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ORIGINAL ARTICLE

Do Workers With Chronic Nonspecific Musculoskeletal Pain, With and Without Sick Leave, Have Lower Functional Capacity Compared With Healthy Workers?

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ABSTRACT. Soer R, de Vries HJ, Brouwer S, Groothoff JW, Geertzen JH, Reneman MF. Do workers with chronic nonspecific musculoskeletal pain, with and without sick leave, have lower functional capacity compared with healthy workers? Arch Phys Med Rehabil 2012;93:2216-22.

Objectives: (1) To analyze whether functional capacity (FC) of sick listed workers with chronic nonspecific musculoskeletal pain (CMP) referred for rehabilitation (SL-Rehab group) and workers with CMP who stay at work (SAW group) differ from the FC of healthy workers (HW group). (2) To analyze if FC of workers with CMP is insufficient to meet work demands, and to assess factors associated with insufficient FC.

Design: A 3-group cross-sectional comparison.

Setting: Rehabilitation center.

Participants: Workers (N=942) were included (SL-Rehab group: n=122, SAW group: n=119, and HW group: n=701).

Interventions: All subjects performed a short Functional Capacity Evaluation (FCE) and completed questionnaires assessing demographics, personal, and work characteristics.

Main Outcome Measure: FCE performances. Participants' FC was insufficient to meet their work demands when their FC was lower than the 5th percentile of the HW group's FC.

Results: Both the SL-Rehab and SAW groups had significantly lower FC compared with the HW group; 15% to 71% demonstrated insufficient FC. Insufficient FC was associated with group status (SL Rehab group: odds ratio [OR]=6.5; SAW group: OR=7.2), having physically high demanding work (OR=35.1), being a woman (OR=35.7), higher age (OR=1.2), and lower effort level during FCE (OR=1.9). Among subjects with CMP, kinesiophobia, physical health, and perceived disability were associated with having an insufficient FC for work.

Conclusions: Workers in the SL-Rehab group have lower FC than their working counterparts. Many workers in both groups with CMP demonstrated insufficient FC. Not the pain itself, but personal and work-related factors are related to insufficient FC.

Key Words: Chronic pain; Rehabilitation.

IN REHABILITATION AND occupational medicine, chronic nonspecific musculoskeletal pain (CMP) is among the most prevalent[1,2] and expensive health conditions.[3] Populations from various social and cultural backgrounds show prevalence ranging from 13% to 47%.[2] In low back pain and fibromyalgia, the majority of costs are related to indirect costs (loss in productivity), mainly because of temporary or permanent work disability.[3-5] While many workers with CMP discontinue work, many others stay at work despite their pain. This raises a question about the origin of work disability in workers with CMP, specifically about differences between these groups. Within the biopsychosocial model, the differences in work (dis)ability may be explained by differences in biological, psychological, and social factors. A leading explanation is the deconditioning paradigm, which postulates that the patient's functional capacity (FC) is decreased as a result of inactivity because of catastrophizing, kinesiophobia, and avoidance of activity.[6,7] Cognitive behavioral therapies, such as graded exposure, have been developed to reduce avoidance behavior. This approach has been one of the underlying rationales for the widespread application of (work) reconditioning programs for patients with CMP.

Deconditioning suggests a decrease of capacity over time. For example, a worker's FC decreases during the duration of being in pain. Evidence underlying the deconditioning paradigm, however, is inconclusive.[8] One of the reasons is that it is still challenging to objectively assess activity levels and patterns,[8,9] although it was recently concluded from a meta-analysis that higher self-reported disability was weakly associated with lower activity levels in patients with chronic low back pain.[10] Evidence of deconditioning because of reduced aerobic capacity[7,11] and muscle atrophy[12] is also limited, and conflicting. Although decreased surface area of the *m. psoas* and *m. multifidi* in patients with back pain were observed[12] studies

List of Abbreviations

ANOVA	analysis of variance
CI	confidence interval
CMP	chronic nonspecific musculoskeletal pain
DOT	Dictionary of Occupational Titles
FC	functional capacity
FCE	Functional Capacity Evaluation
NRS	numeric rating scale
OR	odds ratio
PDI	Pain Disability Index
PSEQ	Pain Self-Efficacy Questionnaire

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aimed at objectifying deconditioning by measurement of physical activities of daily living could not objectify decreased levels in patients with chronic low back pain.[7] Evidence of being deconditioned for functional tasks, such as lifting and postural tolerances, is unavailable. Regardless of its longitudinal course, however, from the perspective of the worker's ability to perform work, FC should be interpreted in relation to work load. Even if deconditioning would occur, a patient's FC can still be sufficient to perform the minimal required workload. If this were the case, then alternative reasons should be considered to explain work disability.

In management of CMP, multidisciplinary rehabilitation programs that focus on restoration of functioning and return to work are recommended over interventions that focus on pain reduction, such as medications, transcutaneous electrical nerve stimulation, or nerve root blocks.[13] While evidence is present that rehabilitation is effective in management of CMP,[14] the underlying biological, psychological, and social mechanisms that explain these effects are insufficiently investigated. When relationships between pain, FC, and work disability become clear, rehabilitation clinicians may improve the effectiveness of their interventions. Relevant subgroups may be distinguished and individualized treatments may be developed. To establish such, we need to analyze if the FC of workers is related to work demands. In addition, it should be investigated whether workers with a lower FC than work demands are able to perform their work. It is unknown, however, whether the relationships between FC and pain-related variables differ between sick listed and working individuals with CMP.

The aim of the current study was to analyze the FC of sick listed workers with CMP referred for rehabilitation (SL-Rehab group) and workers with CMP who stay at work (SAW group), and to compare their FC with healthy workers (HW group). The following research questions were investigated: (1) Do workers in an SL-Rehab group have lower FC compared with workers in an SAW group and an HW group? (2) Is the FC of workers in SL-Rehab and SAW groups sufficient to meet their work demands? (3) Which factors are associated with insufficient FC to meet work demands?

METHODS

Design

A cross-sectional study design was used. FC was tested in a standardized environment with a Functional Capacity Evaluation (FCE). Three groups were compared based on their FC. The first group consisted of sick listed subjects with CMP who were admitted to a multidisciplinary pain rehabilitation program (SL-Rehab group). The second group included subjects with CMP who stayed at work despite CMP (SAW group). The third group consisted of healthy working subjects (HW group).

Study Samples

The SL-Rehab group consisted of patients referred for a multidisciplinary outpatient pain rehabilitation program in the Center for Rehabilitation of the University Medical Center Groningen, the Netherlands. Inclusion criteria were: diagnosed by a physiatrist as CMP (pain in back, neck, shoulder, extremities, or disorders such as widespread pain, fibromyalgia, or whiplash) without known underlying specific medical cause (eg, infection, neoplasm, metastasis, osteoporosis, rheumatoid arthritis, fracture, neurologic disorders, and serious spinal pathology); aged 20 to 60 years; and currently sick listed from paid work (paid work for at least 20 hours per week during the 12mo before participation in the study). Age was limited to between 20 and 60 years because between these ages, a stable working situation normally can be developed. Before 20 and after 60 years, working hours often are diminished and people mostly have partial, adapted, or temporary work participation. Exclusion criteria were: relevant comorbidities with severe negative consequences for physical and/or mental functioning (eg, severe psychiatric disease), addiction to drugs, pregnancy, and insufficient knowledge of the Dutch language.

Participants of the SAW group were recruited in the context of the working with pain research project from May 2009 to December 2010 by announcements in newspapers and websites of national patient associations of low back pain, whiplash, and fibromyalgia in the Netherlands.[15] Participants in the SAW group were less than 5% sick listed and did not seek help in a pain rehabilitation program in the year prior to participation. All other inclusion and exclusion criteria were equal to the SL-Rehab group.

The HW group consisted of healthy workers without pain and was derived from a previous study.[16] The HW group was between 20 and 60 years of age and was working 20 hours or more in a wide range of professions.

Procedures

Data were collected from January 2006 to December 2010. FCEs were administered to all participants. Self-report measures were administered prior to the FCE. Data from the SL-Rehab group were derived from usual care prior to the start of rehabilitation. Subjects received a €15 coupon for their cooperation, and travel expenses were compensated. Subjects from all 3 groups provided written informed consent. Data from the SAW and HW groups were derived from specific projects for which approval was received by the Medical Ethical Committee of the University Medical Center Groningen, the Netherlands. All subjects were stratified by work load according to the Dictionary of Occupational Titles (DOT).[17] Prior to the FCE, the Physical Activity Readiness Questionnaire was used to screen for risks for performing physical exercise.[18] Workers with 1 or more answers indicating a risk (yes) were excluded.

Primary Measures

Functional Capacity Evaluation. A standardized 1.5 hour, 12 item FCE was performed. Six tests were used for the current study. These tests were lifting low, lifting high, overhead work, static bending, dynamic bending, and energetic capacity. All tests were reliable[19-21] and merely derived from the WorkWell protocol.[22] The Bruce protocol was used to measure energetic capacity.[23] After an introduction to general FCE procedures, subjects were verbally instructed on how to perform each individual test. Subjects in the HW group were individually evaluated by 15 physical therapy students who had completed 2-day FCE-training provided by a licensed WorkWell trainer. The SAW and SL-Rehab groups were tested by licensed physical therapists. A more comprehensive description of these 6 tests can be found elsewhere.[16] To analyze if FC was insufficient to perform work, individuals' test results were compared with the 5th percentile of normative values of the HW group in the corresponding physical demands category.[16] Participants were classified into 4 categories of physical demands based on intensity and duration of lifting or carrying needed for the job. These categories were sedentary, light, medium, and heavy/very heavy.[17] Insufficient FC was considered in those subjects who performed lower than 5% of the normative values of the tests lifting low or lifting high. These tests were chosen because they have the highest predictive value for fitness for work.[24]

Secondary Measures

Health status. Self-reported health was measured with the RAND 36-Item Health Survey. The RAND 36-Item Health Survey is a generic health questionnaire covering 9 domains of self-reported health. For the analyses, the subscales physical functioning, role-physical, bodily pain, and general health were merged into the physical component summary, and the subscales vitality, social functioning, role-emotional, and mental health were merged into the mental component summary.[25] Scores range from 0 to 100, and higher scores reflect better perceived health perception. The Dutch version of the RAND 36-Item Health Survey is a reliable, valid, and sensitive instrument.[26]

Physical activity level. Self-reported habitual physical activity in sports, leisure time, and work was assessed with the Baecke Physical Activity Questionnaire.[27] The total score can range from 3 to 15 and subscales range from 1 to 5, with higher scores indicating higher levels of habitual physical activity. Reliability and validity of the Baecke Physical Activity Questionnaire is adequate.[27]

Subjects with CMP (SL-Rehab and SAW groups) filled out questionnaires to measure pain intensity, pain self-efficacy, and disability. Pain intensity was measured with an 11-point numeric rating scale (NRS) for pain ranging from 0 (no pain) to 10 (worst pain imaginable).[28] Reliability and validity of the pain NRS is sufficient.[29] Pain self-efficacy was measured by the 10-item, Dutch version of the Pain Self-Efficacy Questionnaire (PSEQ). Higher scores reflect stronger pain self-efficacy beliefs.[30] Reliability and validity of the PSEQ is good.[30] Pain-related disability was measured with the Pain Disability Index (PDI). The PDI is a 7-item questionnaire used to investigate the magnitude of perceived disability in different situations such as work, leisure time, activities of daily living, and sports. The questionnaire is constructed on 7 NRSs (each 0–10) and can be considered an interval scale in which a total score of 0 means no disability and 70 means maximum disability.[31,32]

Statistical Analysis

Descriptive statistics were provided for all 3 groups. In case of missing values, cases were excluded pair-wise for descriptive analyses and univariate analyses. List-wise exclusion occurred for multivariate analyses. Depending on data distribution, *t* tests or Mann-Whitney *U* tests were performed to test differences between groups. To answer the first question (Do sick listed workers referred for rehabilitation have lower FC compared with workers who stay at work despite pain and compared with healthy workers?), one-way analyses of variance (ANOVAs) were calculated for each of the 6 tests. Because significant differences exist between sex in lifting low and lifting high, men and women were calculated separately.[16] Normality was tested with a Kolmogorov-Smirnov test and by plotting the data. If data were not normally distributed, Kruskal-Wallis tests were performed instead of ANOVAs. To test for equality of variances, Levene tests were calculated. When variances were not equal, a Brown-Forsyth test was calculated instead of ANOVAs. Post hoc Tukey tests were performed to determine which means differed significantly.

To study FC related to work demands, patients of the SL-Rehab and SAW groups were stratified into work demands categories as provided by the DOT.[17] To answer which factors were associated with having insufficient FC for work, a logistic regression analysis (method Enter) was performed using insufficient FC for work (yes/no) as the dependent variable. Two models were calculated. In model 1, a 3-group comparison was made between the SL-Rehab and SAW groups compared with the HW group, in which sex (women=0, men=1), age (y), height (cm), weight (kg), DOT category, and group status were entered as predictor variables. In model 2, the SL-Rehab group was compared with the SAW group with additional predictor variables including pain intensity, pain self-efficacy, kinesiophobia, self-reported activity, disability, and self-reported health. DOT categories and group status (SL-Rehab and SAW groups) were entered as categorical variables in the regression equation. B values, odds ratios (ORs), and 95% confidence intervals (CIs) of ORs were calculated. The *P* value of $<.05$ was considered significant.

RESULTS

In this study, a total number of 942 subjects (553 men, 389 women) were included. The SL-Rehab group consisted of 122 subjects (58 men, 64 women). The SAW group included 119 subjects (48 men, 71 women), and in the HW group, 701 subjects (447 men, 254 women) were included. In table 1, descriptive statistics are provided. Pain-related variables in the

Table 1: Baseline Data of 3 Groups of Workers: SL-Rehab, SAW, and HW Groups

Descriptive Characteristics	Unit or Scale	SL-Rehab Group (n=122)	SAW Group (n=119)	HW Group (n=701)
Men	%	47.5	40.3	63.8
Age	Mean±SD	39.6±10.1	48.3±7.8	41.4±10.3
Sedentary work load	%	19.5	34.4	17
Light work load	%	33.1	35.3	32.7
Medium work load	%	29.7	24.4	43.4
(Very) heavy work load	%	17.8	5.9	6.9
Pain intensity	0–10; mean±SD	6.1±1.9	4.6±2.1	NA
Pain self-efficacy	0–60; mean±SD	35.4±11.8	46.9±8.5	NA
RAND-36 PCS	0–100; mean±SD	37.8±12.5	59.8±17.9	89.1±9.3
RAND-36 MCS	0–100; mean±SD	54.1±20.0	74.1±17.0	80.5±12.1
Physical activity work	1–5; mean±SD	3.2±0.6	2.7±0.6	2.9±0.7
Physical activity sports	1–5; mean±SD	2.3±0.6	2.6±0.8	2.7±0.8
Physical activity leisure	1–5; mean±SD	3.0±0.6	3.1±0.6	3.1±0.7
Physical activity total	3–15; mean±SD	8.5±1.1	8.4±1.2	8.7±1.3
Observed effort lifting low males	0–10	6.1±2.0	8.2±1.7	8.2±1.6
Observed effort lifting low females	0–10	5.4±2.3	8.3±1.8	8.0±1.9

Abbreviations: MCS, mental component summary; NA, not applicable; PCS, physical component summary; RAND-36, RAND 36-Item Health Survey.

Table 2: Differences in Functional Capacity Between 3 Groups of Workers: SL-Rehab, SAW, and HW Groups

			Post hoc Tukey Test		
			Mean Score ± SD		
Test	F (*P*)	df	SL-Rehab Group (n=122)	SAW Group (n=119)	HW Group (n=701)
Lifting low (kg)					
Males	70.4 (0.00)	2	27.0±14.1[‡§]	34.7±12.4[‖]	48.0±12.6
Females	57.9 (0.00)	2	15.0±7.2[‡§]	20.7±6.4[‖]	26.7±8.2
Lifting high (kg)					
Males	25.5 (0.00)	2	14.5±5.3[§]	17.2±4.2[‖]	21.1±5.2
Females*	15.5 (0.00)	2	9.2±3.7[§]	9.9±2.3[‖]	11.8±3.4
Energetic capacity (METS)	18.2 (0.00)	2	9.4±2.0	9.1±1.6[‖]	10.3±1.9
			Post Hoc Mann-Whitney *U* Test		
	χ^2 (*P*)		Median (IQR)		
Overhead work (s)†	15.6 (0.00)	1	108 (72–174)[‡§]	157 (113–226)[‖]	240 (181–312)
Static bend (s)†	19.8 (0.00)	1	148 (97–212)[‡§]	221 (150–287)[‖]	287 (194–419)
Dynamic bend (s)†	3.1 (0.08)	1	48 (44–54)[§]	51 (46–58)[‖]	45 (41–49)

NOTE. 1 MET is 3.5L $O_2 \cdot min^{-1} \cdot kg^{-1}$.
Abbreviations: IQR, interquartile range; METS, metabolic equivalent.
*Brown-Forsythe test.
†Kruskal-Wallis test.
‡SL-Rehab group significantly different from SAW group.
§SL-Rehab group significantly different from HW group.
‖SAW group significantly different from HW group.

HW group were absent, because these workers reported no pain scores.

Do Workers in the SL-Rehab Group Have Lower FC Compared With Workers in the SAW and HW Groups?

In table 2, the differences between groups on FC are presented. In general, FC of the SL-Rehab group was the lowest. In all tests, except for energetic capacity, both groups with CMP scored significantly lower than healthy workers. On lifting low, overhead work, and static bending, the SL-Rehab group scored significantly lower than the SAW group, while differences in lifting high, energetic capacity, and dynamic bending were nonsignificant.

Is the FC of Workers in the SL-Rehab and SAW Groups Insufficient to Meet Their Work Demands?

Table 3 presents the percentage of workers with CMP whose FC is sufficient to meet work demands (higher than the 5th percentile of FC of the HW group).

The percentage of subjects in the SL-Rehab group meeting the 5th percentile is the lowest. For higher workload (higher DOT categories), this means that the SL-Rehab group is in many cases not able to meet the work load. Depending on work load and sex, 15% to 71% demonstrated insufficient FC to meet work demands. For all other tests, besides lifting low, lifting high, and carrying, most workers' FC exceeded the work load.

Which Factors Are Associated With Sufficient FC to Perform Work?

Results of 2 logistic regression models are presented in table 4. In model 1, the SL-Rehab and SAW groups were compared with the healthy controls. A total of 799 subjects were included in the analysis, 143 cases were excluded because of missing values. Total explained variance of sufficient FC in model 1 was 54% (Nagelkerke R^2). Both CMP groups scores were highly significant, meaning that having CMP was negatively associated with sufficient FC. The mean odds of a person with CMP having insufficient FC are 6.5 (range, 2.7–15.4) in the SL-Rehab group and 7.2 (range, 3.4–15.5) in the SAW group. Being a woman, having higher age, lower effort level, and higher work load were also significantly associated with insufficient FC. The second model included comparisons of the SL-Rehab group with the SAW group. A total of 138 subjects were included in the analysis; 103 cases were excluded because

Table 3: Percentage of Workers With CMP Whose Test Results Are Higher Than Their Work Demands (≥P5)

	% SL-Rehab Group ≥P5 Healthy Workers				% SAW Group ≥P5 Healthy Workers			
Work Load Category	Sedentary	Light	Medium	Heavy	Sedentary	Light	Medium	Heavy
Lifting low males (%)	NA	85	80	40	100	87	100	NA
Lifting low females (%)	64	29	47	NA	82	60	71	NA
Energetic capacity (METS)*	100	100	100	100	97	97	96	NA
Static overhead work (s)	NA	54	77	NA	83	85	84	NA
Static forward bend (s)	77	68	75	13	93	90	93	NA
Dynamic bending 20× (s)	85	85	84	71	72	68	82	NA

Abbreviations: METS, metabolic equivalent; NA, not applicable because of insufficient group size (n<10); P5, score representing 5th percentile score of corresponding DOT class.
*1 MET is 3.5L $O_2 \cdot min^{-1} \cdot kg^{-1}$.

Table 4: Logistic Regression Analysis of Sufficient FC to Meet Workload (≥P5)

	Model 1			Model 2		
Predictor Variables	B	OR	95% CI of OR	B	OR	95% CI of OR
Constant	1.40	4.2	NA	−8.70	0.0	NA
SL-Rehab group	1.90	6.5*	2.7–15.4	−0.20	1.2	0.2–9.2
SAW group	2.00	7.2*	3.4–15.5	NA	NA	NA
Sex	−3.60	35.7*	11.9–100.0	−5.00	143.0*	13.2–1000.0
Age	0.03	1.0	0.9–1.0	0.18	1.2*	1.1–1.3
Observed effort	−0.70	1.9*	1.6–2.3	−1.10	3.0*	1.8–5.1
Baecke Physical Activity Questionnaire	−0.10	1.1	0.9–1.5	0.10	1.1	0.6–1.9
Light work load	1.00	2.7†	1.1–6.4	1.40	4.0	0.8–19.6
Medium work load	1.10	3.0†	1.1–7.7	0.10	1.1	0.2–6.4
Heavy work load	3.60	35.1*	7.6–162.5	3.90	50.6*	3.1–828.6
Tampa Scale of Kinesiophobia	NA	NA	NA	0.10	1.1†	1.0–1.2
RAND-36 mental	NA	NA	NA	−0.04	1.0	1.0–1.1
RAND-36 physical	NA	NA	NA	0.06	1.1†	1.0–1.1
Pain	NA	NA	NA	−0.10	1.1	0.8–1.5
Disability (PDI)	NA	NA	NA	0.10	1.1†	1.0–1.2
Self-efficacy (PSEQ)	NA	NA	NA	0.00	1.1	1.1–1.2

NOTE: Model 1 is a 3-group comparison of the SL-Rehab group and SAW group compared with the HW group (n=799); model 2 is a 2-group comparison of the SL-Rehab group compared with the SAW group (n=138).
Abbreviations: NA, not applicable; P5, score representing 5th percentile score of corresponding DOT class; RAND-36, RAND 36-Item Health Survey.
*$P<.01$; †$P\leq.05$.

of missing values. Total explained variance of insufficient FC in model 2 was 67% (Nagelkerke R^2). Being a woman, having higher age, lower effort level, lower activity level, and heavy physical work load were associated with insufficient FC. Group status was not significantly associated with having insufficient FC to perform work (OR=1.2; 95% CI, 0.2–9.2).

DISCUSSION

The main objective of this study was to investigate if subjects with CMP who are sick listed and subjects with CMP who stay at work had lower FC compared with healthy workers, and to study the role of work participation in workers who stay at work with CMP and sick listed workers. Based on the results, it can be concluded that both groups with CMP had lower FC than healthy workers, and that the FC of the SL-Rehab group was lower than the SAW and HW groups. In the SAW group, most workers' FC was sufficient, regardless of their type of workload. For subjects in the SL-Rehab group, FC in most cases was sufficient for sedentary work demands, but insufficient for higher work demands, especially for lifting and carrying.

For energetic capacity, no relevant differences appear between the 3 groups. This is not in accordance with research in which energetic capacity was observed to be lower in patients with chronic low back pain compared with healthy controls.[33] Even so, it remains unknown if a lower score on the FCE is truly reduced by deconditioning or if other factors may be associated with the lower FC of the SL-Rehab group compared with the SAW and HW groups. Besides deconditioning, a range of other explanations can be postulated to explain differences in the FC between these groups. The first explanation is that patients with CMP stop the tests because of pain experience, fear of pain, or taking into account possible consequences of performing heavy tasks, rather than because of limiting FC. Pain intensity, however, is unlikely to be the modifying factor for observing low effort, because the SAW group suffers from pain as well. Pain intensity was not associated with insufficient FC. Personal (kinesiophobia, perceived physical health and disability, sex, and age) and work-related factors (work load) were associated with insufficient FC (see table 4). A second explanation may be that patients see the FCE as a prerequisite for inclusion in the rehabilitation program. In the patient's perception, a higher performance may reflect little limitation. Patients may therefore (un)consciously perform different in different contexts. In table 1, it can be observed that the SL-Rehab group scored remarkably lower on observed effort during the test. Observed effort also was a significant contributor in model 2 (see table 4). The origin of reduced effort may be because of patient or FCE evaluator variations. The evaluator may respond differently to the patients with higher pain-related behavior compared with healthy subjects, which in turn may limit the performance of the patients.[34] Additionally, previous research observed that beliefs and attitudes of clinicians play a significant role on advising patients about CMP.[35] In this study, these possible explanations could not be determined, and it is recommended to further explore the role of these interaction effects on functioning in future research.

For women and physically high demanding work, high ORs were associated with insufficient FC (see table 4). The reason for this result is because the 5% normative value for sufficient FC was constructed regardless of sex, but women score significantly lower on material handling tests than men. This also explains the high ORs for high work load. It must be stated, however, that limited value to the scores of the ORs can be given concerning the sex and workload factors, because the 95% CIs were very broad. In particular, in model 2, sex (OR=143; 95% CI, 12.2–1000) and heavy work load (OR=50.6; 95% CI, 3.1–828.6) had very broad intervals.

Whether patients in this study were deconditioned remains unclear, but this may be more theoretically than clinically relevant. In this study, we focused on the FC of workers related to work demands. It was demonstrated that patients with CMP have lower FC when they are off work. It was observed that insufficient FC was not significantly associated with group status, indicating that workers in the SL-Rehab and SAW

groups were both equally equipped to perform work. That was not in accordance with the different work status of both groups. Factors other than group status explained the variance in (in)sufficient FC (age, sex, observed effort, kinesiophobia, perceived physical health). The results are important for clinicians and therapists working in vocational rehabilitation. Patients who have sufficient FC but who are absent from work may be limited by more than physical factors. Physical training in patients with insufficient FC for work may be a part of rehabilitation programs, but not strictly, because nonphysical factors were also significant predictors for lower FC.

Study Limitations

There are some critical notes to the choices that were made in this study. First, it appeared impossible to state if lower FC in CMP groups was the result of deconditioning, because this assumes a process which occurs over a certain time period. A cross-sectional design is not suitable for measuring changes over time, and only a current state of the patient can be observed. In the study by Bousema et al,[36] deconditioning was prospectively measured and deconditioning was observed in patients with chronic pain. In the Bousema study,[36] however, it remained unclear whether the deconditioning could be considered relevant, because capacity was not related to work load or functioning. Even if significant deconditioning has occurred over time, FC could still be sufficient to meet the work load. In the present study, therefore, the minimal FC, which is assumed to be sufficient (>5th percentile of the HW group),[16] was used as a criterion for insufficient FC. From this point of view, it was hypothesized that subjects who score above this criterion, indeed have sufficient capacity (highly sensitive), but for those subjects who score below this criterion, it is still unknown if capacity is sufficient (lower specificity). It can be argued, however, that FC will become a threat if one performs below the 5th percentile criterion. The data of the present study confirm that 2 groups can be identified based on different predictors. Future prospective research to deconditioning in relationship to work load may further investigate this challenging postulation. Second, FC was based on FCE results in relationship to work load. FC could be defined as a broader concept than only a physical one: besides physical components, psychological and social factors are known to influence functioning. The magnitude of this influence is ambiguous and should be a further object of study. Third, inclusion of subjects in the groups was nonstratified, and randomization was not possible. This led to different group characteristics with respect to age, sex, and workload. In table 2, results were stratified based on sex, because it is known that lifting capacity differs between men and women.[16] In table 4, corrections were applied in a multivariate design to overcome these distribution differences. Finally, the validity of the DOT is questionable. Validity of the DOT has never been scientifically tested, nor has it been based on quantitative work-related task analyses, and instead it is based on consensus meetings of experts.[37]

CONCLUSIONS

Sick listed workers with CMP referred for rehabilitation have lower FC than workers with CMP who stay at work. Compared with healthy workers, both groups with CMP have lower FC. CMP is strongly associated with insufficient FC to meet work demands. In many cases, workers among both groups demonstrate insufficient FC to meet work demands. Not the pain itself, but personal and work-related factors are related to insufficient FC.

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