Chapter 1

Introduction

Introduction

Sick leave and work disability are of major concern for governments as well as for employers [1;2]. One of the leading models for explaining mechanisms responsible for work disability is the model of work load and work capacity [3]. This model is frequently used by medical disciplines such as rehabilitation, occupational and insurance medicine to determine work ability or financial disability compensation. Following this model, presented in figure 1, physical, chemical and psychosocial work load will lead, dependently of work capacity, to short-term effects. These short-term effects may disappear by recovery or remain present and become chronic (long-term effects). Individual differences in consequences to short-term effects are due to differences in work capacity. A disbalance in which workload exceeds work capacity may then lead to long lasting disability [3]. Chronic musculoskeletal pain (CP) is one example which is frequently explained by disbalance between work load and work capacity. Prevalence and incidence rates of CP is huge and of major concern for society. Of the Dutch population over 25 years of age, 44% reported chronic musculoskeletal pain [4]. Of all work disability claims, 28% are due complaints of the musculoskeletal system. It was estimated that in the Netherlands, total costs were over 6 billion euros per year, which accounts for approximately □400,- per capita [1].

For practitioners, working in rehabilitation, occupational or insurance medicine, objective data for work load and work capacity is of great importance to determine work disability, to improve work ability, facilitate return to work (RTW) or staying at work. In occupational rehabilitation, increase in functioning by restoring balance between workload and work capacity by means of decreasing load and/or increasing capacity is a main treatment goal. These occupational rehabilitation programs have their main focus on restoring functioning of those disabled to participate in society and the work process. Multidisciplinary rehabilitation is effective and efficient in restoring functioning [5]. In insurance medicine, this model is used to determine a client's capacity in relation to their work. Based on this data, determinations are made with respect to work a client is able to perform. Furthermore, the work load and work capacity model is used to determine work disability allowances. To measure load or capacity, practitioners working in different disciplines can choose from questionnaires, expert based opinions or performance based measurements [6]. It is unknown which one can be used preferably, but all measurements are known to measure different constructs [6]. A gold standard for measuring capacity is lacking [7] and quantification of work load and work capacity in relation to functioning remains challenging for practitioners.

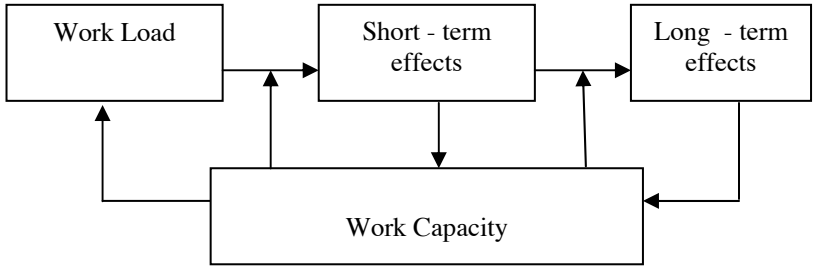

Figure 1. Model of work load and work capacity [3].

Functional Capacity Evaluation

In the past decade, there has been a growing support that performance based measurements may contribute to more objective determinations of functional capacity in patients with CP [6;8]. One example of performance based measurements is a Functional Capacity Evaluation (FCE). FCEs are standardized batteries of tests which form an evaluation of capacity of activities. FCEs are used in rehabilitation, occupational and insurance medicine which all use the same method, but differ in purpose. The objectives of FCE in occupational medicine concern evaluation of capacity in a work context. Matching FCE results with data gathered from a Work Place Assessment (WPA) are used to determine the level of work ability. In insurance medicine FCEs can contribute to determination of a client's functional capacity to determine (dis)ability in workers compensations claims or medico legal claims. In rehabilitation medicine, FCEs are used to identify work ability and treatment goals. Additionally, FCE may serve as a program evaluation to indicate whether patients have improved in capacity after rehabilitation. In the past years, the use of FCEs has been increasingly studied in the field of insurance medicine [9], rehabilitation medicine [10] and occupational medicine [10].

Measurement qualities of FCE

Two reviews were performed to report on the reliability and validity of different work related assessments [11;12]. Both concluded that more extensive research was needed to study reliability and validity dependent on the different protocols which are used in the field. One of these protocols, The WorkWell FCE (WW FCE; the former Isernhagen Work Systems FCE), was reviewed to have some qualities concerning reliability and validity [11;12]. Additionally, to be able to predict RTW and long lasting functioning, responsiveness of the FCE had to be researched [13;14]. Responsiveness of FCE, however, remains challenging because a gold standard for Functional Capacity is missing and because there appears to be a large natural variance in normal performance [7]. In contrast to self-report measurement by questionnaire and clinician based assessment, FCE is used to gain objective data which measures independently of patients reports.

Some FCE providers claim that with FCE an evaluator is able determine capacity independent of pain behaviour [15]. Hart et al. proposed a hierarchic model of measurement qualities any clinical test should require [16]. These are: safety, reliability, validity, practicality and utility. Safety of FCE has been scarcely addressed in the peer reviewed literature. Safety of FCE was disputed because a definition of injury was lacking and it was unknown whether a pain response after FCE was due to muscle soreness or aggravation of symptoms. Reliability was demonstrated in the WW FCE in healthy subjects and patients with chronic low back pain [17;18]. As addressed above, some parts of validity were identified for the WW FCE but some were not. Practicality and utility has strongly increased in the past years. According to the first manual of the WW FCE, testing of all activities lasts approximately 5 hours, divided over two days of testing [19]. FCE has evolved, as evidenced by protocols described in Version 2 [20]. To improve utility, shorter FCE protocols were developed based on diagnosis or work characteristics. Examples are a back protocol for patients suffering from Chronic Low Back Pain [21], or job specific protocols for health care professionals in nursing [22]. Development of other FCE protocols for different pathologies and jobs may enhance further improvement in utility of FCE.

Gaps in FCE research

While extensive research was performed in the past years concerning the measurement qualities described in a previous study [16], other important issues concerning good measurement qualities have not yet been examined. Perhaps because FCE research evolved from different health related sectors, a consented conceptual framework was lacking in order to describe what is intended to measure. This is important because when no gold standard *can* be identified, or consented upon, it is unclear what exactly FCE intends to measure.

In 2001, The World Health Organisation published the International Classification of Functioning, Disability and Health (ICF) to provide a scientific basis for understanding and studying health and health-related states, outcomes and determinants; to establish a common language for describing health and health-related states in order to improve communication between different users; to permit comparison of data across countries, health care disciplines, services and time and to provide a systematic coding scheme for health information systems [23]. The first three aims of ICF are very closely related to the abovementioned gaps in FCE research and ICF may therefore be of substantial use for classification of FCE related terms. The second lack in FCE related research is frequently argued upon in international literature and concerns confused use of language [13;24]. Literature tends to use different terms interchangeably sometimes even without providing any definitions. This may have caused discussion in the past. If no consensus in operational definitions is found, then this makes it difficult for a clinician to interpret FCE results validly.

Another gap in FCE research, addressed in international literature, concerns the lack of normative values for FCE. This restricts health care providers to correctly interpret data and make recommendations. Although content validity of some FCEs are based on the Dictionary of Occupational Titles (DOT) [25-27], and most tests are related to functional demands as described by the DOT, generalization to the workplace appears to remain challenging [28;29]. The load-capacity model [3] may be a clear and logic model in this case, but evidence on operationalization of this model is scare. Comparing work capacity to work-load data to make recommendations for work can be done only minimally yet. The WorkWell protocol described rules for generalization of capacity perceived from FCE to work load over a day [20]. Reliability and validity of these rules, however, are not available. The use of normative data of healthy workers in this may play a role in closing the gap between determination of work load and work capacity in relation to functioning.

Aims of this Thesis

This thesis focuses on the measurement qualities of FCE which are outlined above. Because the focus is on measurement qualities, this thesis is mainly performed with healthy subjects. Only in Chapter 5 and 8, data is used from patients with Chronic Low Back Pain (CLBP). In figure 2 at page 8, a scheme is presented which outlines this thesis.

In Chapter 2, a study is presented which focuses on reaching consensus between international experts on operational definitions and conceptual framework of FCE. This study is performed to allow comparison of data across countries and to create a theoretical foundation in which different aspects of functioning can be described.

In Chapter 3 and 4, a new FCE protocol is presented for upper extremity pain to improve utility and practicality of FCE. Chapter 3 focuses on the construct validity of the FCE protocol and in Chapter 4, test-retest reliability is reported.

Chapter 5 and 6 deal with the pain response following FCE. This is done to further study safety aspects of the FCE. In Chapter 5, a study is presented which addresses the pain response of healthy individuals following an FCE and describes the differences and similarities of the pain response of healthy individuals compared to patients with CLBP. In Chapter 6, possible predictive variables for a pain response after FCE are investigated to identify potential risk groups.

In Chapter 7, a study is presented which describes normative values for Functional Capacity. These normative values contribute to closing the gap between work load and work capacity and may improve interpretation of disability and work ability decisions.

In Chapter 8, a study is presented in which two lifting assessment protocols are compared to each other.
Chapter 9 is the final chapter of this thesis and provides a general discussion concerning the clinical relevance of the performed studies, methodological considerations and future directions regarding FCE research.

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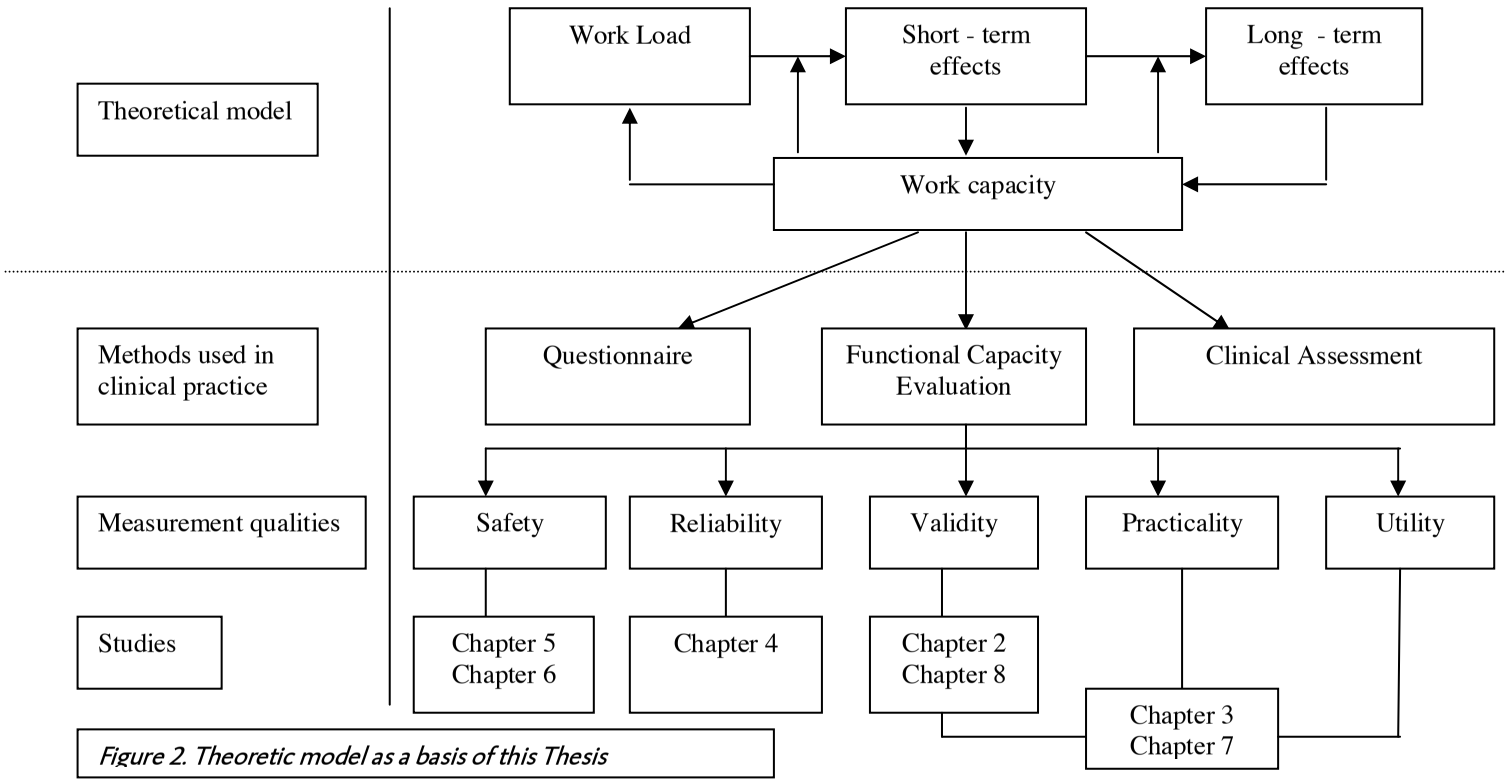

Figure 2. Theoretic model as a basis of this Thesis