Towards improving workers' health by matching work and workers
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Chapter 4
Matching work capacities and demands at job placement in employees with disabilities

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Abstract

Objective To determine whether employees with disabilities were initially assigned to jobs with work demands that matched their work capacities.

Participants Forty-six employees with various physical, mental, sensory and multiple disabilities working in a sheltered workshop.

Methods Physical and psychosocial work capacities were assessed post-offer and pre-placement using the Ergo-Kit and Melba. Work demands of the jobs were determined by workplace assessments with TRAC and Melba and were compared with the work capacities.

Results Of the 46 employees, 25 employees were not physically overloaded. When physical overload occurred, it was most often due to regular lifting. All employees were physically underloaded on six or more work activities, most often due to finger dexterity and manipulation. Almost all employees (n = 43) showed psychosocial overload or underload on one or more psychosocial characteristics. Psychosocial overload was most often due to endurance (long-term work performance), while psychosocial underload was most often due to speaking and writing.

Conclusion Despite the assessment of work capacities at job placement, underload and overload occurred on both physical activities and psychosocial characteristics. Assessing both work capacities and work demands before job placement is recommended. At job placement more attention should be paid to overloading due to lifting and long-term work performance.
Introduction

Participation in working life is a subject of great importance for most people, including people with a disability.\(^1\) For people with a disability it can be difficult to find and perform suitable employment.\(^2\) The rate of unemployment in people with a disability is high in comparison with employees without a disability. Lautenbach et al.\(^2\) reported an employment rate of 44% in Dutch persons with a disability, in contrast to an employment rate of 68% in the total Dutch labor force. Being employed is important because of the financial benefits associated with employment, and even more because of the positive effect of employment on quality of life.\(^3\) In a sample of healthy persons, being able to work and hold a job was judged as the sixth most important aspect of quality of life, and in a sample of people with a chronic illness, employment was judged to be the third most important aspect of quality of life.\(^1\) Work participation has personal meaning and fosters pride and self-esteem.\(^4\) Over the last few decades, work disability has become a socio-economic problem and has dominated the political debate.\(^5\) From a societal viewpoint, encouraging employees to work whenever possible is an economic and social imperative.\(^6\) For the past several decades, social policy in many countries has been focused on helping individuals with a chronic disease or disability that restricts participation in work roles, to enter or re-enter the labor market.\(^7\)

In order to assist in finding suitable jobs for people with a disability, knowledge of their work capacities is essential.\(^8\) Performance-based tests provide information that allows professionals to base their work-ability assessment on concrete evidence rather, than intuitive principles or presumptive facts.\(^9\) Some developed instruments focus on physical work capacities, whereas other instruments are oriented to psychosocial work capacities. The combination of both physical and psychosocial assessments may lead to consistent, comprehensive insight into the work capacities of employees.

However, a better performance on a capacity test alone does not appear to be a strong predictor of better work participation.\(^10\) For successful placement of people with a disability, in addition to knowledge concerning work capacities, the work demands of the jobs must also be known. It is the match between work capacities and work demands that is needed to ensure safe placement of employees, preventing people with a disability from being placed in jobs in which they will be physically or psychosocially under- or overloaded, which may subsequently contribute to appropriate work participation.\(^8\) The definition of overload is when demands exceed an individual’s capacity to deal with them. Underload occurs when demands are too low, including monotonous work situations, and
do not sufficiently challenge the individual. Mismatch between work capacities and demands (under or overload) may have negative effects on physical or psychosocial health.

Chaffin et al. concluded in 1978 that a worker’s likelihood of sustaining a back injury or musculoskeletal illness increases when job lifting requirements approach or exceed the strength capacity of the employee. Harbin and Olson developed a testing protocol for physical capacity that could be adapted as a post-offer, pre-placement program and also described the work demands. They concluded that if an employee had the physical capacity to perform the essential work demands, there was a lower injury rate as compared to the employee who is unable to demonstrate the physical capacity to perform the work demands. So, being physically overloaded has been shown to be related to a higher incidence of work related injuries. Several studies showed that psychosocial overload is associated with psychosocial health effects as burn-out, stress, and (work-related) fatigue. Being psychosocially underloaded was shown to be related to reduced job satisfaction, more psychological distress and more sick leave. Thus, it is assumed that if the capacities of an employee match the work demands, the likelihood of work participation is high. Consequently, besides assessments of employees’ work capacities, workplace assessments must be performed in order to determine the physical and psychosocial work demands of jobs to which people with a disability are appointed.

In this study it was investigated whether employees of a sheltered workshop, who, post-offer and pre-placement, underwent a specific assessment of work capacities, developed by a sheltered workshop, were adequately placed on jobs. Sheltered workshops are non profit organizations that provide employment opportunities to people with a disability. At the Belgian sheltered workshop in this study, a work assessment is done by occupational therapists to assess work capacities of new employees before job placement.

The aim of the present study was to determine if employees were initially assigned to jobs with physical and psychosocial work demands that matched their physical and psychosocial work capacities assessed at the moment of job placement.
Methods

Design
An observational study was performed to investigate the match between physical and psychosocial work capacities and work demands after job placement among employees with a disability in a sheltered workshop in Belgium. In the sheltered workshop, work assessments are done by occupational therapists to assess work capacities of new employees and place them in appropriate jobs. During the two days of the assessment, the instruments Ergo-Kit (EK)\(^{23}\) and Melba\(^{24}\) are used to assess physical and psychosocial capacities of employees. Interests and job preferences are also asked during the intake. In addition, employees are given the opportunity to try to work in a selected number of potentially suitable jobs. All information regarding the assessments is collected in reports that give recommendations on suitable jobs for the employees. Based on these reports, employees are able to begin a potentially suitable job and are supported in these jobs by an ergonomist and occupational therapists.

Assessment reports of employees performed between 2004 and 2007 were used for this study. To investigate if new employees between 2004 and 2007 were initially assigned to jobs with demands that matched their capacities at the moment of job placement, the work demands of their first job after their initial assessment were determined by performance of workplace assessments in 2008 using TRAC (Task Recording and Analysis on Computer)\(^{25}\) and Melba.\(^ {24}\) It was assumed that the work demands of the jobs measured in 2008 were comparable with the work demands of these jobs in 2004-2007. Therefore, it was possible to test whether the work capacities matched the work demands.

Study population
The sheltered workshop in Belgium provides employment opportunities for employees who are recognized as having a disability by the ‘Vlamish Agency for Persons with a Disability’.\(^ {26}\) Their definition for people with a disability is: “every long-lasting and important participation problem of a person that is due to a combination of function disturbances of mental, psychological, physical or sensory kind, restrictions in performance of activities and personal and external factors”. Long-term unemployed people are also welcome at the sheltered workshop. Employees who understand and speak the Dutch language and have some ability to work are required to complete a physical and psychosocial assessment before job placement.
The primary inclusion criterion for the study population of this study was employees between 2004 and 2007 for who complete assessments of both physical and psychosocial capacity were available. To correctly match work capacities and work demands afterwards, the second inclusion criteria was that the demands of the first job were still observable and the sheltered workshop occupational therapists could confirm that between 2004 and 2008 the work demands of the first jobs after initial assessment had not changed.

**Physical work capacities and demands**

**Physical work capacities**
The EK was used to assess the physical work capacities of the individual employees. This Functional Capacity Evaluation (FCE) contains 55 standardized tests, which are comprised of measurements and observations to evaluate the performance of the employee in both long term and short term tasks. These tasks consist of activities with the following characteristics: working in different body postures, executing movements, using hands and fingers, and carrying and lifting. Different types of tests are performed by the employee such as manipulation, balance, endurance, and isometric and dynamic strength tests. The isometric and dynamic lifting tests of the EK have a moderate to high level of reliability. Criterion-related validity for future work disability was found to be poor for the two isometric EK lifting tests and moderate for the three dynamic lifting tests. Data gathered during the tests include blood pressure, heart rate, load lifted, working height, working distance, working position, working method, working speed, level of coordination and control, and experienced level of discomfort. This information is used to assess the physical work capacities of the employees on 19 activities (Table 1). The four occupational therapists who rated the EK assessments had completed a training program and were certified to administer the measure.

**Physical work demands**
The physical work demands of the jobs in the sheltered workshop were assessed at a group level using TRAC. TRAC is a method for systematic observation of work demands in different jobs, wherein the variables to be observed can be chosen and defined for each specific work situation. During the workplace assessments, the same 19 activities as in the EK were observed by two observers. The systematic observations were aimed at determining the job characteristics, as opposed to the individual work techniques. TRAC
has a moderate to high level of reliability, depending on the body region in which working postures and activities are observed.\textsuperscript{31} The validity of TRAC depends on the dynamic characteristics of the work. The more dynamic the work gets, the more difficult to validly observe activities and postures.\textsuperscript{32,33} The jobs in the sheltered workshop were characterized by a relatively short cycle time and little variation. Every job was observed for 30 minute durations, between three to six times, at a randomly selected time during the workday. Before starting the measurements, the two observers trained with TRAC until the intraclass-correlation-coefficient (ICC) of their independent observations was high (ICC>0.90) for all work activities.\textsuperscript{34}

**Matching physical work capacities and demands**

The physical work capacities were evaluated using the classification system of the EK for an eight hour working day. According to this classification system, the activities ‘lifting’ and ‘carrying’ are subdivided into sporadic (< 32 repetitions a day), regular (< 200 repetitions a day), and constant (≥ 200 repetitions a day); the weight of objects lifted and carried are then evaluated by the four EK classifications: light, average, heavy, very heavy.\textsuperscript{23} For all other activities, the percentage of an eight hour workday that the employee can perform them was reported according to the seven EK time segments: 0, 0-10%, 10-33%, 33-50%, 50-66%, 66-90%, 90-100%. The classification-system of the EK was also used to evaluate the observed work demands.

As stated above, each job was observed several times for 30 minutes to assess the work demands. The observations resulted in percentages of time that the demanding activities within these 30 minute periods were prevalent. These percentages were recalculated to the total number of minutes or hours that these activities were performed on a working day of an employee. For lifting and carrying activities, the frequency and weight were determined and were evaluated in the same four EK categories as the physical work capacities. The assessed physical work capacities and the physical work demands were expressed in the same activities and classified into the same categories, and thus it was possible to match them.
Table 1. The 19 physical activities assessed by the Ergo-Kit FCE.

<table>
<thead>
<tr>
<th>No.</th>
<th>Activity</th>
<th>No.</th>
<th>Activity</th>
<th>No.</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lower lifting</td>
<td>8</td>
<td>Climbing</td>
<td>14</td>
<td>Lower reaching</td>
</tr>
<tr>
<td>2</td>
<td>Upper lifting</td>
<td>9</td>
<td>Walking on stairs</td>
<td>15</td>
<td>Higher reaching</td>
</tr>
<tr>
<td>3</td>
<td>Middle lifting</td>
<td>10</td>
<td>Crouching</td>
<td>16</td>
<td>Right manipulation</td>
</tr>
<tr>
<td>4</td>
<td>Carrying</td>
<td>11</td>
<td>Kneeling</td>
<td>17</td>
<td>Left manipulation</td>
</tr>
<tr>
<td>5</td>
<td>Sitting</td>
<td>12</td>
<td>Bending over</td>
<td>18</td>
<td>Right finger dexterity</td>
</tr>
<tr>
<td>6</td>
<td>Standing</td>
<td>13</td>
<td>Crawling</td>
<td>19</td>
<td>Left finger dexterity</td>
</tr>
<tr>
<td>7</td>
<td>Walking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lower lifting: lifting from floor to hip height, upper lifting: lifting from hip to above shoulder height, middle lifting: lifting from hip to shoulder height on same height with moving distance <5 meters, carrying: carrying with moving distance >5 meters.

Psychosocial work capacities and demands

Psychosocial work capacities

To assess the psychosocial work capacities of the individual employees the Melba (Merkmalprofile zur Eingliederung Leistungs-gewandelter und Behinderter in Arbeit) was used. The Melba is an instrument that describes the work capacities against 29 characteristics of the employees (Table 2). To complete the Melba-capacity-profile, the IDA (Instrumentarium zur Diagnostic von Arbeitsfähigkeiten) was used. The IDA is a diagnostic instrument, consisting of 14 standardized work tests, which is coupled to the Melba. In addition to the IDA, interviews, test tasks, psychometric methods, and observation of behavior are methods by which raters complete the Melba-capacity-profile. Reliability and validity of the Melba has yet to be determined. The four occupational therapists who rated the Melba assessments had completed a training program and were certified.

Psychosocial work demands

To assess the psychosocial work demands of the jobs in the sheltered workshop on a group level, the Melba-demands-profile was used by the certified occupational therapists. The same 29 characteristics as in the Melba-capacity-profile were assessed, but now of the work capacities needed to perform the jobs (i.e., work demands). The demands of the jobs were assessed according to the methods of the Melba (e.g., making observations of job tasks in the workplace).
Matching Psychosocial Work Capacities and Demands

The assessed psychosocial work capacities and demands were both evaluated according to the classification system of the Melba. All 29 characteristics of the capacity- and demands-profile were evaluated in five Melba categories: very limited capacity, limited capacity, average capacity, capacity just above average, and capacity far above average. Since the Melba-capacity-profile and the Melba-demands-profile are analogue in structure and composition, it was possible to match both profiles.

Table 2. The 29 psychosocial characteristics assessed in the Melba, classified in 5 categories.

<table>
<thead>
<tr>
<th>Cognitive characteristics</th>
<th>Social characteristics</th>
<th>Characteristics of work execution</th>
<th>Psycho-motor characteristics</th>
<th>Culture, competence and communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning of work</td>
<td>Perseverance</td>
<td>Endurance</td>
<td>Energetic effort</td>
<td>Reading</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Leader quality</td>
<td>Critical control</td>
<td>Fine motor system</td>
<td>Calculating</td>
</tr>
<tr>
<td>Attention</td>
<td>Contact skill</td>
<td>Frustration tolerance</td>
<td>Quickness of reaction</td>
<td>Writing</td>
</tr>
<tr>
<td>Ability to concentrate</td>
<td>Critical judging</td>
<td>Ability to arrange</td>
<td></td>
<td>Speaking</td>
</tr>
<tr>
<td>Learn/ remember</td>
<td>Receiving criticism</td>
<td>Accuracy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem solving</td>
<td>Teamwork</td>
<td>Independence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conversion</td>
<td></td>
<td>Carefulness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imagination</td>
<td></td>
<td>Responsibility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analyses

For each employee, the work capacities were compared with the work demands for each EK activity and each Melba characteristic. The activities and characteristics were classified in terms of higher physical/psychosocial work capacities than work demands (underload), equal work capacities and work demands (match), and lower work capacities than work demands (overload). When data were missing, the relationship between work capacities and work demands could not be determined (missing), thus these data were not included in the analysis. Outcomes were the calculated numbers of underloaded, matched, and overloaded physical activities (n = 27) and psychosocial characteristics (n = 29) per employee. Also the top five underloaded, matched, and overloaded physical activities and psychosocial characteristics were determined. Descriptive analyses were performed using the Statistical package for the Social Sciences (SPSS v. 16.0).
Results

Study population
Forty-six (n = 46) employees had complete reports about their physical and psychosocial work capacities at job placement in the period 2004-2007. For these employees the work demands of their first job after placement were assessed. This sample consisted of 31 males and 15 females, with a mean age of 35 years (s.d. = 10). Information about diagnosis was missing for nine employees. Thirteen employees were diagnosed with a physical disability, six with a mental disability, three with a sensory disability and 15 with multiple disabilities. Therefore, they had various physical and psychosocial limitations (e.g., limitations in coordination or cognitive functioning) and worked in 29 jobs, in seven divisions (e.g., wood, metal, assembly and stitching). The mean length of a workday was 7.5 hours (s.d. = 1.7) and the mean number of workdays per week was five days (s.d. = 0.4).

Matching physical work capacities and demands
Figure 1 shows the number of physical activities wherein work capacities were lower (overload), the same (match), or higher (underload) than the work demands per employee. Twenty-five employees were not overloaded on any of the 27 activities. Of the employees who where overloaded on one or more activities, the largest group (n = 12) was overloaded on two activities. As shown in Table 3, overload was most often due to physical activities involving regular (≤ 200 repetitions a day) lower lifting from floor to hip height, regular or sporadic (≤ 32 repetitions a day) middle lifting from hip to shoulder on same height, and standing. Matching most often occurred on the activities involving crawling, constant (> 200 repetitions a day) upper lifting from hip to above shoulder height, constant middle lifting from hip to shoulder on same height, and crouching. All employees were underloaded on six or more activities. Three employees were underloaded on all 27 activities. Underload most often occurred on the activities finger dexterity and manipulation of both the dominant and non-dominant hand (Table 3).
Work capacities and demands in employees with disabilities

Fig. 1 Number of physical activities for which work capacities were lower (overloaded), the same (matched) or higher (underloaded) than the work demands, per employee (n = 46).

Table 3. Top 5 physical activities wherein work capacities were most often lower (overloaded), the same (matched), or higher (underloaded) than the work demands.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Physically Overloaded</th>
<th>Physically Matched</th>
<th>Physically Underloaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower lifting (regular)</td>
<td>15 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle lifting (regular)</td>
<td>15 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle lifting (sporadic)</td>
<td>11 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standing</td>
<td>11 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bending over</td>
<td>9 (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crawling</td>
<td></td>
<td>41 (19)</td>
<td></td>
</tr>
<tr>
<td>Higher lifting (constant)</td>
<td></td>
<td>39 (18)</td>
<td></td>
</tr>
<tr>
<td>Middle lifting (constant)</td>
<td></td>
<td>37 (17)</td>
<td></td>
</tr>
<tr>
<td>Standing</td>
<td></td>
<td>37 (17)</td>
<td></td>
</tr>
<tr>
<td>Carrying (constant)</td>
<td>33 (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifting low (constant)</td>
<td>33 (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kneeling</td>
<td>33 (15)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

dh: dominant hand, ndh: non-dominant hand

Matching psychosocial work capacities and demands

Figure 2 shows the number of psychosocial characteristics wherein work capacities were lower (overload), the same (match), or higher (underload) than the work demands per employee. No employees were overloaded on all 29 characteristics; maximal 11 overloaded psychosocial characteristics were found in two employees. Almost all employees (n = 43) showed overload on one or more psychosocial characteristics. Most of these employees (n = 10) were overloaded on three psychosocial characteristics. Overload most often occurred on the psychosocial characteristics endurance (long-term work performance), critical control, and carefulness (Table 4). Matching most often occurred on the psychosocial characteristics imagination, comprehension, accuracy, and energetic...
effort (Table 4). All employees were underloaded on three or more psychosocial characteristics. One employee was underloaded on 21 psychosocial characteristics. Underload most often occurred on the psychosocial characteristics speaking, reading, and writing (Table 4).

![Graph showing number of psychosocial characteristics for which work capacities were lower (overloaded), the same (matched) or higher (underloaded) than the work demands, per employee (n = 46).]

**Fig. 2** Number of psychosocial characteristics for which work capacities were lower (overloaded), the same (matched) or higher (underloaded) than the work demands, per employee (n = 46).

**Table 4.** Top 5 of the psychosocial characteristics wherein work capacities were most often lower (overloaded), the same (matched), or higher (underloaded) than the work demands.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Psychosocially Overloaded % (n)</th>
<th>Psychosocially Matched % (n)</th>
<th>Psychosocially Underloaded % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endurance</td>
<td>52 (24)</td>
<td>54 (24)</td>
<td>85 (39)</td>
</tr>
<tr>
<td>Critical control</td>
<td>37 (17)</td>
<td>52 (24)</td>
<td>76 (35)</td>
</tr>
<tr>
<td>Carefulness</td>
<td>37 (17)</td>
<td>52 (24)</td>
<td>70 (40)</td>
</tr>
<tr>
<td>Receiving criticism</td>
<td>35 (16)</td>
<td>52 (24)</td>
<td>67 (31)</td>
</tr>
<tr>
<td>Responsibility</td>
<td>33 (15)</td>
<td>50 (23)</td>
<td>67 (31)</td>
</tr>
</tbody>
</table>

**Discussion**

In this study, the physical and psychosocial work capacities of a population of employees with a disability, determined by performance based assessments, were matched with physical and psychosocial work demands of jobs performed in a sheltered workshop. The
results show that after assessment of work capacities at job placement, 25 employees (54%) were not overloaded at all on any of the 27 physical activities. All employees were underloaded on six or more physical activities.

**Strengths and weaknesses of the study**

The major strength of this study is that it evaluated whether employees with a disability were correctly placed at jobs which match both their physical and psychosocial work capacities. To our knowledge, this is the first study to evaluate such an intervention in practice. All performance based measurements were performed by experts on the specific topics. The occupational therapists who rated the EK and Melba assessments were certified. Real-time observation with TRAC to assess the physical work demands appears to be a valid and reliable method to measure work demands, and the two observers practiced with the use of TRAC until the ICC between them was sufficiently high (ICC>0.9).

A possible weakness of the study is whether the sensitivity of the EK and Melba assessments are appropriate for the population of this study – employees with several physical and psychosocial limitations. The test scores of both the EK and the Melba assessments might not be sensitive enough to classify the work capacities of these persons into different categories. However, when the scores of the studied employees on the EK and Melba tests were examined, it was concluded that the employees were distributed along the whole range of the scale divisions of both the EK and Melba. Therefore, the test scores of the EK and Melba assessments appear sensitive enough for this population.

Three other remarks must be made. First, because the assessed physical work capacities and physical work demands were expressed using the same activities and classified into the same categories, most EK activities and observed work demands could be directly matched. However, as Kuijer et al. reported, one has to be aware that FCE tests do not always resemble the capacity performed in the job. Since our workplace assessments were structured similar to the EK test activities and the work performed consisted of fairly simple activities, the bias due to this mismatch is limited. Moreover, this potential weakness was overcome in practice, by allowing for a subsequent opportunity to try and work in a selected number of potentially suitable jobs before definitive job-placement. Second, it should be noted that the work capacities of employees were determined for each individual, while the work demands were determined on a group level by task-based analyses. However, because of the short-cyclic repetitive characteristics of the jobs, it can be assumed that variations in task performance were
minimal. Third, in this study, work capacities of employees were assessed before job placement, while work demands of jobs were assessed afterwards. Although it was assumed by occupational therapists that the observed work demands measured in 2008 were comparable with the work demands of the jobs in 2004-2007, it may be that little changes in work demands occurred, which may have contributed to some mismatches in an employee’s work capacities and the job’s work demands.

Implications for practice
Despite assessment of work capacities at job placement, some physical and psychosocial underload and overload occurred. In the studied sheltered workshop, physical overload was mostly due to lifting and psychosocial overload was mostly due to endurance (long-term work performance). Attention should be focused on activities and characteristics wherein overload was found, as this may have negative influences on work participation and work production. Therefore, criteria must be formulated that determine to what extent overload is acceptable to keep employees healthy and prevent sick leave. This is especially true for the most occurring overloaded physical work activity lifting, which can lead to low back pain and therefore sickness-absence. Psychosocial overload may be related to the repetitive characteristics of the work performed in the sheltered workplace. Jobs characterized by a short cycle time and monotonous motor demands represent high workload; psychological distress and sick leave were found to be positively related to such repetitive work.

Very little physical underload was found; when it did occur it tended to occur primarily in activities (finger dexterity and manipulation) wherein it would not be alarming to find lack of movement during the performance of a task. Psychosocial underload was primarily due to speaking, writing, reading, and calculating. Although these characteristics are important to foster social and cognitive skills, underload on these characteristics in a job appears not harmful in terms of health.

The results of the present study show that the EK and Melba assessment is time consuming. It may not be necessary to assess the capacities for all physical activities and psychosocial characteristics. Assessment of work capacities may be improved and shortened to reduce time and costs by measuring only the work capacities which are needed to perform the potential job; therefore, a job-specific protocol should be considered. Furthermore, temporary test placement of employees within the sheltered workshop, with observation of work execution, would likely be useful to ensure the employees have the necessary work capacities to succeed in that type of work. If required
and if possible, training of worker’s skills, adaptations of work tasks, and physical and psychosocial work environment modifications may be performed to optimize job placement.

An assessment of workload should not only measure work capacities and work demands, but should also include the employee’s vocational interest and preferences. If the employee finds his work meaningful and relevant, capacity to deal with short-term task over- or underload is often improved, compared to workers who are in demanding or non demanding jobs that they have no interest in. In the assessments of this study it was tried to trace employees’ interests and pay attention to these wishes. However, it could be helpful to add a tool that assesses vocational interests. Assessment should also include employees’ judgments of workload. In such a scheme, workload could be expressed in terms of job satisfaction and need for recovery. \cite{41,42,43} In addition, the relationship between workload and outcomes such as sick leave and turnover should be determined. It was considered to include these measures in this study. Unfortunately, due to the small sample sizes, there was not enough statistical power to perform these analyses.

In summary, it was found that the assessment of work capacities and demands provided useful information to assess whether employees were correctly placed in jobs. It is recommended assessing both work capacities and work demands before placement of employees, as this facilitates the direct matching of work capacities and demands prior to placement. Furthermore, attention should be given to employees’ judgments of workload and recovery and it is recommended to assess the consequences of possible mismatches in terms of health, productivity, sick leave and turnover.

**Conflicts of interest**
The authors report no conflicts of interest. The data gathering and analysis were performed by IZ, LG, PPFMK, MJMH and MHWFD.

**Acknowledgements**
We would like to thank the management and employees of Mariasteen VZW for initiating this study. Special thanks to the occupational therapists of Mariasteen VZW for completing the EK and Melba forms. Also, special thanks to Nele Castelein and Herman DeGryse who contributed greatly to the completion of this study.
Chapter 4.

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Chapter 4.


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