components analysis* revealed a one-factor solution.

Study III focussed on the responsiveness of the Care Dependency Scale in the rehabilitation setting (CDS-R). The calculation according to Kazis⁵ yielded values of 0.24/0.49 for patients who changed, and 0.86/1.46 according to Liang⁶. *Eta squared* was 0.10/0.19 for patients who changed. In addition, all differences between admission and discharge occurred at statistically significant levels for patients who changed (*p-value*<0.001). Responsiveness-analyses related to different disease-groups showed constantly large *effect sizes* for patients with musculoskeletal-disorders.

In Study IV, emphasis was placed on comparing the responsiveness of the CDS-R with the well-known and commonly used Barthel Index⁴. For the group of all patients, the calculation according to Kazis⁵ yielded values of 0.10 for both instruments. For the group of patients who changed clinically relevant, values of 0.50 could be obtained for the CDS-R and 1.06 for the Barthel Index. For the group of all patients, the calculation according to Liang⁶ yielded values of 0.42 for the CDS-R and 0.34 for the Barthel Index. For the group of patients who changed clinically relevant, values of 1.47 could be obtained for the CDS-R and 1.92 for the Barthel Index.

GENERAL CONCLUSION

The overall aim of this doctoral thesis was to investigate the psychometric properties and to evaluate the clinical utility of the Care Dependency Scale in the rehabilitation setting (CDS-R). With regard to the results of studies I to IV, it can be concluded that the investigations of this thesis confirmed the psychometric quality and clinical utility of the CDS-R.

The CDS-R showed a high level of internal consistency and equivalence. Furthermore, strong evidence for criterion-related validity and satisfactory results regarding construct validity were ascertainable.

Furthermore, the studies showed positive results regarding the clinical utility of the CDS-R. Especially in comparison to other instruments, the CDS-R is regarded as more differentiated, significant and precise as well as more comprehensive and individual in assessing patients' care dependency in rehabilitation. In the context of evaluating the clinical utility, a Staff View Assessment Instrument (SVAI) was modified and tested. It was found that the SVAI enables an evaluation of the clinical utility of the CDS-R.

The analysis of responsiveness indicates that the CDS-R can detect patient changes over time and discriminates between patients who change under rehabilitation and those who do not. For this reason, the CDS-R seems to be appropriate for the evaluation of individual patient changes. When comparing the CDS-R and the Barthel Index ⁴ regarding responsiveness, the analysis demonstrates that the Barthel Index seems to be slightly more responsive than the CDS-R. Nevertheless, the exact level of responsiveness could not be clearly identified for both instruments.

Based on these results, it can be stated that the CDS-R is a reliable, valid, responsive and clinically useful instrument for the assessment of patient care dependency in rehabilitation.

GENERAL DISCUSSION OF THE FINDINGS

The studies of this thesis provide an insight into the psychometric properties and clinical utility of the Care Dependency Scale in the rehabilitation setting (CDS-R). The relevance of the studies for the body of knowledge and rehabilitation practice will be discussed in the following sections.

Relevance of the item '*ability to cope*'

For the field of rehabilitation, the Care Dependency Scale was modified by adding the item '*ability to cope (psychological/emotional)*'. In regard to this, the following questions arise: was the addition of a new item necessary and does it make a difference regarding the level of care dependency or the psychometric properties of the scale?

According to descriptive statistical analysis, patients were in general not more or less dependent when the item '*ability to cope*' was added. Investigations of the psychometric properties, with and without the item '*ability to cope*', showed satisfactory results for the scale. From a statistical point of view, the modification of the Care Dependency Scale therefore seems neither necessary nor important.

On the other hand, this statistical circumstance can be advantageous. First of all, this situation provides the possibility to use the CDS-R for comparisons of patients' care dependency between different settings. The item '*ability to cope*' merely needs to be excluded for such a purpose. This strategy can be helpful also for an application of the CDS-R within the moving, transfer and discharge of patients as well as for communication with nurses in other settings.

From a professional point of view, the integration of the item '*ability to cope*' is seen as necessary and important⁷ for a comprehensive assessment and nursing care in rehabilitation. The considerations of '*ability to cope*' can help to sensitise nurses to situations where patients are suffering from chronic diseases, disability and dependency. This can help, furthermore, to empower and support patients regarding the management of their problems⁷. To confirm the practical relevance of the item '*ability to cope*' from practitioners' perspectives, further studies are recommended. Whether this item can be seen as a rehabilitation-specific item or also appropriate in other settings of nursing care also needs further investigation.

Relevance of the investigations in terms of the CDS-R

The application of the Care Dependency Scale in the field of rehabilitation was quite new, and only some first experiences from colleagues in the UK were available⁷. For this reason, the investigation of the scale's psychometric properties and clinical utility was deemed to be important to guarantee the quality, adequacy and practicability of the instrument in this setting. The studies of this doctoral thesis confirmed the reliability, validity, responsiveness and clinical utility of the scale. It can be concluded that the application of the modified scale in rehabilitation can be recommended.

Despite the positive results, it has to be argued that the application range of the CDS-R is limited. The psychometric testing was only conducted for the orthopaedic and neurological setting. On the other hand, orthopaedic and neurologi-

cal diseases are frequent reasons for disabilities and functional impairments ⁸, thus making the choice of such a rehabilitation setting appropriate. Nevertheless, the psychometric properties for other rehabilitation settings cannot be automatically concluded. However, it can be assumed that comparable results will be obtained for other settings as well, since the results of the present investigations are comparable with previous studies (see table 2 and 3).

Table 2: Reliability of the German version of the Care Dependency Scale ¹⁴⁻¹⁷

	Homogeneity Cronbach's alpha	Interrater-reliability Cohen's kappa
Community care	0.96	0.41 - 0.64
Geriatrics	0.98	0.40 - 0.76
Hospital	0.95 - 0.98	0.50 - 0.70
Nursing home	0.94, 0.97	0.39 - 0.63
Paediatrics	0.91	0.57 - 0.80
Rehabilitation	0.97	0.89 - 0.96

Table 3: Validity of the German version of the CDS ¹⁴⁻¹⁷

	Criterion-related validity Pearson's (r)	Construct validity
Community care	-0.65	-
Geriatrics	+	-
Hospital	0.72 - 0.89	one-factor solution
Nursing home	-0.69	one-factor solution
Paediatrics	-0.86	one-factor solution
Rehabilitation	0.88	one-factor solution

Relevance of the Care Dependency Scale for the rehabilitation setting

A number of instruments in rehabilitation exist internationally for the assessment and evaluation of patients' self-care deficits, needs and resources. Currently, the Barthel Index ⁴ is one of the most frequently used instruments in rehabilitation. Nevertheless, the Barthel Index shows disadvantages compared to the CDS-R, since it focuses mainly on physical aspects. For this reason a comprehensive assessment of patients' physical and psycho-social needs, which constitutes the basis for appropriate interventions and an individual nursing care, is not possible. In comparison, the CDS-R includes psycho-social

aspects, such as '*communication*' and '*contact with others*' and the new item '*ability to cope*'.

For health care practitioners, practical issues are very relevant as well. In this context, this thesis identifies several advantages of the CDS-R in comparison to e.g. the Barthel Index (see chapter 5). The majority of the participating nurses stated that the CDS-R was more differentiated, significant and precise, more individual and comprehensive regarding the assessment of care dependency than the Barthel Index. In particular, the consideration of cognitive and psychological aspects was emphasised. Consequently, the CDS-R is a useful instrument in daily nursing rehabilitation practice and might be a better alternative to the Barthel Index for assessing and evaluating patients' care dependency during rehabilitation.

Relevance of the investigations in terms of the SVAI

In order to evaluate the clinical utility of the CDS-R, an existing questionnaire ⁹, which was used for the evaluation of the Residential Assessment Instrument / Minimum Data Set (RAI/MDS) ⁹, was modified and tested (see chapter 5). The result of this process was the Staff View Assessment Instrument (SVAI), which seems to be suitable for evaluating the clinical utility of the CDS-R.

Since the SVAI focuses on general aspects like assessment, care planning, nursing documentation, communication and cooperation related to care dependency, this instrument could be also conceivably evaluate the Care Dependency Scale in other settings of nursing care. The SVAI could also be relevant to evaluate other instruments, such as the Barthel Index ⁴ or the Functional Independence Measurement ¹⁰. The advantage of such applications lies in the evaluation of the clinical utility of the implemented instruments. Instruments which do not show clinical utility can be eliminated and replaced by appropriate instruments.

GENERAL RECOMMENDATIONS FOR FUTURE RESEARCH

In spite of the positive results of the investigations, further research is strongly recommended to gain more knowledge of the application and psychometric properties of the Care Dependency Scale in other rehabilitation settings.

Influence of training programmes on reliability

In terms of reliability, it was evident that in comparison to previous studies, the observer agreement was higher (see table 2, Interrater-reliability). This can be explained by the special training of the nurses, consisting of a 2.5-hour workshop, which had been conducted in such manner for the first time. It can thus be assumed that the 2.5-hour workshop might have had a positive influence on the level of agreement between the nurses. For this reason, it is recommended to evaluate the influence of the training programme in regard to the equivalence of the scale. Such insights can help to plan the implementation and to ensure the correct application of the scale in practice as well as the reliability of the collected data.

Responsiveness

Data regarding the responsiveness were collected by assessing patients' care dependency with the CDS-R after admission to and before discharge from the rehabilitation stay. The collected data were analysed by identifying differences between admission and discharge and by using statistical techniques such as the calculation of *effect sizes*.

Another possibility involves carrying out Randomised Control Trials (RCTs), where interventions are used to test the responsiveness of an instrument ¹¹. As a consequence of the first investigations conducted (see chapter 6 and 7), this can be recommended for future research.

To confirm the responsiveness of the CDS-R, it is moreover recommended to compare patients' or nurses' perspectives on the change of care dependency with the standardised assessment of the CDS-R. The reason lies in the fact that the collected data were analysed regarding specific cut-off points within the present studies (see chapter 6 and 7). These cut-off points are based on the opinions of selected experts in the field of rehabilitation and some case studies. Since it is possible that the cut-off points may differ owing to different user perspectives ¹², the results are limited and further investigations are recommended.

GENERAL IMPLICATIONS AND RECOMMENDATIONS FOR PRACTICE

A better understanding of care dependency can facilitate health care practitioners in recognizing the needs of their patients and to offer individual, patient-centred and comprehensive treatment and care. For this reason, health care practitioners are in need of appropriate, psychometrically tested and practical instruments. This chapter will present some implications regarding the CDS-R for the application in rehabilitation practice.

Before implementing an instrument in daily practice, it has to fulfil several quality criteria, such as reliability and validity (see chapter 1). Until now, most of the currently used instruments in the German-speaking area of rehabilitation have not been sufficiently proved in terms of these aspects. This situation can be seen as problematic, since only tested instruments can ensure the collection of adequate and qualitative data necessary for an appropriate planning of treatment and care. Otherwise it is possible that practitioners assess the same patient in a different way, resulting in different interventions. This situation can compromise a continuous rehabilitation process, and additional costs for the health care system can occur. For these reasons, practitioners need to implement well-validated instruments like the CDS-R.

To avoid the problem of a wrong or inconsistent assessment, it is furthermore suggested that assessment instruments, like the CDS-R, be applied on an interdisciplinary level. From British users it is known ⁷ that the assessment and communication as well as the planning and evaluation of interventions is enhanced by an interdisciplinary application of the CDS-R. For this reason it is strongly recommended to apply the scale in that way.

Another aspect for the rehabilitation practice is the improvement of patients' mental and functional status as well as the increase of independency ^{12, 13}. In this context, practitioners should detect changes of patients' functional status and care dependency during the whole rehabilitation process. Practitioners are thus in need of instruments which are responsive. This doctoral thesis provides positive insights into the responsiveness of the CDS-R and offers practitioners an instrument to document and show the clinical chances and outcomes of the rehabilitation process. The use of such outcomes can be very helpful in discussions about financial resources and support with social insurances or representatives of social and health care policy.

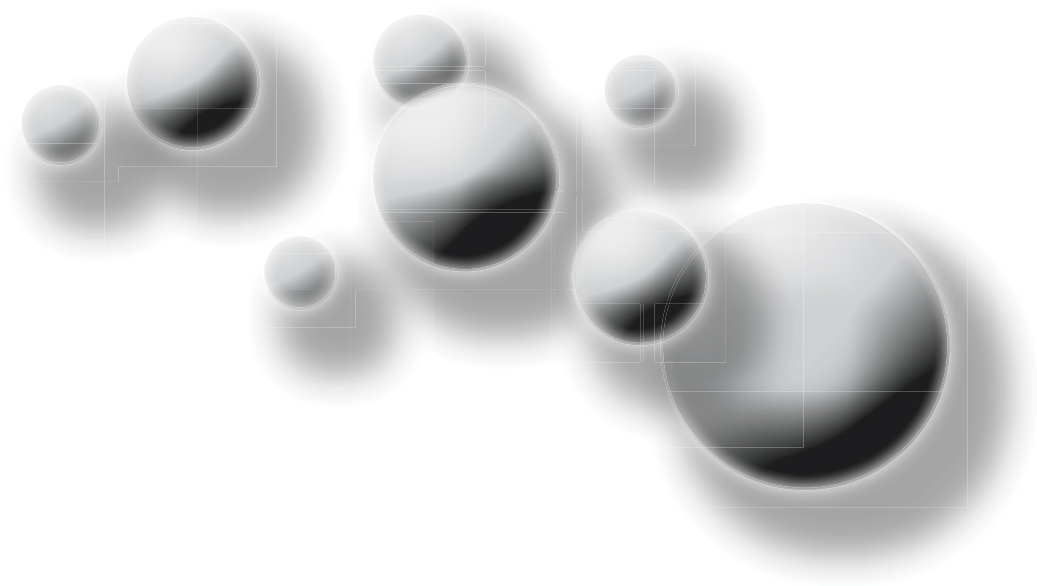
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Chapter 9

Summary



SUMMARY

The experience of physical or psychological limitations can affect every person at one point in their lives. The reasons for this may include, for example, (chronic) diseases, injuries or psychological changes which can induce care dependency. This situation can be prevented or ameliorated by rehabilitative treatment and care. For this reason, nurses have to be aware of the needs and abilities of the persons they care for and thus require appropriate assessment instruments to measure aspects such as self-care abilities, needs and dependency.

The present doctoral thesis deals with an instrument which should allow the care dependency of patients to be assessed in the rehabilitation setting – the Care Dependency Scale for Rehabilitation (CDS-R). In this context a series of studies were conducted on the psychometric properties of the scale and its clinical utility in rehabilitation.

The first chapter of the doctoral thesis provides an overview of the relationship between chronic diseases, disabilities and care dependency. The meaning of rehabilitation, the relevance of assessment and quality criteria of assessment instruments are described here. Examples of available assessment instruments in rehabilitation, the relevant research gap for this thesis and the overall research aim are presented.

Chapter two provides an insight into the background, architecture, psychometric properties and application of the Care Dependency Scale and its modified version.

Methodological aspects in terms of design, sample, setting, data collection and analysis of the conducted studies are gone into briefly in chapter three.

Chapter four emphasises the investigation of the reliability and validity of the CDS-R. To this end, a cross-sectional study with a convenience sample of 1197 patients was conducted in an Austrian rehabilitation centre over a period of 6 months in 2007/2008. To estimate aspects of reliability of the CDS-R, *Cronbach's alpha*, *Cohen's kappa*, *percentage agreement*, *intraclass correlation coefficient* and *standard error of measurement* were calculated. To evaluate the construct-validity, a factor-analysis was conducted. The criterion-related validity was examined by correlating CDS-R scores with scores of the Barthel Index via the *Pearson* calculation. The results of the investigations indicate that the

CDS-R has a high level of internal consistency and equivalence. Furthermore, strong evidence for criterion-related validity and satisfactory results regarding construct validity are ascertainable. Based on these, it can be argued that the CDS-R shows good psychometric properties and can be used as an assessment instrument to assess and evaluate the care dependency of rehabilitation patients.

The focus of chapter five was the investigation of how nurses evaluate the clinical utility of the CDS-R in daily nursing rehabilitation practice. A further aim of the investigation was the modification, application and psychometric testing of the Staff View Assessment Instrument (SVAI). For this purpose, a cross-sectional study was performed in three Austrian rehabilitation centres and the data of 118 nurses collected over a period of two weeks in 2009. To estimate aspects of reliability for the SVAI, *Cronbach's alpha* and the *corrected item-total correlation* were calculated and a factor analysis was carried out to investigate the validity of the scale. First, data regarding the clinical utility were analysed using descriptive statistical analysis in order to investigate the data of the closed questions. Second, content-analysis was performed to analyse the qualitative statements in the open-ended questions. The results of the investigations indicate that the SVAI enables the clinical utility of the CDS-R to be evaluated. The analysis of the data furthermore showed positive results regarding the clinical utility of the CDS-R. Most nurses agree that the CDS-R is a clinically useful instrument, improves communication and cooperation within the nursing team and is easy and quick to use, analyse and interpret. It can thus be recommended for application in daily nursing practice.

Chapter six focused on the responsiveness of the CDS-R, on which basis a longitudinal study was carried out in an Austrian rehabilitation centre over 6 months in 2007/2008. 1564 patients were assessed after admission and before discharge with the CDS-R. Responsiveness was determined by descriptive analysis, calculation of *effect sizes* and significance tests. The results of this investigation indicate that the CDS-R can detect patient changes over time and discriminate between patients who change under rehabilitation and those who do not. Furthermore, responsiveness analyses related to different disease groups were performed and showed constantly large *effect sizes* for patients with musculoskeletal disorders. In general, the results demonstrated that the CDS-R seems to be appropriate for the evaluation of patient changes during rehabilitation. Nevertheless, the values for the CDS-R did not allow a clear

assignment to a specific level of responsiveness. For this reason, it is recommended in chapter six that further research is carried out to confirm the level of responsiveness of the CDS-R in general and for different disease groups.

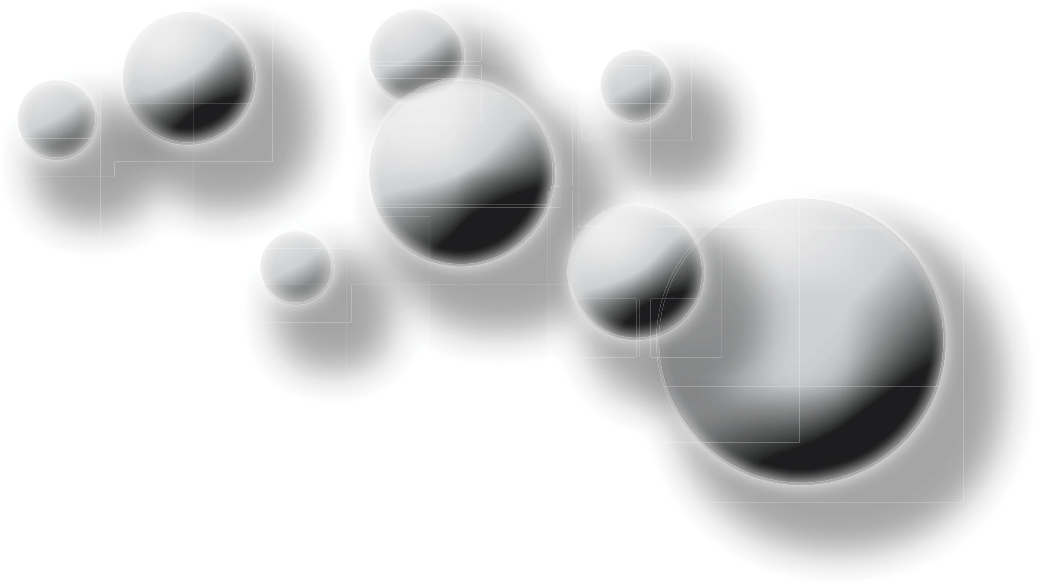
Chapter seven emphasises the comparison between the responsiveness of the CDS-R and the Barthel Index. To this end, a longitudinal study was carried out with a sample of 1542 patients. Data were collected in an Austrian rehabilitation centre over 6 months in 2007/2008 and patients were assessed after admission and before discharge with both instruments. The collected data were analysed by calculating *effect sizes*. The results of this study indicate that both instruments appear to be appropriate for the assessment of changes in patients over time. In chapter seven, it was demonstrated that the Barthel Index appears to be slightly more responsive than the CDS-R. Nevertheless, the exact level of responsiveness could not be clearly identified for both instruments. To confirm the level of responsiveness, further research was also recommended.

Chapter eight briefly summarises and discusses the main findings of the present doctoral thesis. The discussion focuses mainly on the relevance of the conducted modification of the Care Dependency Scale for the field of rehabilitation and the relevance of investigations of the psychometric properties and clinical utility. Additionally, the relevance of the CDS-R itself for the rehabilitation setting is discussed. Finally, the chapter concludes by revealing a number of implications and making recommendations for future research and clinical practice. The main aspects in this context are the influence of training programmes on the equivalence of the scale, conducting future responsiveness investigations, and the interdisciplinary application of the CDS-R in rehabilitation.



Chapter 10

Zusammenfassung



ZUSAMMENFASSUNG

Physische und psychische Einschränkungen kann jeder Mensch im Laufe seines Lebens erfahren. Gründe hierfür sind unter anderem in (chronischen) Erkrankungen, Unfällen oder psychischen Veränderungen zu suchen, welche zu Pflegeabhängigkeit führen können. Diese Situation ist vermeidbar oder reduzierbar, beispielsweise durch die Anwendung rehabilitativer Behandlung und Pflege. Hierzu gilt es, die Bedürfnisse und Fähigkeiten von Patienten und Patientinnen genau zu kennen. Aus diesem Grund benötigen Pflegende angemessene Instrumente, um Aspekte wie Selbstpflegefähigkeiten, Bedürfnisse und Pflegeabhängigkeit messen zu können.

Die vorliegende Doktorarbeit beschäftigt sich mit einem Instrument, welches die Messung und Beurteilung von Pflegeabhängigkeit im Bereich der Rehabilitation ermöglichen soll – der Pflegeabhängigkeitsskala in der Rehabilitation (PAS-R). In diesem Zusammenhang wurden im Rahmen der Arbeit eine Reihe von Untersuchungen hinsichtlich der psychometrischen Eigenschaften, der Praktikabilität und der klinischen Nützlichkeit der Skala in der Rehabilitation durchgeführt.

Das erste Kapitel bietet einen Einblick hinsichtlich des Zusammenhanges von chronischen Erkrankungen, Behinderungen und Pflegeabhängigkeit. Darüber hinaus werden die Bedeutung von Rehabilitation, die Relevanz von Assessment sowie Qualitätskriterien von Assessmentinstrumenten beschrieben. Ebenso werden Beispiele verfügbarer Instrumente in der Rehabilitation, die relevante Forschungslücke sowie das Forschungsziel aufgezeigt.

Kapitel zwei gibt einen Überblick in den Hintergrund, die Architektur, die psychometrischen Eigenschaften und die Anwendung der Pflegeabhängigkeitsskala und ihrer modifizierten Version.

Methodologische Aspekte der durchgeführten Studien werden im Hinblick auf Studiendesign, Population, Setting, Datensammlung und -analyse in Kapitel drei dargestellt.

Kapitel vier legt den Fokus auf die Untersuchung der Reliabilität und Validität der PAS-R. Hierzu wurden im Rahmen einer Querschnittsstudie Daten von 1197 PatientInnen in einem österreichischen Rehabilitationszentrum über einen Zeitraum von 6 Monaten (2007/2008) erhoben. Aspekte der Reliabilität wurden unter anderem mittels Cronbach's alpha, Cohen's kappa, prozentu-

aler Beobachterübereinstimmung und Intra-Klassen-Korrelationskoeffizienten berechnet. Die Durchführung einer Faktorenanalyse diente der Beurteilung der Konstruktvalidität. Die Evaluation der Kriteriumsvalidität erfolgte mittels Berechnung des Korrelationskoeffizienten nach Pearson. Hierbei wurden die Werte der PAS-R mit denen des Barthel Index' in Beziehung gesetzt. Die Ergebnisse der Untersuchungen zeigen, dass die PAS-R über einen hohen Level an interner Konsistenz und Äquivalenz verfügt. Darüber hinaus ist eine starke Evidenz hinsichtlich der Kriteriums- und Konstruktvalidität der Skala gegeben. Basierend auf diesen Erkenntnissen kann von guten psychometrischen Eigenschaften der PAS-R ausgegangen werden. Aus diesem Grund empfiehlt sich die Anwendung dieses Instrumentes zur Messung und Beurteilung der Pflegeabhängigkeit bei Rehabilitations-PatientInnen.

Den Schwerpunkt von Kapitel fünf bildet die Untersuchung der Praktikabilität und der klinischen Nützlichkeit der PAS-R in der täglichen Rehabilitationspraxis aus Sicht der Pflegenden. Um diese beurteilen zu können, stellt die Modifikation, Anwendung und psychometrische Überprüfung des Staff View Assessment Instruments (SVAI) einen weiteren zentralen Aspekt des Kapitels dar. In diesem Zusammenhang wurde eine Querschnittsstudie in 3 österreichischen Gesundheitseinrichtungen durchgeführt und Daten von 118 Pflegenden über einen Zeitraum von 2 Wochen (September/Oktober 2009) gesammelt. Aspekte der Reliabilität des SVAI wurden unter anderem mittels Cronbach's alpha-Wert berechnet. Die Beurteilung der Validität des SVAI erfolgte mittels Faktorenanalyse. Deskriptive statistische Verfahren dienten der Analyse der erhobenen quantitativen Daten. Die Analyse der qualitativen Statements, erhoben mittels offener Fragen, folgte dem Prinzip der Inhaltsanalyse. Die Ergebnisse dieser Untersuchungen weisen darauf hin, dass das SVAI geeignet ist, die Praktikabilität und Nützlichkeit der PAS-R zu beurteilen. Die Analyse der Daten zeigte darüber hinaus positive Ergebnisse hinsichtlich der Praktikabilität und Nützlichkeit der Skala in der Rehabilitation. Viele Pflegende stimmten zu, dass die PAS-R ein klinisch nützliches Instrument ist, welches die Kommunikation und Kooperation im Pflgeteam verbessern kann sowie einfach und schnell anzuwenden, zu analysieren und zu interpretieren ist.

Die Untersuchung der Änderungssensibilität der PAS-R stellt den zentralen Aspekt von Kapitel sechs dar. In diesem Zusammenhang wurde eine Längsschnittstudie in einem österreichischen Rehabilitationszentrum durchgeführt. Die Datensammlung erfolgte über einen Zeitraum von 6 Monaten (2007/2008), wobei die

involvierten PatientInnen (N=1564) nach ihrer Aufnahme und vor ihrer Entlassung aus der Einrichtung mit der PAS-R beurteilt wurden. Deskriptive statistische Verfahren, Berechnung von Effektgrößen und Signifikanztests dienten der Analyse der erhobenen Daten. Die Ergebnisse dieser Untersuchung verdeutlichen, dass die PAS-R fähig ist, Veränderungen auf PatientInnenebene zu identifizieren. Die Ergebnisse weisen ebenfalls darauf hin, dass mittels der Skala zwischen PatientInnen, die sich während der Rehabilitation verändert haben und denjenigen, die stabil geblieben sind, unterschieden werden kann. Die Analyse der Änderungssensibilität hinsichtlich verschiedener Diagnosegruppen zeigte konstant hohe Werte bei PatientInnen mit Muskel- und Skelett-Erkrankungen. Generell verdeutlichen die Ergebnisse, dass die PAS-R angemessen zu sein scheint, Veränderungen von PatientInnen während der Rehabilitation zu evaluieren. Nichtsdestotrotz erlauben die Ergebnisse der Analyse keine klare Zuordnung zu einem bestimmten Level der Änderungssensibilität. Aus diesem Grund empfiehlt sich weitere Forschung, um das Level der Änderungssensibilität im Allgemeinen sowie für verschiedene Diagnosegruppen bestätigen zu können.

Im Fokus von Kapitel sieben steht der Vergleich der PAS-R mit dem Barthel Index hinsichtlich der Änderungssensibilität. Zur Beurteilung der Änderungssensibilität beider Instrumente wurde eine Längsschnittstudie mit 1542 PatientInnen über einen Zeitraum von 6 Monaten (2007/2008) durchgeführt. Relevante Daten wurden in einem österreichischen Rehabilitationszentrum nach Aufnahme und vor Entlassung der PatientInnen mit der PAS-R und dem Barthel Index gesammelt. Die Analyse der Daten erfolgte durch Berechnung verschiedener Effektgrößen. Die Ergebnisse der Untersuchung deuten darauf hin, dass beide Instrumente über die Fähigkeit verfügen, Veränderungen auf PatientInnenebene zu identifizieren. Dennoch zeigt sich, dass der Barthel Index über eine höhere Änderungssensitivität verfügt als die PAS-R. Allerdings erlauben die momentanen Ergebnisse keine konkrete Zuordnung beider Instrumente zu einem bestimmten Level der Änderungssensibilität. Aus diesem Grund wird weitergehende Forschung angeraten.

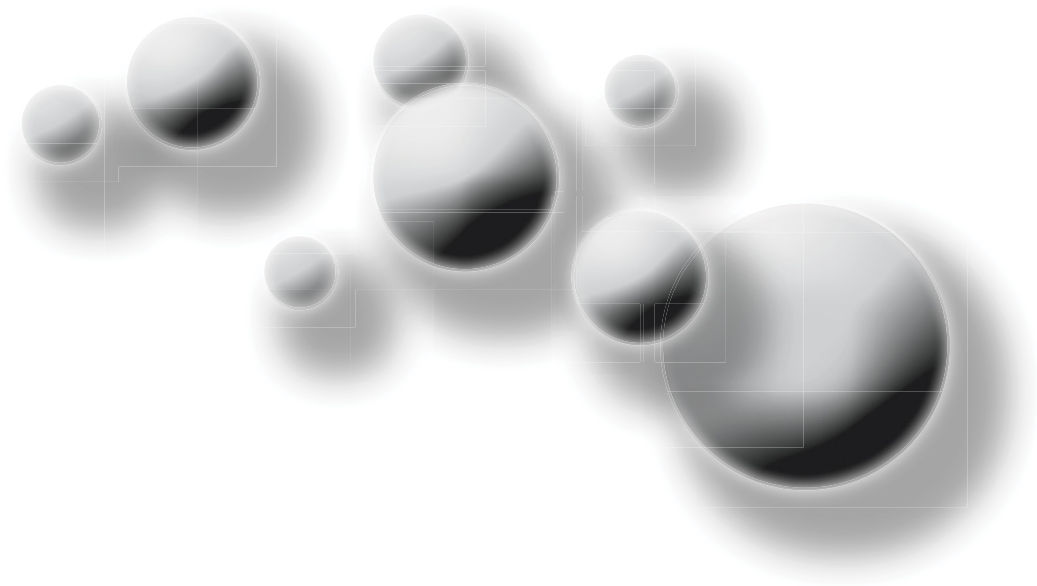
Kapitel acht gibt einen kurzen Überblick über die wesentlichen Ergebnisse der Doktorarbeit. Ebenso findet eine Diskussion der Ergebnisse statt. Hauptaspekte im Rahmen der Diskussion stellen die Relevanz der Modifikation der Pflegeabhängigkeitsskala für den Bereich Rehabilitation dar sowie die Relevanz der psychometrischen und praktischen Untersuchungen. Des Weiteren wird die Bedeutung der PAS-R für den Bereich der Rehabilitation diskutiert. Am

Ende des Kapitels werden Implikationen und Empfehlungen für die zukünftige Forschung sowie die klinische Praxis ausgesprochen. Wesentliche Punkte stellen in diesem Zusammenhang der Einfluss von Schulungen auf die Äquivalenz der Skala sowie weitere Untersuchungen zur Änderungssensibilität und die interdisziplinäre Anwendung der PAS-R in der Rehabilitationspraxis dar.



Chapter 11

Acknowledgements



ACKNOWLEDGEMENTS

This doctoral thesis was carried out at the Institute of Nursing Science at the Medical University of Graz, Austria. I would sincerely like to express my warmest gratitude to everyone who has had any part in this work.

In particular, I would like to sincerely thank first and foremost all the patients and nurses involved who contributed to this work through their participation, and also the nursing directors, without whose help this project could not have been carried out.

I would like to express special gratitude to my first supervisor, Univ. Prof. Dr. Christa Lohrmann, Institute of Nursing Science at the Medical University of Graz (Austria), for her engagement, continuous support, valuable advice and constructive discussions. I would like to thank her especially for giving me the opportunity to become a part of the scientific community, whether at (inter)national conferences and working groups or within doctoral programmes.

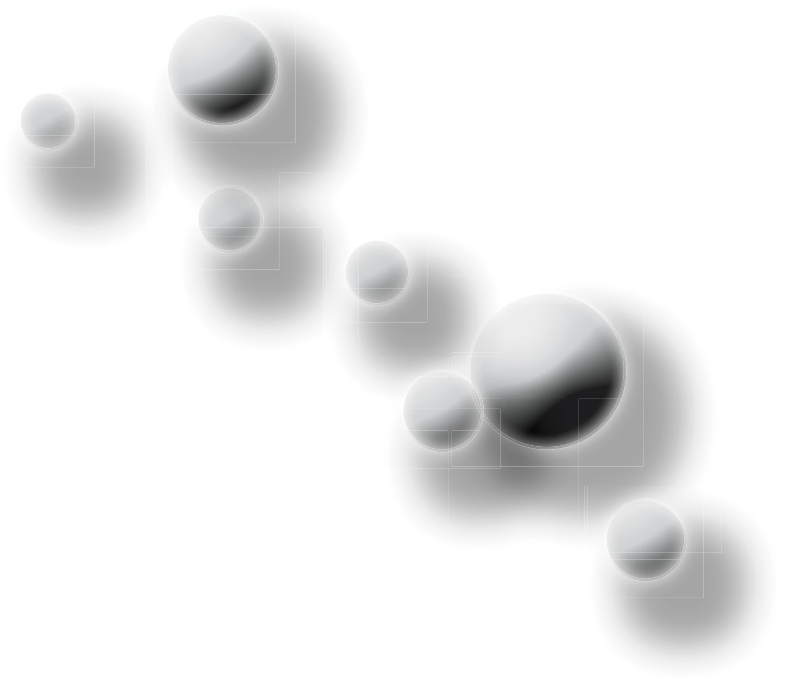
Furthermore, I would like to extend a heartfelt thank you to my second supervisor, Univ. Prof. Dr. Theo Dassen, Department of Nursing Science at the Charité-Universitätsmedizin Berlin (Germany), in particular for his constructive and motivating comments during all consultations as well as for his valuable and supportive review of the present thesis.

I would also like to express my special thanks to the European Research Group of Elderly Care (EURECARE), in particular Prof. Dr. Ate Dijkstra, Judy Smith and Margaret White, for providing a forum for highly valuable insights, inspiring ideas and constructive discussions regarding the Care Dependency Scale.

A big thank you goes to all my fellow students and supervisors at the 'Joint PhD-College of Nursing Science' of the Charité-Universitätsmedizin Berlin (Germany) and the Universiteit Maastricht (The Netherlands) and also to my fellow students and supervisors at the European Academy of Nursing Science (EANS) for not only creating a good scientific atmosphere but also for all their valuable input, constructive feedback and discussions.

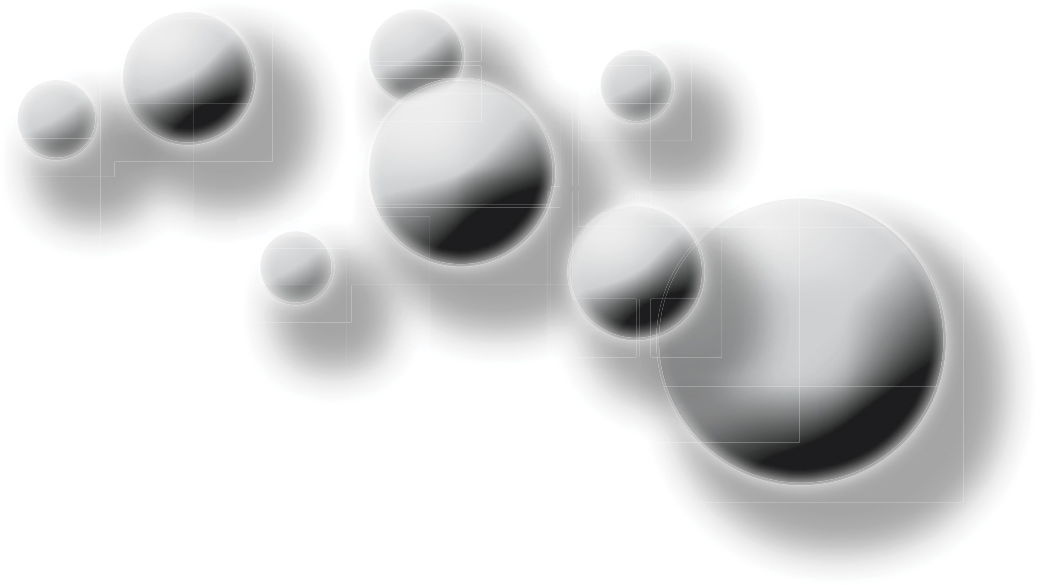
Furthermore, I would like to sincerely thank all colleagues at the Institute of Nursing Science at the Medical University of Graz (Austria) who contributed in several ways to this doctoral thesis. In this context, a special thanks to Manuela Schatz for her excellent linguistic revision of all my English publications during the last years as well as to Sandra Klein for her precise and artistic layout of the present thesis.

Last but not least I would also like to acknowledge the team of the Institute for Medical Informatics, Statistics and Documentation of the Medical University of Graz (Austria) for the support and helpful discussions on statistical issues.



Chapter 12

Curriculum vitae



CURRICULUM VITAE

Juliane Eichhorn-Kissel conducted her general nursing training at the nursing school of the Catholic Hospital “St. Johann Nepomuk” in Erfurt (Germany), where she afterwards obtained a position as a teacher and nurse.

From 2001 to 2006 Juliane Eichhorn-Kissel studied nursing education with the focus on nursing science at the Charité University Medicine in Berlin (Germany), where she was additionally involved in the research team of the Department of Nursing Science. During this time she also worked as a guest lecturer in several nursing education facilities, as scientific consultant for nursing management as well as a nurse in clinical practice.

Since 2006 Juliane Eichhorn-Kissel has been a member of the Institute of Nursing Science at the Medical University of Graz, where she works as researcher and lecturer. Her particular research and teaching focus is the assessment of care dependency and Primary Nursing as well as nursing quality and outcomes and didactics in nursing education.

In 2007 Juliane Eichhorn-Kissel started her doctoral studies. She participated in the ‘Joint PhD-College of Nursing Science’ of the Charité-Universitätsmedizin Berlin (Germany), the Universiteit Maastricht (The Netherlands) and the Medical University of Graz (Austria). Furthermore, she also participated in the 3-year Summer School for Doctoral Studies of the European Academy of Nursing Science (EANS).

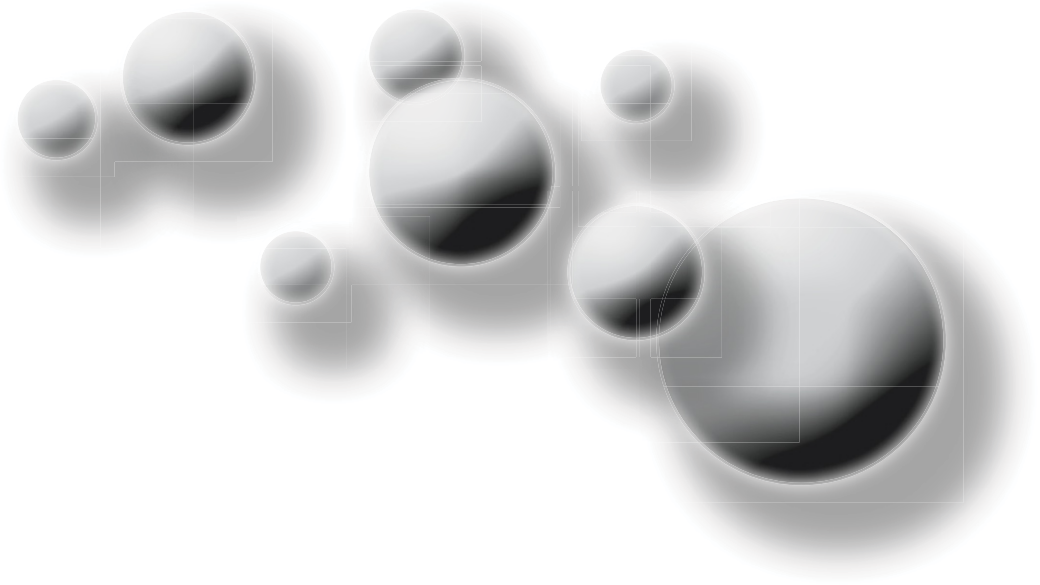
Since 2005 Juliane Eichhorn-Kissel has been a member of the European Research Group for Elderly Care (EURECARE), which is responsible for projects related to the Care Dependency Scale. She is also an author, reviewer and guest editor in several national and international nursing journals as well as in books on nursing. She was also involved in the organisation of a number of national and international nursing conferences and symposia.

In 2009 Juliane Eichhorn-Kissel obtained the position as First Deputy Chair of the Institute of Nursing Science at the Medical University of Graz (Austria).



Chapter 13

List of publications



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