Original article

Scand J Work Environ Health Online-first -article

doi:10.5271/sjweh.3823

The effectiveness of vocational rehabilitation on work participation: a propensity score matched analysis using nationwide register data

by Leinonen T, Viikari-Juntura E, Husgafvel-Pursiainen K, Juvonen-Posti P, Laaksonen M, Solovieva S

For recently employed individuals with musculoskeletal- or mental-related work disability histories, the statutory vocational rehabilitation scheme in Finland has modest effectiveness on work participation. For shorter rehabilitation, the gains tend to be short term, whereas for longer rehabilitation, they tend to be delayed. Enhanced or complementary interventions should therefore be developed, accounting for this temporal variation in the effectiveness.

Affiliation: Finnish Institute of Occupational Health, P.O. Box 40, FI-00032 TYÖTERVEYSLAITOS, Finland. taina.leinonen@ttl.fi

Refers to the following texts of the Journal: 2019;45(2):203-208 2017;43(5):447-456 2016;42(4):273-279 2012;38(1):27-37

Key terms: employment; Finland; Finland; labor market status; matched analysis; mental disorder; musculoskeletal disease; occupational rehabilitation; propensity score; quasi-experimental study; register data; rehabilitation; return to work; vocational rehabilitation; work disability; work participation

This article in PubMed: www.ncbi.nlm.nih.gov/pubmed/30977515

Additional material

Please note that there is additional material available belonging to this article on the *Scandinavian Journal of Work, Environment & Health* -website.

Original article

Scand J Work Environ Health – online first. doi:10.5271/sjweh.3823

The effectiveness of vocational rehabilitation on work participation: a propensity score matched analysis using nationwide register data

by Taina Leinonen, PhD,[1] Eira Viikari-Juntura, MD, PhD,[1] Kirsti Husgafvel-Pursiainen, PhD[1] Pirjo Juvonen-Posti, PhD,[1] Mikko Laaksonen, PhD,[2] Svetlana Solovieva, PhD [1]

Leinonen T, Viikari-Juntura E, Husgafvel-Pursiainen K, Juvonen-Posti P, Laaksonen M, Solovieva S. The effectiveness of vocational rehabilitation on work participation: a propensity score matched analysis using nationwide register data. *Scand J Work Environ Health* – online first.

Objective Research on the effectiveness of vocational rehabilitation has focused on small and selected groups, lacked proper controls, or not captured dynamic changes in work participation. Using rich nationwide data on vocational rehabilitees and matched controls, long-term changes in work participation before and after vocational rehabilitation were examined to assess its effectiveness.

Methods Representative Finnish register data were used to examine 3199 recently employed individuals aged 30–55 years with histories of musculoskeletal- and mental-related work disability starting vocational rehabilitation in 2008–2010 (intervention group), and 3199 propensity score matched non-rehabilitees (control group). Sociodemographic and work-related factors and detailed 3-year work disability and other labor market history were used for matching. Generalized estimation equations were used to examine differences in the proportion of time spent at work between periods before and after rehabilitation among the intervention and control group and the difference in these differences (DID).

Results Vocational rehabilitation resulted in gains in work participation, the total 1-, 2-, and 3-year DID being 11.8 [95% confidence interval (CI) 10.0–13.7], 8.9 (95% CI 7.6–10.2), and 7.2 (95% CI 6.1–8.3) percentage points, respectively. Contrary to this overall pattern, larger DID was observed over the long term for those whose rehabilitation lasted >10 months. The DID was lowest among women with musculoskeletal diseases.

Conclusions Vocational rehabilitation after musculoskeletal- or mental-related work disability showed modest effectiveness on work participation. To promote sustained work participation after shorter rehabilitation (likely comprising workplace interventions) and faster work resumption after longer rehabilitation (likely comprising training), enhanced and complementary interventions should be considered.

Key terms employment; Finland; labor market status; mental disorder; musculoskeletal disease; occupational rehabilitation; quasi-experimental study; return to work; work disability.

Several recent reviews have focused on interventions aiming to promote work participation among individuals with ill-health (1–8). Among the various interventions, vocational rehabilitation services have been associated with favorable outcomes (5, 9–16). There is nevertheless much methodological and programme-related diversity between the studies.

Finding proper controls for the rehabilitees constitutes a challenge. Regulating access to vocational rehabilitation services is often legally and ethically unfeasible. Randomized controlled trials have therefore typically been restricted to examining the effectiveness of specific return-to-work interventions in small study populations and selected settings (1, 5, 6, 8). Based on these trials, the effectiveness of larger-scale vocational rehabilitation schemes has remained unclear.

Observational studies, instead, have often been unable to fully control for confounding factors influencing both the receipt of vocational rehabilitation services and subsequent labor market outcomes. For example, previous studies (13, 14, 17) have examined changes in work participation before and after vocational rehabilitation using individual-level panel data, and thereby accounted for the within-individual association between previous and subsequent work participation. However, these studies did not include controls not receiving or

1 Finnish Institute of Occupational Health, Helsinki, Finland.
2 Finnish Centre for Pensions, Helsinki, Finland.

Correspondence to: Taina Leinonen, Finnish Institute of Occupational Health, P.O. Box 40, FI-00032 TYÖTERVEYSLAITOS, Finland. [E-mail: taina.leinonen@ttl.fi]

applying for vocational rehabilitation services.

Other observational studies have assessed the effectiveness of vocational rehabilitation by comparing recipients to non-recipients using propensity score (PS) matching. Such matching has utilized observed characteristics, such as sociodemographic factors, previous employment participation, and features of the work disability process, including diagnosed causes. Findings have been mixed, indicating either ineffectiveness (18), effectiveness (15, 16, 19), or effectiveness only in particular sub-groups (9, 11). The target populations of these studies included long-term sickness beneficiaries (9, 18), disability insurance beneficiaries (11, 16, 19), or persons with reduced work capacity with mixed benefit recipiency statuses (15). The type of vocational rehabilitation varied. Different services such as vocational assessments, education and training, job search assistance, work try-outs, and/or subsidized employment could typically be included (9, 11, 15, 18). The programmes could additionally include medical or social rehabilitation (18) or comprise specific contents, namely placement coaching (16). Most of the studies examined either immediate (18) or cumulative (9, 11, 15, 19) return-to-work outcomes, thereby not addressing dynamic long-term changes in work participation before and after vocational rehabilitation.

One of the studies using PS matching did nevertheless further apply the difference in differences (DID) approach to examine changes in income and disability benefit receipt before and after a pilot programme of placement coaching. The programme was found to be effective in terms of both outcomes (16). When information on labor market participation is available both before and after rehabilitation, it may be useful to complement PS matching with the DID approach. The DID addresses differential changes in the outcome between the pre- and post-intervention periods. It therefore controls for any differences in the pre-intervention level of the outcome that remain, despite matching, between the intervention and control group.

In the present study, the DID approach was applied to individuals receiving work-oriented vocational rehabilitation of the Finnish earnings-related pension scheme and their PS matched controls. Changes in work participation over periods of three years before and after rehabilitation were examined to assess the effectiveness of the intervention.

Methods

Data sources

A 70% random sample of the working-age population living in Finland on 31 December 2007 was used. The register-based longitudinal data include information on episodes of vocational rehabilitation, employment, unemployment, earnings-related retirement, and other benefit receipt from the Finnish Centre for Pensions, on episodes of compensated sickness absence and national pensions obtained from the Finnish Social Insurance Institution, and on sociodemographic factors, work-related factors, and employment services obtained from the Finnish Longitudinal Employer–Employee Data (FLEED). For this study, information between 1 January 2005 and 31 October 2014 was utilized.

Vocational rehabilitation in Finland

Since 2004, access to vocational rehabilitation services has been a statutory right in Finland. Eligibility is assessed based on a threat of disability retirement within the next five years due to an illness or injury and on an expectation that work participation can be promoted and disability retirement postponed or prevented with rehabilitation. Those who have recent attachment to working life and enough earnings from work in the previous five years (sum of approximately €35 000 at 2018 level) are eligible for rehabilitation of the earnings-related pension scheme, taking sociodemographic and work-related factors into account. Others may receive rehabilitation from the Social Insurance Institution of Finland. These two schemes are the main sources of vocational rehabilitation in Finland, with around 17 000 recipients in the former and 20 000 in the latter scheme in 2017. Other less prevalent, but overruling sources of vocational rehabilitation include insurances for occupational, traffic, or military injuries (20–24).

The present study focused only on the earnings-related pension scheme, ie, included rehabilitees with relatively good previous labor market attachment. The main services of the scheme include work try-outs, work counselling, and training. The former two are often carried out at a person's own workplace, and during the calendar period of this study, these covered around half of the provided services. Work try-outs typically last for a few months and work counselling for six months or even more. The duration of training may vary considerably, with the content ranging from short courses to training programs lasting for several years. The content of rehabilitation is planned case-specifically according to individual needs. Medical rehabilitation is not covered in the scheme (22, 24). The effectiveness of the provided vocational rehabilitation is yet to be established (20). A previous study nevertheless showed very diverse work participation trajectories before and after the rehabilitation (17).

The decision to apply for vocational rehabilitation is ultimately made by the individual. However, especially after prolonged sickness absence, the need for and appropriateness of rehabilitation is addressed at the occupa-

tional health service level, possibly in cooperation with the employer. Employer cooperation is also important for rehabilitation to run smoothly at the workplace. An application for vocational rehabilitation, sent to the statutory pension insurer, requires a medical assessment of work disability from the treating physician (22).

Intervention group

The intervention group was based on individuals who began vocational rehabilitation within the earnings-related pension scheme in 2008, 2009, or 2010 (first episode during these index years included as the index episode), and who reached age 30–55 during that year (originally 7214 persons). When considering rehabilitation length, successive episodes with time gaps of ≤32 days were combined.

For those whose rehabilitation lasted ≤10 months (ie, shorter rehabilitation, 70.3%), follow-up data for work participation after termination of rehabilitation was available for a full 3-year period. For those whose rehabilitation lasted >10 months (ie, longer rehabilitation, 29.7%), there was a trade-off between the observation time for participation in rehabilitation and subsequent work participation follow-up. To enable at least a 2-year follow-up between the end date of rehabilitation and 31 October 2014 (last available data on work participation), the longer-length rehabilitation episodes that ended after 31 October 2012 were excluded (N=521, 7.2% of the original number of episodes). Longer rehabilitation was therefore not fully represented in this study: episodes starting earlier in the index period and/or episodes with "shorter" longer duration were more likely to be included and also more likely to be succeeded by a full 3- rather than 2-year work participation follow-up. The longest rehabilitation episodes, starting early in the index period to be included, lasted up to around 4.5 years. Only 0.9% of the original number of episodes lasted beyond that duration.

Heterogeneity among the remaining 6693 persons in the intervention group was reduced to find better matched controls. Individuals were excluded if, over a 3-year period before rehabilitation, they received full permanent pensions (9.2%) or did not have any work disability (compensated full or part-time sickness absence or partial/temporary disability retirement) due to a musculoskeletal disease (International Classification of Diseases (ICD-10) codes M00–M99) or a mental disorder (F00–F99) (17.1%). The study focused on these two disease groups, as they together cover over 70% of the principal underlying conditions of those undergoing vocational rehabilitation of the earnings-related pension scheme (24). Other disease groups were too small to be examined separately and too heterogeneous to be pooled for the analyses. Those who were non-employed (18.7%), self-employed (1.8%), or had an unknown occupation (0.3%) at the end of the year preceding rehabilitation were also excluded. Before matching, 3547 vocational rehabilitees remained eligible for the intervention group.

Sociodemographic and work-related factors

Age reached in the rehabilitation year was categorized at 5-year intervals. Region of residence (Southern, Western, Eastern, and Northern Finland), employment sector (public/private), and education were measured at the end of the preceding calendar year. Education consisted of categories tertiary (≥13 years of education), secondary (11–12 years of education), and primary (no education after 9 years of compulsory school and sometimes a voluntary 10th year).

Job exposures were estimated by linking information from job exposure matrices (JEM) that were developed earlier in a large population survey and have been described in more detail elsewhere (25, 26). Basically, they provide gender- and occupation-specific estimates of different job exposures, based on the proportion reporting these exposures in men and women holding a specific occupational title in the survey. This previously developed JEM information was then linked to occupational titles of the individuals in the present register data, using a classification by Statistics Finland, based on the International Standard Classification of Occupations (ISCO-88). Heavy physical work, kneeling and squatting, and awkward postures were dichotomized (low/high) with a cut-off point of 40 (range 0–100). Job control was based on the Karasek model (27) and also used as a dichotomous variable (high/low).

Labor market history

Labor market history over a 3-year period before the start date of vocational rehabilitation was based on information on episodes of employment and of receiving different types of social security benefits. Annual number of days was calculated for the following statuses: in full work duties (being employed without receiving benefits that compensate for being out of work such as sickness allowance), partial work disability (part-time sickness absence or partial disability retirement), full sickness absence, vocational rehabilitation (previous to the index episode), unemployment, full temporary disability retirement, and other status (see the appendix www.sjweh.fi/show_abstract.php?abstract_id=3823 for "Categorizations of labor market history variables"). Receiving training through employment services, examined based on the job-seeker register, could overlap with these mutually exclusive statuses.

Furthermore, two latent clusters of work disability

history were empirically identified to capture the temporal pattern of emerging overall work disability more thoroughly. The clusters are referred to as "increasing work disability" and "full work duties prevailing" (see the appendix for more details on "Constructing the clusters of work disability history"). Disease group of work disability was defined based on the most recent episode of any type of work disability due to either a musculoskeletal disease or a mental disorder.

Propensity score matching

The control pool for PS matching was formed based on individuals aged 30–55 years in 2008, 2009, and/or 2010 who did not receive vocational rehabilitation in these years, but otherwise met the same inclusion criteria as the intervention group (figure 1). To be able to apply the inclusion criteria and measure covariates regarding the 3-year labor market history among the non-rehabilitees, exact index dates corresponding to the start dates of rehabilitation were required. Index dates of non-rehabilitees were set as first days of randomly assigned calendar months within each index year. Over 700 000 observations were found to be eligible for the control pool (see "Identifying the control pool" described in the appendix in more detail).

Recommendations from systematic reviews were followed regarding inclusion of variables for PS construction, selection of the PS model and matching method, approach for the evaluation of the covariates' balance, and conducting further statistical methods after matching for testing the "intervention effect" (28, 29). To compute the PS, a set of hierarchical logistic regressions was conducted with a set of background factors as covariates and receiving vocational rehabilitation as the dependent variable ("The PS matching process" described in the appendix in more detail). A higher PS indicates a higher probability of receiving rehabilitation.

PS matching was conducted within 36 (2×2×3×3) exactly matched strata by disease group of preceding work disability, gender, education, and index year. Covariates used in the PS models are presented in table 1. A matched pair could be found for 3199 (90.2%) rehabilitees. These pairs were included into the final study population. PS analyses were complemented by the DID approach to analyze work participation among the matched pairs.

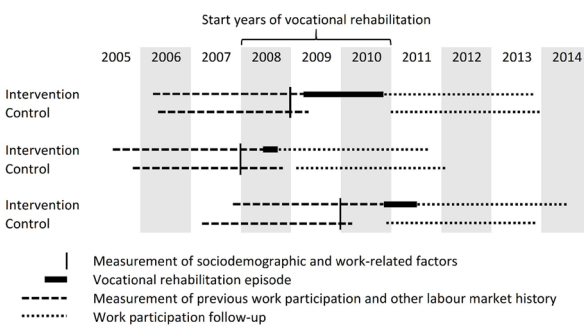

Figure 1. Study design with model examples of matched pairs including a vocational rehabilitee of the intervention group and his/her control.

Table 1. Distribution of background factors among vocational rehabilitees who were eligible for the intervention group but unmatched, the matched intervention group, and the matched control group.

	Eligible for the intervention group, unmatched		Intervention group, matched		Control group, matched	
	%	N	%	N	%	N
Musculoskeletal disease (vs mental)	58.6	204	67.8	2170	67.8	2170
Men (vs women)	39.4	137	33.7	1078	33.7	1078
Education						
Tertiary	30.8	107	27.8	888	27.8	888
Secondary	47.4	165	56.2	1797	56.2	1797
Primary	21.8	76	16.1	514	16.1	514
Index year						
2008	33.1	115	34.0	1086	34.0	1086
2009	33.1	115	33.6	1074	33.6	1074
2010	33.9	118	32.5	1039	32.5	1039
Age group (years)						
30–35	11.8	41	10.4	334	14.1	452
36–40	13.8	48	14.0	447	13.1	419
41–45	19.0	66	20.0	639	18.2	582
46–50	31.9	111	27.6	883	25.1	804
51–55	23.6	82	28.0	896	29.5	942
Region of residence						
South	53.2	185	47.0	1503	48.7	1559
West	21.3	74	23.3	744	23.8	762
East	11.5	40	15.2	487	15.1	482
North	14.1	49	14.5	465	12.4	396
Private (vs public) sector	58.3	203	55.9	1787	56.9	1820
Heavy physical work (vs low exposure)	44.0	153	46.6	1490	44.4	1419
Kneeling and squatting (vs low exposure)	32.5	113	30.3	968	30.9	989
Awkward postures (vs low exposure)	40.8	142	42.0	1345	41.5	1329
Low job control (vs high)	63.1	219	67.1	2145	66.4	2124
≥180 days in full work duties (vs fewer)						
Year -3	74.1	258	93.0	2974	91.5	2927
Year -2	59.5	207	85.0	2720	86.5	2768
Year -1	4.0	14	39.5	1265	54.0	1728
≥105 days in full sickness absence (vs fewer)						
Year -3	20.1	70	9.2	295	8.1	259
Year -2	30.2	105	23.4	750	16.9	541
Year -1	60.1	209	67.7	2165	49.4	1581
≥180 days in unemployment (vs fewer)						
Year -3	4.6	16	1.4	45	2.8	90
Year -2	2.9	10	0.8	26	1.8	58
Year -1	2.0	7	4.9	157	3.6	114
Vocational rehabilitation (vs no)						
Year -3	4.0	14	1.4	46	1.0	31
Year -2	2.9	10	1.2	37	1.0	31
Year -1	1.4	5	0.6	20	0.4	14
Partial work disability, year -1 (vs no)	23.9	83	6.8	217	6.4	205
Full disability retirement, year -1 (vs no)	32.2	112	15.5	495	11.2	359
Increasing work disability cluster (vs full work duties prevailing)	95.7	333	60.3	1930	47.8	1530
Total	100.0	348	100.0	3199	100.0	3199

Work participation outcome variable

For calculating work participation, it was assumed that individuals with the full work duties status worked 100% of the time; full-time work is very typical in Finland (30). It was also assumed that individuals with the partial work disability status worked 50% of the time. Persons on part-time sick leave are required to work 40–60% of the time.

Annual proportions of time spent at work were calculated over 3-year periods before and after vocational rehabilitation, the measurement period thereby not covering the time spent in rehabilitation (average rehabilitation length 7.9 months). Among a control, the index episode length was defined to be the same as that observed among the matched rehabilitee (figure 1). For descriptive purposes, note that during their index episode, the controls were in either full work duties (60.2% of the time), partial work disability (3.9%), temporary full work disability (full sickness absence or temporary disability retirement, 21.6%), unemployment (10.1%), full permanent disability retirement (2.9%), or other status (1.4%). The controls therefore spent at work 62.2% (60.2%+0.5×3.9%) of the time that the intervention group spent in rehabilitation.

Statistical methods after matching

Generalized estimation equations (GEE) were used to estimate the mean proportion of time spent at work (ie, work participation) before (years -3, -2, and -1) and after (years 1, 2, and 3) vocational rehabilitation (for simplicity, the index episode is referred to as rehabilitation also among controls). The GEE models account for the within-individual correlation between repeated measurements.

Estimations were made of trajectories of annual work participation among the intervention and control group and of differences in work participation between periods before and after rehabilitation and of the resulting DID. To be able to include and compare those with different rehabilitation lengths and to assess the effectiveness of the intervention over time, 1-year (years -1 and 1), 2-year (years -2− -1 and 1−2), and 3-year (years -3− -1 and 1−3) periods before and after rehabilitation were examined. A positive value of DID reflects the percentage point gain in work participation due to the intervention.

Sensitivity analyses are presented for various subgroups, including more specific categories of rehabilitation length, the different index years, level of the PS, pairs assigned to the same cluster of labor market history, and pairs in which neither had preceding (3-year period before), coinciding, or succeeding (3-year period after) other vocational rehabilitation episode, training through employment services, and partial work disability. Participating in training through employment services and working part-time while receiving partial work disability benefits can serve as alternative interventions to vocational rehabilitation. Further sensitivity analyses are presented comparing work participation among the unmatched and matched intervention group.

Results

Distributions of the background factors were relatively balanced between the matched intervention and control group (table 1). The intervention group nevertheless had shorter time in full work duties and longer time in full sickness absence in year -1 and was more often assigned to the cluster of increasing work disability than the control group. Factors remaining imbalanced after matching were adjusted for in the analyses (only full work duties and sickness absence in year -1, since further adjustment for the cluster of work disability history had little effect on the estimates). Compared to the matched intervention group, those who were eligible for the intervention group but could not be matched had more often mental disorders and generally also less favorable labor market histories.

Examining 1-year periods before and after rehabilitation, work participation increased more in the intervention than the control group (table 2). This differential change resulted in an overall DID of 11.8 [95% confidence interval (CI) 10.0–13.7], reflecting the percentage point gain in the mean proportion of time spent at work during the follow-up due to the intervention. Between 2-year periods, work participation slightly increased in the intervention group and slightly decreased in the control group, the DID being 8.9 (95% CI 7.6–10.2). Between 3-year periods, work participation decreased more in the control than the intervention group, resulting in a DID of 7.2 (95% CI 6.1–8.3).

Among pairs with shorter rehabilitation, the largest gain in work participation occurred in the year immediately after rehabilitation (table 2; figure 2a). Afterwards this gain decreased, thereby following the general pattern observed among the whole study population. Among pairs with longer rehabilitation, the pattern was reversed, with the gain increasing over the follow-up years (table 2; figure 2b). The 3-year DID could only be calculated for pairs with a full 3-year follow-up. For comparison, the 1- and 2-year DID values were somewhat lower for all pairs with longer rehabilitation than for those who had a full follow-up (table 2). Among the four disease group×gender strata, the DID values were lowest for women with musculoskeletal diseases (figure 3).

The results of the main analyses were confirmed in sensitivity analyses examining more specific categories

Table 2. Estimated percentage of time spent at work before and after vocational rehabilitation in the intervention and control group, the difference (Diff) between these two periods, and the difference in these differences (DID) with 95% confidence intervals (CI) among those with shorter and longer rehabilitation.

	Intervention group					Control group					DID	95% CI
	Before rehabilitation		After rehabilitation			Before rehabilitation		After rehabilitation				
	Mean	95% CI	Mean	95% CI	Diff	Mean	95% CI	Mean	95% CI	Diff		
One year before and after rehabilitation												
Shorter rehabilitation [a]	43.5	42.5–44.6	68.5	67.4–69.6	24.9	48.6	47.5–49.6	59.6	58.5–60.7	11.0	13.9	11.8–16.0
Longer rehabilitation												
Any follow-up length [b]	59.2	57.0–61.4	68.8	66.7–71.0	9.6	63.6	61.5–65.8	70.2	68.1–72.4	6.6	3.0	-1.2–7.2
Full follow-up [c]	57.2	54.4–59.9	69.1	66.4–71.9	12.0	61.2	58.5–64.0	68.2	65.4–70.9	6.9	5.0	-0.3–10.4
All, any follow-up length [d]	46.7	45.7–47.6	68.6	67.7–69.6	21.9	51.6	50.6–52.5	61.6	60.7–62.6	10.1	11.8	10.0–13.7
Two years before and after rehabilitation												
Shorter rehabilitation [a]	61.5	60.5–62.4	66.1	65.2–67.1	4.7	64.6	63.7–65.5	59.7	58.8–60.7	-4.9	9.6	8.1–11.0
Longer rehabilitation												
Any follow-up length [b]	68.3	66.5–70.2	69.2	67.3–71.1	0.9	73.8	72.0–75.7	68.9	67.0–70.7	-5.0	5.8	3.0–8.7
Full follow-up [c]	66.9	64.5–69.3	69.9	67.5–72.3	3.0	72.1	69.7–74.5	66.4	64.0–68.8	-5.7	8.7	5.1–12.3
All, any follow-up length [d]	62.8	62.0–63.7	66.8	66.0–67.6	4.0	66.4	65.6–67.3	61.5	60.7–62.3	-4.9	8.9	7.6–10.2
Three years before and after rehabilitation												
Shorter rehabilitation [a]	70.4	69.5–71.2	64.7	63.8–65.5	-5.7	72.1	71.2–73.0	59.5	58.6–60.4	-12.6	6.9	5.7–8.1
Longer rehabilitation												
Any follow-up length [b]	74.2	72.5–75.9				78.0	76.3–79.7					
Full follow-up [c]	73.5	71.2–75.8	70.2	67.9–72.5	-3.3	76.6	74.4–78.9	64.9	62.6–67.1	-11.8	8.5	5.5–11.5
All, full follow-up [e]	70.8	69.9–71.6	65.4	64.6–66.2	-5.3	72.7	71.9–73.5	60.2	59.4–61.0	-12.5	7.2	6.1–8.3

[a] N=2559 matched pairs.
[b] N=640 matched pairs.
[c] N=388 matched pairs.
[d] N=3199 matched pairs.
[e] N=2947 matched pairs.

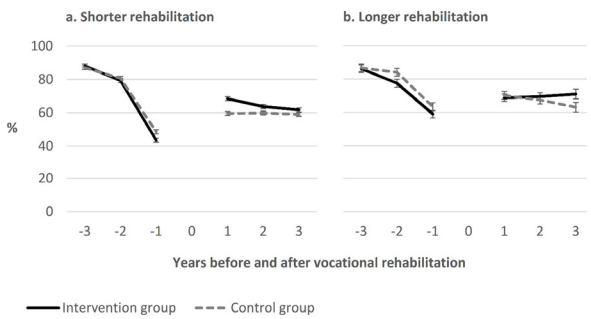

Figure 2. Estimated percentage of time spent at work before and after vocational rehabilitation in the intervention and control group with 95% confidence intervals among those with (a) shorter (N=2559 matched pairs) and (b) longer rehabilitation (N=388–640 matched pairs).

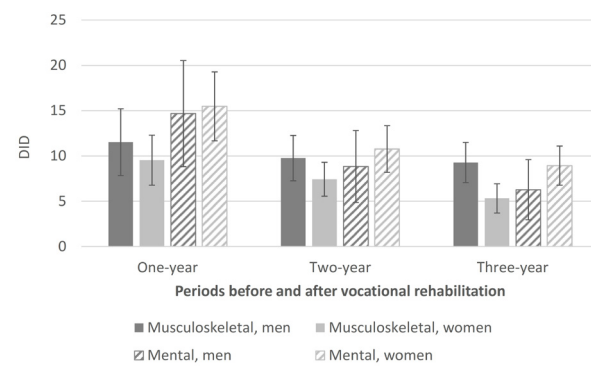

Figure 3. Difference in differences (DID) between the intervention and control group in the estimated percentage of time spent at work before and after the vocational rehabilitation intervention with 95% confidence intervals, stratified by disease group and gender (N=295–1396 matched pairs).

of rehabilitation length (table 3). In categories ≤10 months, the gain in work participation decreased and in categories >10 months it increased over long term. Furthermore, within the shorter episodes, the DID values were highest for rehabilitation of exactly three months. The DID values tended to be higher after index year 2008 and among pairs with a high than with a low PS. Restricting the study population to pairs with the same cluster of work disability history, no other vocational rehabilitation episodes, no training through employment services, and no partial work disability showed similar findings as the main analyses.

Further sensitivity analyses showed that at low levels of the PS, the unmatched group had a lower overall level and a larger increase in work participation after rehabilitation than the matched intervention group (appendix figure S1a). At high levels of the PS, the shape of the trajectories of work participation was similar between the groups (appendix figure S1b).

Discussion

This study found that for recently employed 30–55-year-old individuals with a history of work disability related to a musculoskeletal disease or mental disorder, statutory vocational rehabilitation of the earnings-related pension scheme has modest effectiveness on work participation. Furthermore, an important interplay between rehabilitation length and timing of gained work participation was

Table 3. Difference in differences (DID) between the intervention and control group in the estimated percentage of time spent at work before and after the vocational rehabilitation intervention with 95% confidence intervals (CI) among various sub-groups.

	Periods before and after rehabilitation					
	One-year		Two-year		Three-year	
	DID	95% CI	DID	95% CI	DID	95% CI
Rehabilitation length in months						
<3 (N=517 matched pairs)	9.8	5.3–14.3	6.4	3.3–9.4	4.9	2.4–7.5
3 (N=1003 matched pairs)	17.8	14.5–21.0	12.5	10.3–14.7	9.2	7.4–11.0
>3–≤6 (N=766 matched pairs)	11.3	7.6–15.0	6.8	4.3–9.3	3.9	1.9–6.0
>6–≤10 (N=273 matched pairs)	12.2	6.1–18.4	9.6	5.4–13.8	9.0	5.5–12.4
>10–≤24 (N=265–363 matched pairs)	5.3	-0.1–10.7	8.1	4.5–11.8	10.3	6.8–13.8
>24 (N=123–277 matched pairs)	5.0	-1.1–11.2	7.5	3.3–11.7	11.0	5.9–16.2
Index year						
2008 (N=1033–1086 matched pairs)	8.9	5.8–12.0	6.4	4.2–8.5	5.2	3.4–7.0
2009 (N=991–1074 matched pairs)	14.7	11.6–17.9	11.4	9.2–13.5	9.0	7.2–10.8
2010 (N=923–1039 matched pairs)	12.0	8.8–15.2	9.0	6.8–11.2	7.6	5.7–9.5
Propensity score						
≤0.5 (N=2887–3138 matched pairs)	11.7	9.8–13.6	8.9	7.6–10.2	7.2	6.1–8.3
>0.5 (N=60–61 matched pairs)	21.0	7.7–34.2	11.0	2.0–20.0	9.8	2.4–17.3
Same cluster of work disability history (N=2328–2493 matched pairs)	13.8	11.7–15.9	9.3	7.9–10.8	7.2	5.9–8.4
No previous or succeeding vocational rehabilitation (N=2403–2626 matched pairs)	12.3	10.3–14.4	9.4	8.1–10.8	7.7	6.5–8.9
No previous, coinciding, or succeeding training through employment services (N=2542–2754 matched pairs)	11.9	9.9–13.9	9.2	7.9–10.6	7.4	6.2–8.5
No previous, coinciding, or succeeding partial work disability (N=1850–2022 matched pairs)	12.6	10.2–15.1	10.5	8.9–12.1	9.0	7.6–10.4
All (N=2947–3199 matched pairs)	11.8	10.0–13.7	8.9	7.6–10.2	7.2	6.1–8.3

observed. Among those with shorter rehabilitation, the largest gain actualized in the year immediately after rehabilitation, after which it decreased. Among those with longer rehabilitation, instead, the gain increased with increasing follow-up time. Effectiveness was particularly low among women with musculoskeletal diseases.

Despite the large number of studies investigating the association between vocational rehabilitation services and labor market outcomes (5, 9–18, 31), many have lacked proper controls or examined only immediate or cumulative return to work. Novel findings of the present study on dynamic changes in work participation among the vocational rehabilitees and their PS matched controls suggest very limited effectiveness of vocational rehabilitation. Inclusion of controls revealed that previous findings addressing the same rehabilitation scheme, indicating that almost two thirds of the rehabilitees followed trajectories where previous high or medium levels of work participation were resumed, appeared to provide a too positive impression of the intervention (17). According to the present study, the long-term relative gains were not attributable to absolute increases in work participation between the 3-year pre- and post-intervention periods among the rehabilitees, but rather to larger declines among the controls. Furthermore, the 3-year 7.2% gain in work participation corresponds to only 2.6 gained work months over the 3-year follow-up. This is a small number, considering that while the rehabilitees were out of gainful work receiving a rehabilitation allowance and rehabilitation services during an average intervention length of 7.9 months, the controls spent at work on the average 62.2% of the time, ie, 4.9 months. Despite the observed modest effectiveness of vocational rehabilitation, the intervention is unlikely to be cost-effective in terms of social security expenditure.

To promote work participation among individuals with work disability due to musculoskeletal diseases or mental disorders, alternative or complementary interventions to vocational rehabilitation may be needed. For example, previous Finnish findings indicate that use of part-time sick leave instead of full-time sick leave is not only effective in terms of increased work participation (32, 33), but it also results in considerable savings in social security costs (34). When feasible, the use of part-time sick leave already at an early stage of work disability may be one important way to strengthen work attachment and facilitate later full return to work, either with or without later receipt of vocational rehabilitation.

Further development of the interventions should, however, take into account the needs of different subgroups. Appropriateness of the current vocational rehabilitation services for women with work disability related to musculoskeletal diseases should be considered. Furthermore, most shorter vocational rehabilitation episodes likely comprise workplace interventions such as work try-outs or work counselling (24). Promoting sustained work participation in these cases may require improved implementation of the intervention through enhanced cooperation between rehabilitation providers, the employer, the occupational health service, and the rehabilitee (35). More substantial work modifications and continued support after rehabilitation may also be

needed. Longer vocational rehabilitation, instead, is more likely to comprise training programmes. Promoting faster work resumption after training may require further interventions that support employability and assist in job search more than the current vocational rehabilitation scheme.

This study has various strengths. A large nationally representative population sample was used with rich information on sociodemographic and work-related factors and detailed work disability and other labor market histories. Work participation could be tracked over several years backwards and forwards among individuals who participated in a statutory nationwide scheme of vocational rehabilitation and their PS matched controls. The register-based data did not have missing information or loss to follow-up. Using specific occupational codes, the data were further complemented with information on various job exposures based on previously developed job exposure matrices. The unique dataset, PS matching, and the DID approach allowed assessment of the effectiveness of vocational rehabilitation on longer-term work participation. Moreover, changes in the effectiveness over time were addressed by examining 1-, 2-, and 3-year periods before and after rehabilitation.

PS matching has been widely used in previous studies examining the effectiveness of vocational rehabilitation services or other work-related rehabilitation interventions on labor market participation (9, 11, 15, 16, 18, 19, 36–39). It is a useful tool for finding comparable controls when experimental designs are unfeasible. However, use of the method in the current study had also limitations. Firstly, matching was unsuccessful for around 10% of the rehabilitees. Sensitivity analyses nevertheless indicated that the shape of work participation trajectories was relatively similar among the unmatched and matched intervention group. Secondly, even after matching, some of the distributions relating to labor market history remained imbalanced. Imbalanced factors were nevertheless adjusted for in the models, and the findings were confirmed through sensitivity analyses including only matched pairs that were assigned to the same latent cluster of work disability history. Having already performed matching in 36 strata provides further affirmation, all pairs being exactly matched in terms of disease group of preceding work disability, gender, education, and calendar year. Thirdly, although a wide range of factors were used for matching, unobserved confounding could have remained. For example, despite including detailed patterns of preceding work disability and the most recent diagnosis group, severity of work disability problems may not have been fully captured. Factors such as more specific work environment factors, work motivation, or other health conditions than those captured by preceding work disability could neither be controlled for. However, a recent study on active labor market programmes in Germany showed that while personality traits and other usually unobserved factors largely influenced selection into programme participation, inclusion of these factors in the PS calculation had only little additional influence on the treatment effects of the programmes after having utilized rich administrative data with detailed labor market histories, already capturing many characteristics of the individual (40). In the current study, utilizing detailed information on labor market history in PS matching, further complemented by the DID approach, was likely to reduce the potential confounding effect of unobserved factors.

Information on the specific type and service content of vocational rehabilitation was lacking since this is not collected into the register containing vocational rehabilitation data. There was neither any information on potential medical rehabilitation, which in Finland is conducted separately from vocational rehabilitation. The effectiveness of interventions may depend on whether the provided services include eg, educational, job-related, medical, or other rehabilitation (5, 13, 14, 18, 31, 41). The present study focused solely on non-medical, work-oriented vocational rehabilitation, provided to people with relatively good previous labor market attachment. Within such rehabilitation, however, the effectiveness of specific services may vary from the average effectiveness, as suggested by the observed variation in the findings by rehabilitation length. Future studies including accurate information on the provided services could enhance the knowledge of how vocational rehabilitation should be developed to better promote work participation.

The findings of the present study apply only to recently employed individuals with work disability histories relating to musculoskeletal diseases or mental disorders. It is possible that the effectiveness of vocational rehabilitation differs for other, less common disease groups, or for groups whose employment attachment is less recent. Furthermore, around 7% of the rehabilitation episodes were excluded because their length exceeded the calendar period available for follow-up. Underrepresentation of longer episodes is likely to slightly overestimate the observed short-term effectiveness and slightly underestimate the observed long-term effectiveness.

Concluding remarks

For recently employed individuals with work disability histories relating to musculoskeletal diseases or mental disorders, the statutory vocational rehabilitation scheme in Finland shows modest effectiveness on work participation. For shorter rehabilitation, the gains tend to be short term, whereas for longer rehabilitation, they tend to be delayed. Sustained work participation after shorter rehabilitation, which likely comprises workplace

interventions, may call for improved support that exceeds the time frame of the current vocational rehabilitation services. Faster work resumption after longer rehabilitation, which likely comprises training programmes, may require further support for employability. Furthermore, women with work disability due to musculoskeletal diseases may represent a group with specific work and employment challenges, which should be taken into account in the development of future rehabilitative interventions.

Acknowledgements

The Academy of Finland supported this study (project number 303534 to Viikari-Juntura).

Conflict of interest

The authors declare no conflicts of interest.

References

1. van Vilsteren M, van Oostrom SH, de Vet HC, Franche RL, Boot CR, Anema JR. Workplace interventions to prevent work disability in workers on sick leave. Cochrane Database Syst Rev 2015 Oct;(10):CD006955.

2. Vooijs M, Leensen MC, Hoving JL, Wind H, Frings-Dresen MH. Interventions to enhance work participation of workers with a chronic disease: a systematic review of reviews. Occup Environ Med 2015 Nov;72(11):820–6. https://doi.org/10.1136/oemed-2015-103062.

3. Cancelliere C, Donovan J, Stochkendahl MJ, Biscardi M, Ammendolia C, Myburgh C et al. Factors affecting return to work after injury or illness: best evidence synthesis of systematic reviews. Chiropr Man Therap 2016 Sep;24(1):32. https://doi.org/10.1186/s12998-016-0113-z.

4. Alexander L, Cooper K, Mitchell D, MacLean C. Effectiveness of vocational rehabilitation on work participation in adults with musculoskeletal disorders: an umbrella review protocol. JBI Database Syst Rev Implement Reports 2017 Jun;15(6):1518–21. https://doi.org/10.11124/JBISRIR-2016-003133.

5. Suijkerbuijk YB, Schaafsma FG, van Mechelen JC, Ojajärvi A, Corbière M, Anema JR. Interventions for obtaining and maintaining employment in adults with severe mental illness, a network meta-analysis. Cochrane Database Syst Rev 2017 Sep;9(9):CD011867.

6. Vogel N, Schandelmaier S, Zumbrunn T, Ebrahim S, de Boer WE, Busse JW et al. Return-to-work coordination programmes for improving return to work in workers on sick leave. Cochrane Database Syst Rev 2017 Mar;3(3):CD011618.

7. Cullen KL, Irvin E, Collie A, Clay F, Gensby U, Jennings PA et al. Effectiveness of workplace interventions in return-to-work for musculoskeletal, pain-related and mental health conditions: an update of the evidence and messages for practitioners. J Occup Rehabil 2018 Mar;28(1):1–15. https://doi.org/10.1007/s10926-016-9690-x.

8. Mikkelsen MB, Rosholm M. Systematic review and meta-analysis of interventions aimed at enhancing return to work for sick-listed workers with common mental disorders, stress-related disorders, somatoform disorders and personality disorders. Occup Environ Med 2018 Sep;75(9):675–86. https://doi.org/10.1136/oemed-2018-105073.

9. Aakvik A. Bounding a matching estimator: the case of a Norwegian training program. Oxf Bull Econ Stat 2001;63:115–43. https://doi.org/10.1111/1468-0084.00211.

10. Pruett SR, Swett EA, Chan F, Rosenthal DA, Lee GK. Empirical evidence supporting the effectiveness of vocational rehabilitation. J Rehabil 2008;74(2):56–63.

11. Campolieti M, Gunderson MK, Smith JA. The effect of vocational rehabilitation on the employment outcomes of disability insurance beneficiaries: new evidence from Canada. IZA J Labor Policy 2014;3:10. https://doi.org/10.1186/2193-9004-3-10.

12. Stapleton D, Martin F. What have we learned using merged administrative data from the Social Security Administration and the Rehabilitation Services Administration? J Vocat Rehabil 2017;46(2):121–36. https://doi.org/10.3233/JVR-160849.

13. Dean D, Pepper JV, Schmidt R, Stern S. The effects of vocational rehabilitation services for people with mental illness. J Hum Resour 2017;52(3):826–58. https://doi.org/10.3368/jhr.52.3.0114-6111R1.

14. Dean D, Schmidt R, Pepper J, Stern S. The effects of vocational rehabilitation for people with physical disabilities. J Hum Cap 2018;12(1):1–37. https://doi.org/10.1086/696098

15. Adamecz-Völgyi A, Lévay PZ, Bördős K, Scharle Á. Impact of a personalised active labour market programme for persons with disabilities. Scand J Public Health 2018 Feb;46(19_suppl Suppl 19):32–48. https://doi.org/10.1177/1403494817738421.

16. Hagen T. Evaluation of a placement coaching program for recipients of disability insurance benefits in Switzerland. J Occup Rehabil 2019 Mar;29(1):72–90. https://doi.org/10.1007/s10926-018-9766-x.

17. Leinonen T, Solovieva S, Husgafvel-Pursiainen K, Laaksonen M, Viikari-Juntura E. Do individual and work-related factors differentiate work participation trajectories before and after vocational rehabilitation? PLoS One 2019 Feb;14(2):e0212498. https://doi.org/10.1371/journal.pone.0212498.

18. Frölich H, Heshmati A, Lechner M. A micoeconometric evaluation of rehabilitation of long-term sickness in Sweden [Chichester Engl]. J Appl Econ 2004;19:375–96. https://doi.org/10.1002/jae.757.

19. O'Neill J, Mamun AA, Potamites E, Chan F, da Silva Cordoso E. Return to work of disability insurance beneficiaries who do and do not access state vocational rehabilitation agency services. J Disabil Policy Stud 2015;26(2):111–23. https://doi.org/10.1177/1044207315583900.

20. Gould R, Härkäpää K, Järvikoski A, editors. Toimiiko työeläkekuntoutus? Eläketurvakeskuksen tutkimuksia 01/2012. [Does vocational rehabilitation of the earnings-related pension scheme work? Studies of the Finnish Centre for Pensions 01/2012.] Helsinki: Finnish Centre for Pensions; 2012.

21. OECD. Sickness, disability and work: breaking the barriers. Vol. 3: Denmark, Finland, Ireland and the Netherlands. Paris: OECD; 2008.

22. Finnish Centre for Pensions. Back to work after rehabilitation. Available from: https://www.tyoelake.fi/en/different-pensions/back-to-work-after-rehabilitation/. [Accessed 16 October 2018.]

23. The Social Insurance Institution of Finland. Statistical Yearbook of the Social Insurance Institution 2017. Helsinki: The Social Insurance Institution; 2018.

24. Saarnio L. Työeläkekuntoutus vuonna 2017. Eläketurvakeskuksen tilastoja 05/2018. [Vocational rehabilitation of the earnings-related pension scheme in 2017. Statistics of the Finnish Centre for Pensions 05/2018.] Helsinki: Finnish Centre for Pensions; 2018.

25. Solovieva S, Pehkonen I, Kausto J, Miranda H, Shiri R, Kauppinen T et al. Development and validation of a job exposure matrix for physical risk factors in low back pain. PLoS One 2012;7(11):e48680. https://doi.org/10.1371/journal.pone.0048680.

26. Solovieva S, Pensola T, Kausto J, Shiri R, Heliövaara M, Burdorf A et al. Evaluation of the validity of job exposure matrix for psychosocial factors at work. PLoS One 2014 Sep;9(9):e108987. https://doi.org/10.1371/journal.pone.0108987.

27. Karasek RA, Theorell T. Healthy work: stress, productivity, and the reconstruction of working life. New York: Basic Books; 1990.

28. Weitzen S, Lapane KL, Toledano AY, Hume AL, Mor V. Principles for modeling propensity scores in medical research: a systematic literature review. Pharmacoepidemiol Drug Saf 2004 Dec;13(12):841–53. https://doi.org/10.1002/pds.969.

29. Austin PC. A critical appraisal of propensity-score matching in the medical literature between 1996 and 2003. Stat Med 2008 May;27(12):2037–49. https://doi.org/10.1002/sim.3150.

30. Statistics Finland. StatFin online service. Available from: http://www.stat.fi/tup/statfin/index_en.html. [Accessed 15 May 2018].

31. Dutta A, Gervey R, Chan F, Chou CC, Ditchman N. Vocational rehabilitation services and employment outcomes for people with disabilities: a United States study. J Occup Rehabil 2008 Dec;18(4):326–34. https://doi.org/10.1007/s10926-008-9154-z.

32. Kausto J, Viikari-Juntura E, Virta LJ, Gould R, Koskinen A, Solovieva S. Effectiveness of new legislation on partial sickness benefit on work participation: a quasi-experiment in Finland. BMJ Open 2014 Dec;4(12):e006685. https://doi.org/10.1136/bmjopen-2014-006685.

33. Viikari-Juntura E, Virta LJ, Kausto J, Autti-Rämö I, Martimo KP, Laaksonen M et al. Legislative change enabling use of early part-time sick leave enhanced return to work and work participation in Finland. Scand J Work Environ Health 2017 Sep;43(5):447–56. https://doi.org/10.5271/sjweh.3664.

34. Viikari-Juntura E, Leinonen T, Virta LJ, Hiljanen I, Husgafvel-Pursiainen K, Autti-Rämö I et al. Early part-time sick leave results in considerable savings in social security costs at national level: an analysis based on a quasi-experiment in Finland. Scand J Work Environ Health 2019 Mar;45(2):203–8. https://doi.org/10.5271/sjweh.3780.

35. Juvonen-Posti P. Work-related rehabilitation for strengthening working careers: a multiperspective and mixed methods study of its mechanisms. Acta Universitatis Ouluensis, D Medica 1468. Oulu: University of Oulu; 2018.

36. Saltychev M, Laimi K, El-Metwally A, Oksanen T, Pentti J, Virtanen M et al. Effectiveness of multidisciplinary primary prevention in decreasing the risk of work disability in a low-risk population. Scand J Work Environ Health 2012 Jan;38(1):27–37. https://doi.org/10.5271/sjweh.3169.

37. Bethge M. Effects of graded return-to-work: a propensity-score-matched analysis. Scand J Work Environ Health 2016 Jul;42(4):273–9. https://doi.org/10.5271/sjweh.3562.

38. Kim J, Park S. Effect of Korean rehabilitation services on work resumption by occupational segments. Seoul Journal of Economics. 2018;31(1).

39. Streibelt M, Bürger W, Nieuwenhuijsen K, Bethge M. Effectiveness of graded return to work after multimodal rehabilitation in patients with mental disorders: a propensity score analysis. J Occup Rehabil 2018 Mar;28(1):180–9. https://doi.org/10.1007/s10926-017-9709-y.

40. Caliendo M, Mahlstedt R, Mitnik OA. Unobservable, but unimportant? The relevance of usually unobserved variables for the evaluation of labor market policies. Labour Econ 2017;46:14–25. https://doi.org/10.1016/j.labeco.2017.02.001.

41. Kuoppala J, Lamminpää A. Rehabilitation and work ability: a systematic literature review. J Rehabil Med 2008 Nov;40(10):796–804. https://doi.org/10.2340/16501977-0270.

Received for publication: 19 November 2018