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EFFECTIVENESS OF INTRODUCTION OF NEW LEGISLATION OF PARTIAL SICKNESS BENEFIT ON WORK PARTICIPATION: A QUASI-EXPERIMENT IN FINLAND

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Abstract

Objectives The objective of the study was to examine the effect of new legislation on partial sickness benefit on subsequent work participation of Finns with long term sickness absence. Additionally, we investigated whether the effect differed by sex, age, or diagnostic category.

Design A register based quasi-experimental study. We compared the intervention (partial sick leave) group with the comparison (full sick leave) group regarding their pre-post differences in the outcome. The pre-intervention and post-intervention study period each consisted of 365 days.

Setting Nationwide, individual level data on the beneficiaries of partial or full sickness benefit in 2008 were obtained from national sickness insurance, pension and earnings registers.

Participants 1 738 persons in the intervention and 56 754 persons in the comparison group.

Outcome Work participation, measured as the proportion (%) of time within 365 days when participants were in gainful employment and did not receive either partial or full ill-health-related or unemployment benefits.

Results Although the overall work participation declined in both groups during the study period, the decline was 5% (absolute difference-in-differences) smaller in the intervention group thanin the comparison group, with a minor sex difference. The beneficial effect of partial sick leave was seen especially among those aged from 45 to 54 (5%) and 55 to 65 (6%) and in mental disorders (13%). When the groups were rendered more exchangeable (propensity score-matching), the effects on work participation were doubled and seen in all age groups and in other diagnostic categories than traumas.

Conclusions The results suggest that the new legislation has potential to increase work participation of the population with long term sickness absence in Finland. If applied in a larger

scale, partial sick leave may turn out to be a useful tool in reducing the withdrawal of workers from the labor market due to health reasons.

Article Summary

Strengths and limitations of the study:

- Applying nationally representative population register based data with valid information on the payment of health- and unemployment-related allowances in Finland.
- Applying a quasi-experimental study-design with difference-in differences and propensity score analysis to control for selection on both observed and unobserved factors.
- Registers provided only a limited number of background characteristics.

Introduction

The need to increase work participation of working age people is currently a matter of concern in many Western countries. In Finland, delayed or lacking labor market attachment of young people, absence from work during later years and early exit from labor market have all raised alarm. To counteract these trends, an active labor market policy has been adopted, including the introduction of partial social security benefits and other tools to increase the so called flexicurity of the labor market [1]. In Finland, legislation on partial sickness benefit was introduced in 2007. The new benefit allowed for the first time to combine part-time sick-leave with part-time work.

The Finnish social insurance is based on the Nordic Model. Everyone who is aged from 16 to 67, non-retired and living permanently in the country (employees, self-employed, students, unemployed job seekers and those on sabbatical or alternation leave) and also nonresidents working for at least four months in Finland are covered by statutory sickness insurance. The sickness allowances are financed by employers, employees and the state and they are administrated by the Social Insurance Institution of Finland (SII). Statutory benefits can rest on previous earnings or benefits or the minimum allowance can be granted. For the earnings-related occupational sickness benefits, a minimum of three months of employment is required.

At present, the Finnish national sickness benefit scheme includes a full and a partial sickness benefit. A medical certificate is an absolute requirement for the two sickness benefits to be granted. In order to be eligible for the partial benefit an employee has to be eligible for a full benefit as well, but according to medical judgment partial return to work is safe enough. Partial sick leave is thus alternative to full sick leave and it is always medically certified. During the first years after introducing the partial sickness benefit in Finland, a partial sick leave had to be directly preceded by a period of full sick leave of at least 60 days and the partial sickness benefit could be granted from a minimum of 12 to a maximum of 72 working days. During partial sick leave, work time and salary are reduced by 40 – 60% of the regular work hours and work tasks can be modified if necessary. The employee and the employer sign a fixed term

work contract for the part-time work. In Finland, the use of partial sick leave is voluntary for the individual. The employer, as well, is entitled to decline the use of the benefit in case the work arrangements needed at the work place are not feasible.

Sickness absence rates are in many countries higher among women compared with men [2]. Also partial sick leave has been more frequently used by women [3]. It is known that sickness absence increases with age [2]. It is also recognized that challenges of return to work are different for example in musculoskeletal diseases and mental disorders. In the latter category, the outflow from disability benefits due to recovery has been lower [4].

The current evidence on the effects of partial sick leave on return to work or work participation is partly inconsistent. In the other Nordic countries, partial sick leave has been found to increase the likelihood of return to regular working hours [5, 6] and to be associated with higher subsequent employment rate [7]. No effect of active sick leave (return to work to modified duties) on the average number of sick leave days or long term disability was detected in a Norwegian cluster randomized controlled trial [8]. There is some discrepancy in the findings on the effectiveness of partial sick leave in mental disorders. A Danish study [9] found no effect, whereas a Swedish study [10] reported a weak effect of partial sick leave on full recovery in the beginning of work disability due to mental disorders and a stronger effect when partial sick leave was assigned after 60 days of full sick leave.

In a randomized controlled trial among persons with musculoskeletal disorders we found that early part-time sick leave predicted faster sustained return to work than full sick leave [11]. The beneficial effect of partial sick leave on work retention was also observed at population level [12, 13]. Partial sick leave was associated in the short term with decreased work retention, in terms of increased subsequent sickness absence. In the long term it was associated with increased work retention, in terms of increased subsequent use of partial disability pension and decreased use of full disability pension. These findings imply the necessity to use an outcome that simultaneously accounts for different indicators of work

participation. Some of these previous observational studies have suffered from limited data samples and narrow generalizability of findings [5, 9], self-reported data [9], and incomprehensive operationalization and measurement of work participation [5, 6, 10, 12, 13].

In order for policy makers to be able to make well informed decisions in the area of social and health policies, scientific evaluation of the effectiveness of population level interventions, e.g. introducing new legislation or policy change is needed [14]. Natural or quasi-experiments have successfully been used in connection with various population level interventions in the field of public health when planned experimentation, i.e. manipulation of exposure, has not been possible [15]. In the field of work disability research, this approach has, however been rare [2].

This study examined the effects of the new Finnish legislation on partial sickness benefit on subsequent work participation. For this we compared beneficiaries of partial sickness benefit with those receiving full sickness benefit a year after the law on partial sick leave was enacted. We utilized a quasi-experimental design with an integrated measure of work participation. Analyses were carried out in an individual level register based data representative of the Finnish working population with long-term sickness absence. We examined whether the effects of partial sick leave on subsequent work participation differed by sex, age, or diagnostic category of the benefit receivers.

Methods

Study design and setting

The population level intervention of interest in this study was the introduction of partial sick leave in Finland in 2007. We conducted a quasi-experimental study following recent guidelines on evaluating population health interventions [15]. This design was chosen to minimize the effect of both measured and unmeasured confounding. We compared the intervention (partial sick leave) group with the comparison (full sick leave) group regarding their pre-post

differences in work participation. The pre-intervention (T1) and post-intervention (T2) study period each consisted of 365 days. A wash-out-period of one year was set between the sick leave period and T1 and T2 periods in order to obtain a robust effect of the intervention on work participation (Figure 1). These time-windows were allowed to move according to the timing of the individual's sick leave period.

<Figure 1>

Individual level data were derived from the national sickness insurance register of the SII and the pension and earnings registers of the Finnish Centre for Pensions. Data from these three registers were linked on the basis of social security numbers of the participants. The social insurance register provided information on all medically certified and compensated sickness absence spells, temporary and permanent national disability pensions, and old age pensions in Finland. The registers of the Finnish Centre for Pensions contained information on employment periods, earnings-related pensions and unsalaried periods due to disability, rehabilitation or unemployment. Written consent from the individuals was not needed as only encrypted register data were obtained by the researchers carrying out the analyses in the Finnish Institute of Occupational Health.

Participants

Participants that were granted a partial sickness benefit (intervention group) were compared with those who received a full sickness benefit (comparison group). A total sample of individuals who had received either partial sickness benefit (n = 1 838) or full sickness benefit (n = 67 086) in 2007 - 2008 and whose compensated sickness absence period had ended between 1 January and 31 December 2008 was drawn from the national sickness insurance register. Since a full time sickness absence of 60 working days had to precede partial sick leave, only those with full sick leave ending with an uninterrupted period of at least 60 days of payment of the benefit were included in the total sample. Thus, in our sample, receivers of full sickness benefit had not received partial sickness benefit, but they would have been entitled to it as for the length of the preceding full time sickness absence.

Since eligibility for a partial sickness benefit required a prior work contract, we excluded from the analyses those who did not have any employment periods (n=2 and n=4 923) during the entire study period. We additionally excluded those who had died (n=24 in the partial sick leave group and n=2 600 in the full sick leave group) or moved to old age pension (n=1 and n=354, respectively), had not turned 16 at the time of the first data collection period (T1) (n=3) or whose sickness absence periods (ending in 2008) extended beyond the time-frame of data collection (n=66 and n=1 024). The final sample included 1 738 participants in the partial sick leave group and 56 754 participants in the full sick leave group. We focused our analyses in the four main diagnostic groups in which partial sickness benefit has most frequently been used, i.e. musculoskeletal diseases, mental disorders, traumas and tumors (M, F, S and T, and C and D-categories in ICD-10, respectively). All other diagnoses were merged in one group.

Outcome measure

Work participation was operationalized as the time the individuals were likely to have actually participated in gainful employment. It was approximated as the proportion (%) of time within 365 days when participants had an employment contract and did not receive either partial or full ill-health-related benefits (sickness benefits, rehabilitation allowances, disability pensions) or unemployment benefits. Work participation was calculated for T1 and T2. It was assumed that when receiving partial benefits, the participants worked half of the work time (which is typically the case in Finland).

Covariates

Data on sex, dates of birth and death, insurance district (region), annual gross income in 2007, diagnostic codes (ICD-10), and occupational branch were obtained from the sickness insurance register. Information on occupation was available for all participants in the intervention group and for a random sample of 7.7% of the participants in the comparison group.

Data analyses

The distributions of all variables were compared between the total full sickness benefit group (n = 67 086) and the subsample of those participants in the full sickness benefit group for whom the registers provided information on occupational branch (n = 4 347). Since no differences in the distributions were detected, we assumed that information on occupational branch was missing at random. Multiple imputation was used to compensate for the missing data on occupational branch in the comparison group. For this, we generated multiple imputed data sets (n=10) using the *proc mi* of SAS. The imputation model included all covariates.

Propensity score with 1:1 matching was used to match individuals on the probability that they would belong to the intervention (partial sick leave) group. Individuals that were matched to each other had equal or nearly equal (close enough) estimated propensity scores.

Difference-in differences- (DID-) and propensity score- (PS-) analyses are methods that are complementary to each other and can be applied in causal inference to counter selection bias and confounding [16]. We applied the DID method alone and in combination with PS-matching. Combining methods to counter bias and confounding from different sources and comparing the results has been encouraged [15]. The DID-method can be applied to control for fixed unobserved individual differences and common trends.

The DID-method allows one to estimate the difference in pre-post, within subject, differences between the intervention and the comparison group. The effect of partial sick leave on work participation was consequently estimated as the difference in pre-post-differences (differences between T2 and T1) between partial and full sick leave groups. The effect was estimated using general linear model with repeated measures design. F-statistic for the interaction term between the group assignment and change of work participation in time was applied as the difference-in-differences statistic.

Propensity score is defined as conditional probability of being exposed to a certain intervention given observed covariates [15, 17, 18]. It is applied to balance the covariates in two groups

and thus to reduce bias. We computed PS (i.e. probability of being exposed to partial sick leave) by logistic regression for all participants. The following set of variables and their interaction terms were included in the logistic regression model: age, sex, diagnostic category, income, occupation, insurance district, and work participation, sickness absence, rehabilitation periods and unemployment at T1. The model that balanced the covariates and work participation at T1 between the intervention and comparison group best and had the best model fit was chosen.

Thereafter we matched the partial sick leave and full sick leave groups on the estimated propensity score using local optimal (greedy) algorithm [19]. The matching was performed within (sex x diagnostic category)-strata. Subsequently DID-analysis was also carried out in the matched subsample.

Several sensitivity analyses were carried out. The analyses were run separately for participants for whom the registers provided information on occupational branch and for the total sample in which imputed data on occupational branch were utilized for the comparison group. To examine the group difference in work participation at T1 (due to unemployment or sick leave) as source of reduced group comparability, the analyses were carried out separately among participants who did not receive unemployment benefits at T1 and among participants with 100% of work participation at T1.

Results

Descriptive characteristics of the study population

Information on the background characteristics of the intervention and comparison group in the total analysed sample is shown in Table 1. Women constituted 71% of the partial sick leave group and 53% of the full sick leave group. The partial benefit was most common among those who were aged between 35 and 54, whereas the full benefit among those aged from 45 to 65. The income level of those in the partial sick leave group was higher than of those in the full

sick leave group. The partial sickness benefit was most often used in connection with mental disorders and musculoskeletal diseases, while the full benefit was most often used in musculoskeletal diseases. The use of the partial benefit was most frequent in social and healthcare services and administrative and office work, whereas the full benefit was most commonly used in industrial and service work. No large regional differences in the use of the benefits were detected.

<Table 1>

Difference-in-differences in work participation between partial and full sick leave group

In both groups the level of work participation decreased during the follow up, the absolute reduction being larger in the full sick leave group (-26.5%) compared with the partial sick leave group (-21.2%) (Table 2). The absolute overall difference-in-differences in work participation was 5.3% (95% CI 3.1% to 7.5%).

The difference-in-differences in work participation tended to be larger in men than in women. In all age categories, work participation declined more in the full than in the partial sick leave group. The difference in the decline was significant in age-categories 45-54 and 55-65. There was no effect in those aged 35-44. In the youngest age category (16-34 years) the difference-in-differences was large but statistically non-significant.

A statistically significantly larger effect was found in mental disorders compared with the other diagnostic categories.

<Table 2>

The results found in the subsample of participants for whom the registers provided information on occupational branch were very similar to those in the total sample (data not shown). The exclusion of the participants who received unemployment benefits at T1 led to an absolute

increase in the difference-in-differences in work participation (DID 7.6%, 95% CI 5.4% to 9.7%). The difference-in- differences in work participation increased further (DID 9.5%, 95% CI 6.8% to 12.1%) when participants with reduced work participation (for any reason) at T1 were excluded from the analyses.

Difference-in-differences in work participation in the propensity score-matched subsample

The matching procedure resulted in a total of 1 660 matched pairs of participants. The propensity score matched partial sickness benefit receivers did not differ from full sickness benefit receivers with regard to age, gross income, number of unemployment days, sickness absence days, rehabilitation days or work participation at T1. There were some differences between the groups in the distribution of occupational branches and insurance districts (Appendix Table 1).

The results from the DID-analysis in the PS-matched subsample are presented in Table 3. The absolute overall difference-in-differences was increased to 9.8% (95% CI 5.9 to 13.7). A tendency for a larger DID in men than in women was also found in this subsample. The DID was still largest in those participants aged over 45 years, but in contrast to the total sample an effect was seen in the younger age categories as well. Differences between the diagnostic categories were reduced as compared to the total sample. The largest effect was still found in mental disorders. In addition, a statistically significant DID was also found in musculoskeletal diseases and tumours. Further adjustment for the differences in the distribution of occupation and insurance district between the intervention and comparison group, had no effect on the results of the DID-analysis.

< Table 3>

Discussion

Principal findings

We applied a quasi-experimental design to study the population level effects of the introduction of partial sickness benefit in Finland among a working population with long term sickness absence. It was found that partial sick leave had a positive effect on work participation. Although the overall work participation declined from T1 to T2, at the population level the decline was 5% (absolute difference) smaller among the receivers of partial sickness benefit (intervention group) than among the receivers of full sickness benefit (comparison group). The beneficial effect of partial sick leave was seen especially among those aged from 45 to 54 and 55 to 65 and in mental disorders. No major sex difference was detected. When the groups were rendered more exchangeable, the effect on work participation was doubled, and effects were seen in other diagnostic categories than traumas and all age groups.

Validity of the study

An observational quasi-experimental study design can be applied to assess the effects of a planned event or intervention, when randomized controlled trials are not ethical or feasible. Observational studies can also better simulate real-world settings and offer more relevant information in view of policy-making [20]. The internal validity of observational studies is lower than that of randomized controlled trials due to possible selection according to exposure. For this reason, an analytical approach called potential outcomes or counterfactual framework was chosen. The term refers to the fact that in an ideal situation the exposed would be compared to themselves when unexposed. Since this comparison is impossible, we need a comparable or exchangeable comparison group. We utilized two methods (DID and PS) that have been previously recommended and applied to control for selection on both observed factors and unobserved fixed factors [15, 20, 21].

In the DID- method, it is assumed that the unobserved characteristics in the studied groups are stable and that the outcomes would change identically in these groups in the absence of intervention. Consequently, the intervention and comparison groups should be identical, except for the intervention status. However, it is sufficient that the groups are closely, though not exactly, similar [15]. We included in the comparison group only participants who would have been entitled to partial sickness benefit as for the length of the preceding sickness absence. We also applied a short wash-out period, to minimize the intragroup differences between the two time points. However, as full information on the eligibility of the participants for partial sickness benefit was not available in the registers (e.g. severity of the health problem and degree of remaining workability), we utilized matching on PS to further increase the exchangeability of the groups.

We utilized nationwide population data with comprehensive individual level register based information on ill-health- and unemployment-related absences from work. Personal identification (social security) numbers enabled linking information from three separate source registers. These registers have originally been established for administrative purposes, but the data can also be used for research [22]. Among the advantages of register based studies is a low likelihood of selection and attrition bias. The source registers of this study provided valid information on the receivers and payment days of the benefits. A weakness of the registers is that they typically provide only a limited number of background characteristics of the participants and other covariates. The process of assignment to partial sick leave is complex and it is affected by many actors (the patient, physician, employer, and workplace) for which information cannot be found in the national registers. Nevertheless, the factors that were included in the analyses have earlier been found to be important predictors of the use of health-related social security benefits and also associated with work disability and return to work.

Information on diagnoses for sickness benefits was as well retrieved from registers and was based on medical assessment. In case of a long term sickness absence (lasting more than 60 days) in Finland, the sickness benefit is paid in shorter periods, each being covered with a

separate medical certificate. Diagnostic codes are transferred from these certificates to the administrative registers. We used the latest (and presumably the most accurate) diagnostic code provided for each long term sickness absence in 2007-2008. Data on occupational branch had to be imputed for the majority of participants in the comparison group. Nevertheless, the sensitivity analyses suggested that using imputed data on occupation did not affect the results. In contrast to earlier studies on the topic, work participation was approximated in the current study by taking simultaneously into account the rate of different ill-health- and unemployment-related benefits. We operationalized work participation as proportion of time within a year not receiving ill-health related or unemployment benefits. Hence we had a relatively comprehensive indicator of the availability of the participants for the labour market.

Results in relation to earlier findings

The overall results of this study are congruent with earlier findings, indicating positive effects of partial sick leave on return to work and work retention [5-7, 12]. We found that partial sick leave had a positive effect on future work participation especially in mental disorders, but the results of the analyses in the subgroup suggested that the overall effect in the total sample might be underestimated.

Our findings on the usefulness of partial sick leave in mental disorders, though not directly comparable, are congruent with a study showing beneficial effects of partial sick leave on RTW in mental disorders after 60 days of full sick leave [10], but differ from an earlier study reporting no effect [9]. The literature suggests that returning and continuing at work may be more challenging for those with mental disorders than with somatic problems (e.g. musculoskeletal diseases) [23-25]. In addition, the outflow from disability benefits due to recovery has been lower among those with mental disorders than with musculoskeletal diseases [4]. However, in our previous study we found an effect of partial sick leave on work disability pension in both diagnostic categories, the effect tending to be larger in mental disorders than in musculoskeletal diseases [12]. The diagnostic groups of musculoskeletal

diseases and mental disorders may differ in the degree of comparability of the partial and full sick leave groups with regard to the background characteristics, severity of the health problem and remaining work ability, number of sickness absences as well as in transition to rehabilitation and unemployment. When the exchangeability of the groups was increased with propensity score matching, a beneficial effect on work participation was detected also in persons with musculoskeletal diseases and those with tumours.

Sickness absence is known to increase with age [26]. In addition, it has been found that return to work after long term sickness absence is less likely at higher ages [27, 28]. Partial sick leave was found to be most frequently used and also most effective among middle-aged and older workers. It may well be that work arrangements associated with partial sick leave are more easily implemented by employees in a more established or stable work situation.

Conclusions

The overall results of the effectiveness of partial sick leave on work participation suggest that the new legislation on partial sickness benefit introduced in 2007 has potential to increase work participation of the working population with long term sickness absence in Finland. A positive effect was seen especially in mental disorders. In the future – if applied in a larger scale – partial sick leave may turn out to be an effective tool in reducing temporary and permanent withdrawal of workers from the labour market due to health reasons.

Figure legend

Figure. Schematic presentation of the study design and difference-in-differences method. (T1 corresponds to pre-intervention period, T2 corresponds to post-intervention period).

CONTRIBUTORSHIP STATEMENT

JK, SS, EVJ, LJV and AK designed the study. All authors were involved in data collection. JK, SS and AK conducted the analyses, all contributed to the interpretation of the results and JK, SS and EVJ drafted the manuscript. All authors accepted the final version of the manuscript.

COMPETING INTERESTS

None

DATA SHARING STATEMENT

No additional data available

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Table 1. Characteristics of participants in partial and full sick leave group at the time of intervention (n, %).

	Partial sick leave n =1738	Full sick leave n = 56 754
Sex (%)		
Female	1 236 (71.1)	30 058 (53.0)
Age (years) (%)		
16–34	217 (12.5)	10 901 (19.2)
35–44	430 (24.7)	11 231 (19.8)
45–54	753 (43.3)	18 740 (33.0)
55–65	338 (19.5)	15 882 (28.0)
Mean (SD)	46.2 (9.0)	45.7 (11.3)
Annual gross income (€) (%)		
- 30 000	1 237 (71.2)	46 119 (81.3)
30 001 – 60 000	409 (23.5)	9 593 (16.9)
60 001 -	39 (2.2)	732 (1.3)
Missing	53 (3.1)	310 (0.5)
Median	24 618	20 668
Diagnostic categories (%)		
Mental disorders	663 (38.2)	14 255 (25.1)
Musculoskeletal diseases	624 (35.9)	20 613 (36.3)
Tumours	112 (6.4)	3 031 (5.4)
Traumas	136 (7.8)	8 416 (14.8)
Other	203 (11.7)	10 439 (18.4)
Insurance district (%)		
Northern	219 (12.6)	7 764 (13.7)
Western	259 (14.9)	7 824 (13.8)
Eastern	194 (11.2)	8 525 (15.0)
South-Western	410 (23.6)	13 254 (23.3)
Southern	656 (37.7)	19 349 (34.1)
Missing	0 (0.0)	38 (0.1)
Occupational branch (%)		(non-imputed subsample n = 4 347)
Technical and scientific work etc.	193 (11.1)	409 (9.4)
Social and healthcare services	516 (29.7)	719 (16.5)
Administration and office work	293 (16.9)	413 (9.5)
Commercial work	113 (6.5)	288 (6.6)
Agriculture and forestry	50 (2.9)	214 (4.9)
Transport	60 (3.4)	269 (6.2)
Industrial and construction work, mining	309 (17.8)	1 146 (26.4)
Service work	204 (11.7)	889 (20.5)

Table 2. Comparison of work participation (%) between partial and full sick leave group (GLM repeated measures design).

		Work participation (%)						
	n	Pre-intervention period (T1) Mean (95%CI)	Post-intervention period (T2) Mean (95%CI)	Post-Pre difference (T2-T1) Mean (95%CI)	p	Difference in differences Mean (95%CI)	F-statistic	p
All[1]								
Partial sick leave	1 685	86.6 (85.2 to 88.1)	65.4 (63.4 to 67.4)	-21.2 (-23.4 to -19.1)	0.001	5.3 (3.1 to 7.5)	22.8	0.001
Full sick leave	56 406	79.4 (79.1 to 79.6)	52.9 (52.5 to 53.2)	-26.5 (-26.9 to -26.2)	0.001			
Males[2]								
Partial sick leave	490	86.6 (84.0 to 89.1)	62.7 (59.0 to 66.5)	-23.9 (-27.9 to -19.9)	0.001	6.3 (2.3 to 10.3)	9.3	0.002
Full sick leave	26 507	80.3 (80.0 to 80.7)	50.2 (49.7 to50.7)	-30.1 (-30.7 to -29.6)	0.001			
Females[2]								
Partial sick leave	1 195	85.4 (83.7 to 87.0)	66.9 (64.6 to 69.3)	-18.4 (-21.0 to -15.9)	0.001	4.9 (2.4 to 7.5)	14.2	0.001
Full sick leave	29 889	78.6 (78.2 to 78.9)	55.2 (54.7 to 55.7)	-23.4 (-23.9 to -22.9)	0.001			
16-34 years[1]								
Partial sick leave	210	89.3 (85.8 to 92.8)	75.5 (70.2 to 80.9)	-13.8 (-19.6 to -8.0)	0.001	2.8 (-1.1 to 10.6)	2.5	0.111
Full sick leave	10 759	84.6 (84.1 to 85.1)	66.1 (65.3 to 66.8)	-16.6 (-20.8 to -12.5)	0.001			
35-44 years[1]								
Partial sick leave	424	84.7 (81.9 to 87.5)	68.1 (64.2 to 72.0)	-16.6 (-20.8 to -12.5)	0.001	2.0 (-2.2 to 6.2)	0.9	0.352
Full sick leave	11 177	78.4 (77.9 to 79.0)	59.8 (59.1 to 60.5)	-18.6 (-19.4 to -17.8)	0.001			
45-54 years[1]								
Partial sick leave	725	86.9 (84.7 to 89.0)	65.7 (62.6 to 68.8)	-21.1 (-24.4 to -17.9)	0.001	4.7 (1.4 to 8.0)	7.9	0.005
Full sick leave	18 659	77.6 (77.2 to 78.1)	51.8 (51.2 to 52.4)	-25.9 (-26.5 to -25.2)	0.001			
55-65 years[1]								
Partial sick leave	326	89.6 (86.3 to 92.9)	57.0 (52.3 to 61.7)	-32.6 (-37.7 to -27.5)	0.001	5.7 (0.5 to 10.8)	4.7	0.03
Full sick leave	15 811	78.5 (78.0 to 78.9)	40.2 (39.5 to 40.8)	-38.3 (-39.0 to -37.6)	0.001			
Musculoskeletal diseases[3]								
Partial sick leave	598	87.0 (84.8 to 89.3)	60.3 (57.0 to 63.6)	-26.7 (-30.3 to -23.2)	0.001	0.7 (-2.9 to 4.3)	0.14	0.712
Full sick leave	20 537	79.7 (79.4 to 80.1)	52.3 (51.7 to 52.9)	-27.4 (-28.0 to -26.8)	0.001			
Mental disorders[3]								
Partial sick leave	645	84.6 (82.2 to 87.1)	67.0 (63.8 to 70.3)	-17.6 (-21.3 to -13.9)	0.001	12.8 (9.0 to 16.5)	43.8	0.001
Full sick leave	14 136	74.6 (74.0 to 75.1)	44.2 (43.5 to 44.9)	-30.4 (-31.1 to -29.6)	0.001			

Table 2. Continued.

		Work participation (%)						
	n	Pre-intervention period (T1) Mean (95%CI)	Post-intervention period (T2) Mean (95%CI)	Post-Pre difference (T2-T1) Mean (95%CI)	p	Difference in differences Mean (95%CI)	F-statistic	p
Traumas [3]								
Partial sick leave	132	86.7 (82.0 to 91.3)	68.1 (61.5 to 74.6)	-18.6 (-25.3 to -11.8)	0.001	-3.2 (-10.0 to 3.5)	0.89	0.348
Full sick leave	8 312	82.9 (82.3 to 91.3)	67.6 (66.7 to 68.4)	-15.3 (-16.2 to -14.5)	0.001			
Tumours[3]								
Partial sick leave	109	90.6 (85.9 to 95.4)	75.0 (67.4 to 82.5)	-15.7 (-23.5 to -7.9)	0.001	5.3 (-2.6 to 13.2)	1.7	0.190
Full sick leave	3 021	87.2 (86.3 to 88.1)	66.2 (64.8 to 67.6)	-21.0 (-22.4 to -19.5)	0.001			
Other diagnostic categories[3]								
Partial sick leave	201	87.4 (83.4 to 91.4)	63.6 (57.8 to 69.4)	-23.8 (-30.0 to -17.6)	0.001	6.2 (-0.05 to 12.5)	3.8	0.052
Full sick leave	10 400	80.2 (79.6 to 80.7)	50.1 (49.3 to 50.9)	-30.0 (-30.9 to -29.2)	0.001			

Adjusted for [1] age, sex, income, diagnosis, occupational group, insurance district, [2] age, income, diagnosis, occupational group, insurance district, [3] age, sex, income, occupational group, insurance district.

Table 3. Comparison of work participation (%) between partial and full sick leave group (GLM repeated measures design) in the PS-matched subsample.

	Work participation (%)			
	n (pairs)	Difference in differences Mean (95% CI)	F-statistic	p
All[1]	1 660	9.8 (5.9 to 13.7)	60.8	0.0001
Males[2]	489	12.4 (6.9 to 17.9)	28.1	0.002
Females[2]	1 171	7.2 (3.1 to 11.4)	34.0	0.0001
16-34 years	209	8.5 (0.5 to 16.6)	9.5	0.002
35-44 years	422	6.7 (0.7 to 12.6)	9.8	0.002
45-54 years	708	11.1 (6.3 to 15.9)	30.3	0.0001
55-65 years	321	12.9 (6.5 to 19.4)	12.2	0.001
Musculoskeletal diseases[3]	598	6.3 (1.5 to 11.2)	6.0	0.015
Mental disorders[3]	621	18.9 (14.2 to 23.5)	59.9	0.0001
Traumas[3]	131	0.3 (-9.3 to 9.9)	0.0	0.99
Tumours[3]	109	12.5 (1.8 to 23.2)	5.9	0.016
Other diagnostic categories[3]	201	11.1 (3.3 to 18.9)	7.6	0.006

Adjusted for
[1] age, sex, income, diagnosis, occupational group, insurance district,
[2] age, income, diagnosis, occupational group, insurance district,
[3] age, sex, income, occupational group, insurance district.

APPENDIX

Table 1. Characteristics of participants in partial and full sick leave group at the time of intervention (n, %). Propensity score-matched subsample (n=1660 pairs).

	Partial sick leave	Full sick leave
Female (%)	1 171 (70.5)	1 171 (70.5)
Age (years)		
Mean (95% CI)	46.1 (45.7 to 46.5)	46.0 (45.5 to 46.5)
Annual gross income (€)		
Mean (95% CI)	27 302 (26 754 to 27 850)	26 274 (25 637 to 26 910)
Diagnostic categories (%)		
Mental disorders	621 (37.4)	621 (37.4)
Musculoskeletal diseases	598 (36.0)	598 (36.0)
Tumours	109 (6.6)	109 (6.6)
Traumas	131 (7.9)	131 (7.9)
Other	201 (12.1)	201 (12.1)
Occupational branch (%)		
Technical and scientific work etc.	178 (10.7)	223 (13.4)
Social and healthcare services	492 (29.6)	402 (24.2)
Administration and office work	281 (16.9)	230 (13.9)
Commercial work	112 (6.7)	137 (8.3)
Agriculture and forestry	490 (3.0)	71 (4.3)
Transport	58 (3.5)	79 (4.8)
Industrial and construction work, mining	300 (18.3)	301 (18.1)
Service work	190 (11.4)	217 (13.1)
Insurance district (%)		
Northern	206 (12.4)	234 (14.1)
Western	253 (15.2)	221 (13.3)
Eastern	188 (11.3)	258 (15.5)
South-Western	392 (23.6)	347 (20.9)
Southern	621 (37.4)	600 (36.1)
Number of unemployment days, T1		
Mean (95% CI)	2.8 (1.8 to 3.8)	3.6 (2.5 to 4.6)
Number of full sick leave days, T1		
Mean (95% CI)	17.0 (15.3 to 18.7)	17.9 (16.0 to 19.9)
Number of rehabilitation days, T1		
Mean (95% CI)	1.7 (0.9 to 2.5)	1.6 (0.8 to 2.4)
Work participation, T1		
Mean (95% CI)	94.1 (93.6 to 94.7)	93.7 (93.0 to 94.3)

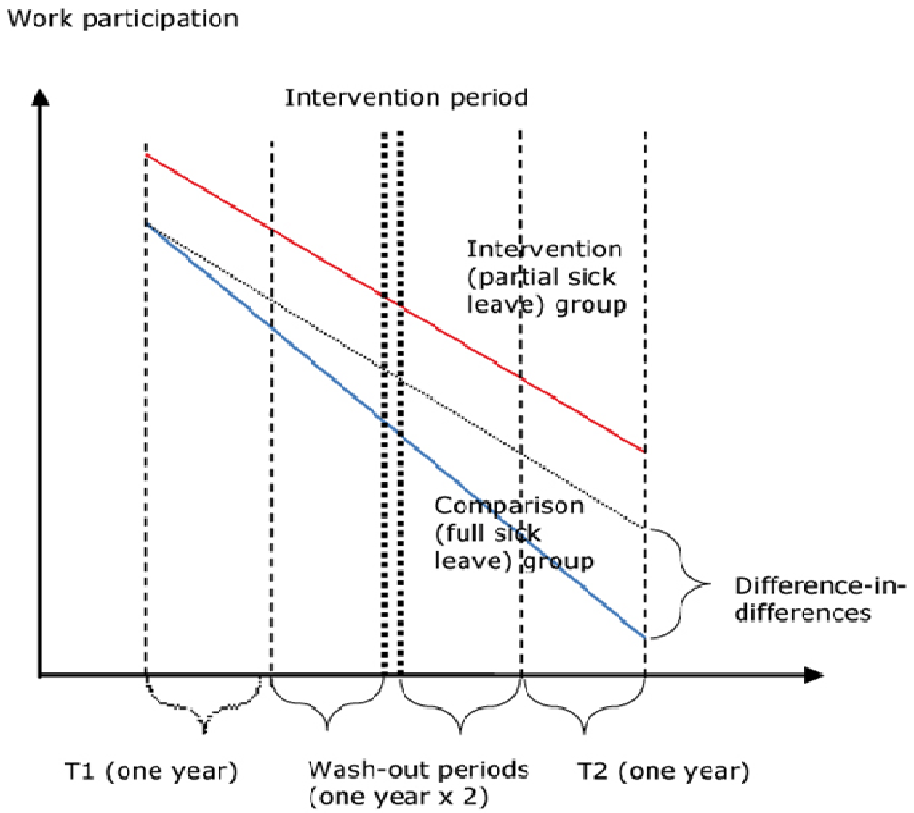

Figure. Schematic presentation of the study design and difference-in-differences method. (T1 corresponds to pre-intervention period, T2 corresponds to post-intervention period).

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Effectiveness of introduction of new legislation of partial sickness benefit on work participation: A quasi-experiment in Finland

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EFFECTIVENESS OF INTRODUCTION OF NEW LEGISLATION OF PARTIAL SICKNESS BENEFIT ON WORK PARTICIPATION: A QUASI-EXPERIMENT IN FINLAND

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Abstract

Objectives To examine the effect of new legislation on partial sickness benefit on subsequent work participation of Finns with long-term sickness absence. Additionally, we investigated whether the effect differed by sex, age, or diagnostic category.

Design A register-based quasi-experimental study compared the intervention (partial sick leave) group with the comparison (full sick leave) group regarding their pre-post differences in the outcome. The pre-intervention and post-intervention-period each consisted of 365 days.

Setting Nationwide, individual-level data on the beneficiaries of partial or full sickness benefit in 2008 were obtained from national sickness insurance, pension and earnings registers.

Participants 1738 persons in the intervention and 56754 persons in the comparison group.

Outcome Work participation, measured as the proportion (%) of time within 365 days when participants were gainfully employed and did not receive either partial or full ill-health-related or unemployment benefits.

Results Although work participation declined in both groups, the decline was 5% (absolute difference-in-differences) smaller in the intervention than in the comparison group, with a minor sex difference. The beneficial effect of partial sick leave was seen especially among those aged 45 to 54 (5%) and 55 to 65 (6%) and in mental disorders (13%). When the groups were rendered more exchangeable (propensity score-matching on age, sex, diagnostic category, income, occupation, insurance district, work participation, sickness absence, rehabilitation periods and unemployment prior to intervention and their interaction terms), the effects on work participation were doubled and seen in all age groups and in other diagnostic categories than traumas.

Conclusions The results suggest that the new legislation has potential to increase work participation of the population with long-term sickness absence in Finland. If applied in a larger scale, partial sick leave may turn out to be a useful tool in reducing withdrawal of workers from the labor market due to health reasons.

Article Summary

Strengths and limitations of the study:

- Applying nationally representative population register-based data with valid information on the payment of health- and unemployment-related allowances in Finland.
- Applying a quasi-experimental study-design with difference-in differences and propensity score analysis to control for selection on both observed and unobserved factors.
- Registers provided only a limited number of background characteristics.

Introduction

The need to increase work participation of working age people is currently a matter of concern in many Western countries. In Finland, delayed or lacking labor market attachment of young people, absence from work during later years and early exit from labor market have all raised alarm. To counteract these trends, an active labor market policy has been adopted, including the introduction of partial social security benefits and other tools to increase the so called flexicurity of the labor market [1]. In Finland, legislation on partial sickness benefit was introduced in 2007. The new benefit allowed for the first time to combine part-time sick-leave with part-time work.

The Finnish social insurance is based on the Nordic Model. Everyone who is aged from 16 to 67, non-retired and living permanently in the country (employees, self-employed, students, unemployed job seekers and those on sabbatical or alternation leave) and also nonresidents working for at least four months in Finland are covered by statutory sickness insurance. The sickness allowances are financed by employers, employees and the state and they are administrated by the Social Insurance Institution of Finland (SII). Statutory benefits can rest on previous earnings or benefits or the minimum allowance can be granted. For the earnings-related occupational sickness benefits, a minimum of three months of employment is required.

At present, the Finnish national sickness benefit scheme includes a full and a partial sickness benefit. A medical certificate is an absolute requirement for the two sickness benefits to be granted. In order to be eligible for the partial benefit an employee has to be eligible for a full benefit as well, but according to medical judgment partial return to work is safe enough. Partial sick leave is thus alternative to full sick leave and it is always medically certified. During the first years after introducing the partial sickness benefit in Finland, a partial sick leave had to be directly preceded by a period of full sick leave of at least 60 days and the partial sickness benefit could be granted from a minimum of 12 to a maximum of 72 working days. During partial sick leave, work time and salary are reduced by 40 – 60% of the regular work hours and work tasks can be modified if necessary. The employee and the employer sign a fixed term

work contract for the part-time work. In Finland, the use of partial sick leave is voluntary for the individual. The employer, as well, is entitled to decline the use of the benefit in case the work arrangements needed at the work place are not feasible.

Sickness absence rates are in many countries higher among women compared with men [2]. Also partial sick leave has been more frequently used by women [3]. It is known that sickness absence increases with age [2]. It is also recognized that challenges of return to work are different for example in musculoskeletal diseases and mental disorders. In the latter category, the outflow from disability benefits due to recovery has been lower [4].

The current evidence on the effects of partial sick leave on return to work or work participation is partly inconsistent. In the other Nordic countries, partial sick leave has been found to increase the likelihood of return to regular working hours [5, 6] and to be associated with higher subsequent employment rate [7]. No effect of active sick leave (return to work to modified duties) on the average number of sick leave days or long-term disability was detected in a Norwegian cluster randomized controlled trial [8]. There is some discrepancy in the findings on the effectiveness of partial sick leave in mental disorders. A Danish study [9] found no effect, whereas a Swedish study [10] reported a weak effect of partial sick leave on full recovery in the beginning of work disability due to mental disorders and a stronger effect when partial sick leave was assigned after 60 days of full sick leave.

In a randomized controlled trial among persons with musculoskeletal disorders we found that early part-time sick leave predicted faster sustained return to work than full sick leave [11]. The beneficial effect of partial sick leave on work retention was also observed at population level [12, 13]. Partial sick leave was associated in the short term with decreased work retention, in terms of increased subsequent sickness absence. In the long-term it was associated with increased work retention, in terms of increased subsequent use of partial disability pension and decreased use of full disability pension. These findings imply the necessity to use an outcome that simultaneously accounts for different indicators of work

participation. Some of these previous observational studies have suffered from limited data samples and narrow generalizability of findings [5, 9], self-reported data [9], and incomprehensive operationalization and measurement of work participation [5, 6, 10, 12, 13].

In order for policy makers to be able to make well informed decisions in the area of social and health policies, scientific evaluation of the effectiveness of population level interventions, e.g. introducing new legislation or policy change is needed [14]. Natural or quasi-experiments have successfully been used in connection with various population level interventions in the field of public health when planned experimentation, i.e. manipulation of exposure, has not been possible [15]. In the field of work disability research, this approach has, however been rare [2].

This study examined the effects of the new Finnish legislation that enabled the use of partial sickness benefit on subsequent work participation. For this we compared beneficiaries of partial sickness benefit with those receiving full sickness benefit a year after the law on partial sick leave was enacted. We utilized a quasi-experimental design with an integrated measure of work participation. Analyses were carried out in an individual-level register-based data representative of the Finnish working population with long-term sickness absence. We examined whether the effects of partial sick leave on subsequent work participation differed by sex, age, or diagnostic category of the benefit receivers.

Methods

Study design and setting

The population level intervention of interest in this study was the introduction of partial sick leave in Finland in 2007. We conducted a quasi-experimental study following recent guidelines on evaluating population health interventions [15]. This design was chosen to minimize the effect of both measured and unmeasured confounding. We compared the intervention (partial sick leave) group with the comparison (full sick leave) group regarding their pre-post

differences in work participation. The pre-intervention (T1) and post-intervention (T2) study period each consisted of 365 days. A wash-out-period of one year was set pre and post intervention (Figure 1) in order to obtain a robust effect of the intervention on work participation. These time-windows were allowed to move according to the timing of the individual's sick leave period.

<Figure 1>

Individual-level data were derived from the national sickness insurance register of the SII and the pension and earnings registers of the Finnish Centre for Pensions. Data from these three registers were linked on the basis of social security numbers of the participants. The social insurance register provided information on all medically certified and compensated sickness absence spells, temporary and permanent national disability pensions, and old age pensions in Finland. The registers of the Finnish Centre for Pensions contained information on employment periods, earnings-related pensions and unsalaried periods due to disability, rehabilitation or unemployment. Written consent from the individuals was not needed as only encrypted register data were obtained by the researchers carrying out the analyses in the Finnish Institute of Occupational Health.

Participants

Participants that were granted a partial sickness benefit (intervention group) were compared with those who received a full sickness benefit (comparison group). A total sample of individuals who had received either partial sickness benefit (n = 1 838) or full sickness benefit (n = 67 086) in 2007 - 2008 and whose compensated sickness absence period had ended between 1 January and 31 December 2008 was drawn from the national sickness insurance register. Since a full time sickness absence of 60 working days had to precede partial sick leave, only those with full sick leave ending with an uninterrupted period of at least 60 days of payment of the benefit were included in the total sample. Thus, in our sample, receivers of full sickness benefit had not received partial sickness benefit, but they would have been entitled to it as for the length of the preceding full time sickness absence.

Since eligibility for a partial sickness benefit required a prior work contract, we excluded from the analyses those who did not have any employment periods (n=2 and n=4 923) during the entire study period. We additionally excluded those who had died (n=24 in the partial sick leave group and n=2 600 in the full sick leave group) or moved to old age pension (n=1 and n=354, respectively), had not turned 16 at the time of the first data collection period (T1) (n=3) or whose sickness absence periods (ending in 2008) extended beyond the time-frame of data collection (n=66 and n=1 024). The final sample included 1 738 participants in the partial sick leave group and 56 754 participants in the full sick leave group. We focused our analyses in the four main diagnostic groups in which partial sickness benefit has most frequently been used, i.e. musculoskeletal diseases, mental disorders, traumas and tumors (M, F, S and T, and C and D-categories in ICD-10, respectively). All other diagnoses were merged in one group.

Outcome measure

Work participation was operationalized as the time the individuals were likely to have actually participated in gainful employment. It was approximated as the proportion (%) of time within 365 days when participants had an employment contract and did not receive either partial or full ill-health-related benefits (sickness benefits, rehabilitation allowances, disability pensions) or unemployment benefits. Work participation was calculated for T1 and T2. It was assumed that when receiving partial benefits, the participants worked half of the work time (which is typically the case in Finland).

Covariates

Data on sex, dates of birth and death, insurance district (region), annual gross income in 2007, diagnostic codes (ICD-10), and occupational branch were obtained from the sickness insurance register. Information on occupation was available for all participants in the intervention group and for a random sample of 7.7% of the participants in the comparison group.

Data analyses

The distributions of all variables were compared between the total full sickness benefit group (n = 67 086) and the subsample of those participants in the full sickness benefit group for whom the registers provided information on occupational branch (n = 4 347). Since no differences in the distributions were detected, we assumed that information on occupational branch was missing at random. Multiple imputation was used to compensate for the missing data on occupational branch in the comparison group. For this, we generated multiple imputed data sets (n=10) using the *proc mi* of SAS. The imputation model included all covariates.

Propensity score with 1:1 matching was used to match individuals on the probability that they would belong to the intervention (partial sick leave) group. Individuals that were matched to each other had equal or nearly equal (close enough) estimated propensity scores.

Difference-in differences- (DID-) and propensity score- (PS-) analyses are methods that are complementary to each other and can be applied in causal inference to counter selection bias and confounding [16]. We applied the DID method alone and in combination with PS-matching. Combining methods to counter bias and confounding from different sources and comparing the results has been encouraged [15]. The DID-method can be applied to control for fixed unobserved individual differences and common trends.

The DID-method allows one to estimate the difference in pre-post, within subject, differences between the intervention and the comparison group. The effect of partial sick leave on work participation was consequently estimated as the difference in pre-post-differences (differences between T2 and T1) between partial and full sick leave groups. The effect was estimated using general linear model with repeated measures design. F-statistic for the interaction term between the group assignment and change of work participation in time was applied as the difference-in-differences statistic.

Propensity score is defined as conditional probability of being exposed to a certain intervention given observed covariates [15, 17, 18]. It is applied to balance the covariates in two groups

and thus to reduce bias. We computed PS (i.e. probability of being exposed to partial sick leave) by logistic regression for all participants. The following set of variables and their interaction terms were included in the logistic regression model: age, sex, diagnostic category, income, occupation, insurance district, and work participation, sickness absence, rehabilitation periods and unemployment at T1. The best fit model was chosen.

Thereafter we matched the partial sick leave and full sick leave groups on the estimated propensity score using local optimal (greedy) algorithm [19]. The matching was performed within (sex x diagnostic category)-strata. Subsequently DID-analysis was also carried out in the matched subsample.

Several sensitivity analyses were carried out. The analyses were run separately for participants for whom the registers provided information on occupational branch and for the total sample in which imputed data on occupational branch were utilized for the comparison group. To examine the group difference in work participation at T1 (due to unemployment or sick leave) as source of reduced group comparability, the analyses were carried out separately among participants who did not receive unemployment benefits at T1 and among participants with 100% of work participation at T1.

Results

Descriptive characteristics of the study population

Information on the background characteristics of the intervention and comparison group in the total analysed sample is shown in Table 1. Women constituted 71% of the partial sick leave group and 53% of the full sick leave group. The partial benefit was most common among those who were aged between 35 and 54, whereas the full benefit among those aged from 45 to 65. The income level of those in the partial sick leave group was higher than of those in the full sick leave group. The partial sickness benefit was most often used in connection with mental disorders and musculoskeletal diseases, while the full benefit was most often used in

musculoskeletal diseases. The use of the partial benefit was most frequent in social and healthcare services and administrative and office work, whereas the full benefit was most commonly used in industrial and service work. No large regional differences in the use of the benefits were detected.

<Table 1>

Difference-in-differences in work participation between partial and full sick leave group

In both groups the level of work participation decreased during the follow up, the absolute reduction being larger in the full sick leave group (-26.5%) compared with the partial sick leave group (-21.2%) (Table 2). The absolute overall difference-in-differences in work participation was 5.3% (95% CI 3.1% to 7.5%).

The difference-in-differences in work participation tended to be larger in men than in women. In all age categories, work participation declined more in the full than in the partial sick leave group. The difference in the decline was significant in age-categories 45-54 and 55-65. There was no effect in those aged 35-44. In the youngest age category (16-34 years) the difference-in-differences was large but statistically non-significant.

A statistically significantly larger effect (12.8% 95% CI 9.0% to 16.5%) was found in mental disorders compared with the other diagnostic categories.

<Table 2>

The results found in the subsample of participants for whom the registers provided information on occupational branch were very similar to those in the total sample (data not shown). The exclusion of the participants who received unemployment benefits at T1 led to an absolute increase in the difference-in-differences in work participation (DID 7.6%, 95% CI 5.4% to 9.7%). The difference-in- differences in work participation increased further (DID 9.5%, 95%

CI 6.8% to 12.1%) when participants with reduced work participation (for any reason) at T1 were excluded from the analyses.

Difference-in-differences in work participation in the propensity score-matched subsample

The matching procedure resulted in a total of 1 660 matched pairs of participants. The propensity score matched partial sickness benefit receivers did not differ from full sickness benefit receivers with regard to age, gross income, number of unemployment days, sickness absence days, rehabilitation days or work participation at T1. There were some differences between the groups in the distribution of occupational branches and insurance districts (Appendix Table 1).

The results from the DID-analysis in the PS-matched subsample are presented in Table 3. The absolute overall difference-in-differences was increased to 9.8% (95% CI 5.9 to 13.7). A tendency for a larger DID in men than in women was also found in this subsample. The DID was still largest in those participants aged over 45 years, but in contrast to the total sample an effect was seen in the younger age categories as well. Differences between the diagnostic categories were reduced as compared to the total sample. The largest effect was still found in mental disorders. In addition, a statistically significant DID was also found in musculoskeletal diseases and tumours. Further adjustment for the differences in the distribution of occupation and insurance district between the intervention and comparison group, had no effect on the results of the DID-analysis.

< Table 3>

Discussion

Principal findings

We applied a quasi-experimental design to study the population level effects of the introduction of partial sickness benefit in Finland among a working population with long-term sickness absence. It was found that partial sick leave had a positive effect on work participation. Although the overall work participation declined from T1 to T2, at the population level the decline was 5% (absolute difference) smaller among the receivers of partial sickness benefit (intervention group) than among the receivers of full sickness benefit (comparison group). The beneficial effect of partial sick leave was seen especially among those aged from 45 to 54 and 55 to 65 and in mental disorders. No major sex difference was detected. When the groups were rendered more exchangeable, the effect on work participation was doubled, and effects were seen in other diagnostic categories than traumas and all age groups.

Validity of the study

An observational quasi-experimental study design can be applied to assess the effects of a planned event or intervention, when randomized controlled trials are not ethical or feasible. Observational studies can also better simulate real-world settings and offer more relevant information in view of policy-making [20]. The internal validity of observational studies is lower than that of randomized controlled trials due to possible selection according to exposure. For this reason, an analytical approach called potential outcomes or counterfactual framework was chosen. The term refers to the fact that in an ideal situation the exposed would be compared to themselves when unexposed. Since this comparison is impossible, we need a comparable or exchangeable comparison group. We utilized two methods (DID and PS) that have been previously recommended and applied to control for selection on both observed factors and unobserved fixed factors [15, 20, 21].

In the DID- method, it is assumed that the unobserved characteristics in the studied groups are stable and that the outcomes would change identically in these groups in the absence of intervention. Consequently, the intervention and comparison groups should be identical, except for the intervention status. However, it is sufficient that the groups are closely, though not exactly, similar [15]. We included in the comparison group only participants who would have been entitled to partial sickness benefit as for the length of the preceding sickness absence. We also applied a short wash-out period, to minimize the intragroup differences between the two time points. However, as full information on the eligibility of the participants for partial sickness benefit was not available in the registers (e.g. severity of the health problem and degree of remaining workability), we utilized matching on PS to further increase the exchangeability of the groups. Moreover, at the time of the study, the national rates in sickness absence were rather stable. The unemployment rate in Finland was relatively low during the intervention in 2008 (6.4%), however the rates were similar at T1 (7.7%-8.4%) and T2 (7.8%-8.4%).

We utilized nationwide population data with comprehensive individual-level register-based information on ill-health- and unemployment-related absences from work. Personal identification (social security) numbers enabled linking information from three separate source registers. These registers have originally been established for administrative purposes, but the data can also be used for research [22]. Among the advantages of register-based studies is a low likelihood of selection and attrition bias. The source registers of this study provided valid information on the receivers and payment days of the benefits. A weakness of the registers is that they typically provide only a limited number of background characteristics of the participants and other covariates. The process of assignment to partial sick leave is not random. Most likely it is complex and it is affected by many actors (the patient, physician, employer, and workplace) for which information cannot be found in the national registers. Nevertheless, the factors that were included in the analyses have earlier been found to be important predictors of the use of health-related social security benefits and also associated with work disability and return to work.

Information on diagnoses for sickness benefits was as well retrieved from registers and was based on medical assessment. In case of a long-term sickness absence (lasting more than 60 days) in Finland, the sickness benefit is paid in shorter periods, each being covered with a separate medical certificate. Diagnostic codes are transferred from these certificates to the administrative registers. We used the latest (and presumably the most accurate) diagnostic code provided for each long-term sickness absence in 2007-2008. Data on occupational branch had to be imputed for the majority of participants in the comparison group. Nevertheless, the sensitivity analyses suggested that using imputed data on occupation did not affect the results. In contrast to earlier studies on the topic, work participation was approximated in the current study by taking simultaneously into account the rate of different ill-health- and unemployment-related benefits. We operationalized work participation as proportion of time within a year not receiving ill-health related or unemployment benefits. Hence we had a relatively comprehensive indicator of the availability of the participants for the labour market.

Results in relation to earlier findings

The overall results of this study are congruent with earlier findings, indicating positive effects of partial sick leave on return to work and work retention [5-7, 12]. We found that partial sick leave had a positive effect on future work participation especially in mental disorders, but the results of the analyses in the subgroup suggested that the overall effect in the total sample might be underestimated.

Our findings on the usefulness of partial sick leave in mental disorders, though not directly comparable, are congruent with a study showing beneficial effects of partial sick leave on RTW in mental disorders after 60 days of full sick leave [10], but differ from an earlier study reporting no effect [9]. The literature suggests that returning and continuing at work may be more challenging for those with mental disorders than with somatic problems (e.g. musculoskeletal diseases) [23-25]. In addition, the outflow from disability benefits due to recovery has been lower among those with mental disorders than with musculoskeletal

diseases [4]. However, in our previous study we found an effect of partial sick leave on work disability pension in both diagnostic categories, the effect tending to be larger in mental disorders than in musculoskeletal diseases [12]. The diagnostic groups of musculoskeletal diseases and mental disorders may differ in the degree of comparability of the partial and full sick leave groups with regard to the background characteristics, severity of the health problem and remaining work ability, number of sickness absences as well as in transition to rehabilitation and unemployment. When the exchangeability of the groups was increased with propensity score matching, a beneficial effect on work participation was detected also in persons with musculoskeletal diseases and those with tumours.

Sickness absence is known to increase with age [26]. In addition, it has been found that return to work after long-term sickness absence is less likely at higher ages [27, 28]. Partial sick leave was found to be most frequently used and also most effective among middle-aged and older workers. It may well be that work arrangements associated with partial sick leave are more easily implemented by employees in a more established or stable work situation.

Conclusions

The overall results of the effectiveness of partial sick leave on work participation suggest that the new legislation on partial sickness benefit introduced in 2007 has potential to increase work participation of the working population with long-term sickness absence in Finland. A positive effect was seen especially in mental disorders. In the future – if applied in a larger scale – partial sick leave may turn out to be an effective tool in reducing temporary and permanent withdrawal of workers from the labour market due to health reasons.

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Data sharing: No additional data available.

Figure legend

Figure 1. Schematic presentation of the study design and difference-in-differences method. (T1 corresponds to pre-intervention period, T2 corresponds to post-intervention period).

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Table 1. Characteristics of participants in partial and full sick leave group at the time of intervention (n, %).

	Partial sick leave n =1738	Full sick leave n = 56 754
Sex (%)		
Female	1 236 (71.1)	30 058 (53.0)
Age (years) (%)		
16–34	217 (12.5)	10 901 (19.2)
35–44	430 (24.7)	11 231 (19.8)
45–54	753 (43.3)	18 740 (33.0)
55–65	338 (19.5)	15 882 (28.0)
Mean (SD)	46.2 (9.0)	45.7 (11.3)
Annual gross income (€) (%)		
- 30 000	1 237 (71.2)	46 119 (81.3)
30 001 – 60 000	409 (23.5)	9 593 (16.9)
60 001 -	39 (2.2)	732 (1.3)
Missing	53 (3.1)	310 (0.5)
Median	24 618	20 668
Diagnostic categories (%)		
Mental disorders	663 (38.2)	14 255 (25.1)
Musculoskeletal diseases	624 (35.9)	20 613 (36.3)
Tumours	112 (6.4)	3 031 (5.4)
Traumas	136 (7.8)	8 416 (14.8)
Other	203 (11.7)	10 439 (18.4)
Insurance district (%)		
Northern	219 (12.6)	7 764 (13.7)
Western	259 (14.9)	7 824 (13.8)
Eastern	194 (11.2)	8 525 (15.0)
South-Western	410 (23.6)	13 254 (23.3)
Southern	656 (37.7)	19 349 (34.1)
Missing	0 (0.0)	38 (0.1)
Occupational branch (%)		(non-imputed subsample n = 4 347)
Technical and scientific work etc.	193 (11.1)	409 (9.4)
Social and healthcare services	516 (29.7)	719 (16.5)
Administration and office work	293 (16.9)	413 (9.5)
Commercial work	113 (6.5)	288 (6.6)
Agriculture and forestry	50 (2.9)	214 (4.9)
Transport	60 (3.4)	269 (6.2)
Industrial and construction work, mining	309 (17.8)	1 146 (26.4)
Service work	204 (11.7)	889 (20.5)

Table 2. Comparison of work participation (%) between partial and full sick leave group (GLM repeated measures design).

		Work participation (%)						
	n	Pre-intervention period (T1) Mean (95%CI)	Post-intervention period (T2) Mean (95%CI)	Post-Pre difference (T2-T1) Mean (95%CI)	p	Difference in differences Mean (95%CI)	F-statistic	p
All[1]								
Partial sick leave	1 685	86.6 (85.2 to 88.1)	65.4 (63.4 to 67.4)	-21.2 (-23.4 to -19.1)	0.001	5.3 (3.1 to 7.5)	22.8	0.001
Full sick leave	56 406	79.4 (79.1 to 79.6)	52.9 (52.5 to 53.2)	-26.5 (-26.9 to -26.2)	0.001			
Males[2]								
Partial sick leave	490	86.6 (84.0 to 89.1)	62.7 (59.0 to 66.5)	-23.9 (-27.9 to -19.9)	0.001	6.3 (2.3 to 10.3)	9.3	0.002
Full sick leave	26 507	80.3 (80.0 to 80.7)	50.2 (49.7 to50.7)	-30.1 (-30.7 to -29.6)	0.001			
Females[2]								
Partial sick leave	1 195	85.4 (83.7 to 87.0)	66.9 (64.6 to 69.3)	-18.4 (-21.0 to -15.9)	0.001	4.9 (2.4 to 7.5)	14.2	0.001
Full sick leave	29 889	78.6 (78.2 to 78.9)	55.2 (54.7 to 55.7)	-23.4 (-23.9 to -22.9)	0.001			
16-34 years[1]								
Partial sick leave	210	89.3 (85.8 to 92.8)	75.5 (70.2 to 80.9)	-13.8 (-19.6 to -8.0)	0.001	2.8 (-1.1 to 10.6)	2.5	0.111
Full sick leave	10 759	84.6 (84.1 to 85.1)	66.1 (65.3 to 66.8)	-16.6 (-20.8 to -12.5)	0.001			
35-44 years[1]								
Partial sick leave	424	84.7 (81.9 to 87.5)	68.1 (64.2 to 72.0)	-16.6 (-20.8 to -12.5)	0.001	2.0 (-2.2 to 6.2)	0.9	0.352
Full sick leave	11 177	78.4 (77.9 to 79.0)	59.8 (59.1 to 60.5)	-18.6 (-19.4 to -17.8)	0.001			
45-54 years[1]								
Partial sick leave	725	86.9 (84.7 to 89.0)	65.7 (62.6 to 68.8)	-21.1 (-24.4 to -17.9)	0.001	4.7 (1.4 to 8.0)	7.9	0.005
Full sick leave	18 659	77.6 (77.2 to 78.1)	51.8 (51.2 to 52.4)	-25.9 (-26.5 to -25.2)	0.001			
55-65 years[1]								
Partial sick leave	326	89.6 (86.3 to 92.9)	57.0 (52.3 to 61.7)	-32.6 (-37.7 to -27.5)	0.001	5.7 (0.5 to 10.8)	4.7	0.03
Full sick leave	15 811	78.5 (78.0 to 78.9)	40.2 (39.5 to 40.8)	-38.3 (-39.0 to -37.6)	0.001			
Musculoskeletal diseases[3]								
Partial sick leave	598	87.0 (84.8 to 89.3)	60.3 (57.0 to 63.6)	-26.7 (-30.3 to -23.2)	0.001	0.7 (-2.9 to 4.3)	0.14	0.712
Full sick leave	20 537	79.7 (79.4 to 80.1)	52.3 (51.7 to 52.9)	-27.4 (-28.0 to -26.8)	0.001			
Mental disorders[3]								
Partial sick leave	645	84.6 (82.2 to 87.1)	67.0 (63.8 to 70.3)	-17.6 (-21.3 to -13.9)	0.001	12.8 (9.0 to 16.5)	43.8	0.001
Full sick leave	14 136	74.6 (74.0 to 75.1)	44.2 (43.5 to 44.9)	-30.4 (-31.1 to -29.6)	0.001			

Table 2. Continued.

		Work participation (%)						
	n	Pre-intervention period (T1) Mean (95%CI)	Post-intervention period (T2) Mean (95%CI)	Post-Pre difference (T2-T1) Mean (95%CI)	p	Difference in differences Mean (95%CI)	F-statistic	p
Traumas [3]								
Partial sick leave	132	86.7 (82.0 to 91.3)	68.1 (61.5 to 74.6)	-18.6 (-25.3 to -11.8)	0.001	-3.2 (-10.0 to 3.5)	0.89	0.348
Full sick leave	8 312	82.9 (82.3 to 91.3)	67.6 (66.7 to 68.4)	-15.3 (-16.2 to -14.5)	0.001			
Tumours[3]								
Partial sick leave	109	90.6 (85.9 to 95.4)	75.0 (67.4 to 82.5)	-15.7 (-23.5 to -7.9)	0.001	5.3 (-2.6 to 13.2)	1.7	0.190
Full sick leave	3 021	87.2 (86.3 to 88.1)	66.2 (64.8 to 67.6)	-21.0 (-22.4 to -19.5)	0.001			
Other diagnostic categories[3]								
Partial sick leave	201	87.4 (83.4 to 91.4)	63.6 (57.8 to 69.4)	-23.8 (-30.0 to -17.6)	0.001	6.2 (-0.05 to 12.5)	3.8	0.052
Full sick leave	10 400	80.2 (79.6 to 80.7)	50.1 (49.3 to 50.9)	-30.0 (-30.9 to -29.2)	0.001			

Adjusted for [1] age, sex, income, diagnosis, occupational group, insurance district, [2] age, income, diagnosis, occupational group, insurance district, [3] age, sex, income, occupational group, insurance district.

Table 3. Comparison of work participation (%) between partial and full sick leave group (GLM repeated measures design) in the PS-matched subsample.

	Work participation (%)			
	n (pairs)	Difference in differences Mean (95% CI)	F-statistic	p
All[1]	1 660	9.8 (5.9 to 13.7)	60.8	0.0001
Males[2]	489	12.4 (6.9 to 17.9)	28.1	0.002
Females[2]	1 171	7.2 (3.1 to 11.4)	34.0	0.0001
16-34 years	209	8.5 (0.5 to 16.6)	9.5	0.002
35-44 years	422	6.7 (0.7 to 12.6)	9.8	0.002
45-54 years	708	11.1 (6.3 to 15.9)	30.3	0.0001
55-65 years	321	12.9 (6.5 to 19.4)	12.2	0.001
Musculoskeletal diseases[3]	598	6.3 (1.5 to 11.2)	6.0	0.015
Mental disorders[3]	621	18.9 (14.2 to 23.5)	59.9	0.0001
Traumas[3]	131	0.3 (-9.3 to 9.9)	0.0	0.99
Tumours[3]	109	12.5 (1.8 to 23.2)	5.9	0.016
Other diagnostic categories[3]	201	11.1 (3.3 to 18.9)	7.6	0.006

Adjusted for
[1] age, sex, income, diagnosis, occupational group, insurance district,
[2] age, income, diagnosis, occupational group, insurance district,
[3] age, sex, income, occupational group, insurance district.

EFFECTIVENESS OF INTRODUCTION OF NEW LEGISLATION OF PARTIAL SICKNESS BENEFIT ON WORK PARTICIPATION: A QUASI-EXPERIMENT IN FINLAND

Abstract

Objectives To examine the effect of new legislation on partial sickness benefit on subsequent work participation of Finns with long-term sickness absence. Additionally, we investigated whether the effect differed by sex, age, or diagnostic category.

Design A register-based quasi-experimental study compared the intervention (partial sick leave) group with the comparison (full sick leave) group regarding their pre-post differences in the outcome. The pre-intervention and post-intervention-period each consisted of 365 days.

Setting Nationwide, individual-level data on the beneficiaries of partial or full sickness benefit in 2008 were obtained from national sickness insurance, pension and earnings registers.

Participants 1738 persons in the intervention and 56754 persons in the comparison group.

Outcome Work participation, measured as the proportion (%) of time within 365 days when participants were gainfully employed and did not receive either partial or full ill-health-related or unemployment benefits.

Results Although work participation declined in both groups, the decline was 5% (absolute difference-in-differences) smaller in the intervention than in the comparison group, with a minor sex difference. The beneficial effect of partial sick leave was seen especially among those aged 45 to 54 (5%) and 55 to 65 (6%) and in mental disorders (13%). When the groups were rendered more exchangeable (propensity score-matching on age, sex, diagnostic category, income, occupation, insurance district, work participation, sickness absence, rehabilitation periods and unemployment prior to intervention and their interaction terms), the effects on work participation were doubled and seen in all age groups and in other diagnostic categories than traumas.

Conclusions The results suggest that the new legislation has potential to increase work participation of the population with long-term sickness absence in Finland. If applied in a larger scale, partial sick leave may turn out to be a useful tool in reducing withdrawal of workers from the labor market due to health reasons.

Article Summary

Strengths and limitations of the study:

- Applying nationally representative population register-based data with valid information on the payment of health- and unemployment-related allowances in Finland.
- Applying a quasi-experimental study-design with difference-in differences and propensity score analysis to control for selection on both observed and unobserved factors.
- Registers provided only a limited number of background characteristics.

Introduction

The need to increase work participation of working age people is currently a matter of concern in many Western countries. In Finland, delayed or lacking labor market attachment of young people, absence from work during later years and early exit from labor market have all raised alarm. To counteract these trends, an active labor market policy has been adopted, including the introduction of partial social security benefits and other tools to increase the so called flexicurity of the labor market [1]. In Finland, legislation on partial sickness benefit was introduced in 2007. The new benefit allowed for the first time to combine part-time sick-leave with part-time work.

The Finnish social insurance is based on the Nordic Model. Everyone who is aged from 16 to 67, non-retired and living permanently in the country (employees, self-employed, students, unemployed job seekers and those on sabbatical or alternation leave) and also nonresidents working for at least four months in Finland are covered by statutory sickness insurance. The sickness allowances are financed by employers, employees and the state and they are administrated by the Social Insurance Institution of Finland (SII). Statutory benefits can rest on previous earnings or benefits or the minimum allowance can be granted. For the earnings-related occupational sickness benefits, a minimum of three months of employment is required.

At present, the Finnish national sickness benefit scheme includes a full and a partial sickness benefit. A medical certificate is an absolute requirement for the two sickness benefits to be granted. In order to be eligible for the partial benefit an employee has to be eligible for a full benefit as well, but according to medical judgment partial return to work is safe enough. Partial sick leave is thus alternative to full sick leave and it is always medically certified. During the first years after introducing the partial sickness benefit in Finland, a partial sick leave had to be directly preceded by a period of full sick leave of at least 60 days and the partial sickness benefit could be granted from a minimum of 12 to a maximum of 72 working days. During partial sick leave, work time and salary are reduced by 40 – 60% of the regular work hours and work tasks can be modified if necessary. The employee and the employer sign a fixed term

work contract for the part-time work. In Finland, the use of partial sick leave is voluntary for the individual. The employer, as well, is entitled to decline the use of the benefit in case the work arrangements needed at the work place are not feasible.

Sickness absence rates are in many countries higher among women compared with men [2]. Also partial sick leave has been more frequently used by women [3]. It is known that sickness absence increases with age [2]. It is also recognized that challenges of return to work are different for example in musculoskeletal diseases and mental disorders. In the latter category, the outflow from disability benefits due to recovery has been lower [4].

The current evidence on the effects of partial sick leave on return to work or work participation is partly inconsistent. In the other Nordic countries, partial sick leave has been found to increase the likelihood of return to regular working hours [5, 6] and to be associated with higher subsequent employment rate [7]. No effect of active sick leave (return to work to modified duties) on the average number of sick leave days or long-term disability was detected in a Norwegian cluster randomized controlled trial [8]. There is some discrepancy in the findings on the effectiveness of partial sick leave in mental disorders. A Danish study [9] found no effect, whereas a Swedish study [10] reported a weak effect of partial sick leave on full recovery in the beginning of work disability due to mental disorders and a stronger effect when partial sick leave was assigned after 60 days of full sick leave.

In a randomized controlled trial among persons with musculoskeletal disorders we found that early part-time sick leave predicted faster sustained return to work than full sick leave [11]. The beneficial effect of partial sick leave on work retention was also observed at population level [12, 13]. Partial sick leave was associated in the short term with decreased work retention, in terms of increased subsequent sickness absence. In the long-term it was associated with increased work retention, in terms of increased subsequent use of partial disability pension and decreased use of full disability pension. These findings imply the necessity to use an outcome that simultaneously accounts for different indicators of work

participation. Some of these previous observational studies have suffered from limited data samples and narrow generalizability of findings [5, 9], self-reported data [9], and incomprehensive operationalization and measurement of work participation [5, 6, 10, 12, 13].

In order for policy makers to be able to make well informed decisions in the area of social and health policies, scientific evaluation of the effectiveness of population level interventions, e.g. introducing new legislation or policy change is needed [14]. Natural or quasi-experiments have successfully been used in connection with various population level interventions in the field of public health when planned experimentation, i.e. manipulation of exposure, has not been possible [15]. In the field of work disability research, this approach has, however been rare [2].

This study examined the effects of the new Finnish legislation that enabled the use of partial sickness benefit on subsequent work participation. For this we compared beneficiaries of partial sickness benefit with those receiving full sickness benefit a year after the law on partial sick leave was enacted. We utilized a quasi-experimental design with an integrated measure of work participation. Analyses were carried out in an individual-level register-based data representative of the Finnish working population with long-term sickness absence. We examined whether the effects of partial sick leave on subsequent work participation differed by sex, age, or diagnostic category of the benefit receivers.

Methods

Study design and setting

The population level intervention of interest in this study was the introduction of partial sick leave in Finland in 2007. We conducted a quasi-experimental study following recent guidelines on evaluating population health interventions [15]. This design was chosen to minimize the effect of both measured and unmeasured confounding. We compared the intervention (partial sick leave) group with the comparison (full sick leave) group regarding their pre-post

differences in work participation. The pre-intervention (T1) and post-intervention (T2) study period each consisted of 365 days. A wash-out-period of one year was set pre and post intervention (Figure 1) in order to obtain a robust effect of the intervention on work participation. These time-windows were allowed to move according to the timing of the individual's sick leave period.

<Figure 1>

Individual-level data were derived from the national sickness insurance register of the SII and the pension and earnings registers of the Finnish Centre for Pensions. Data from these three registers were linked on the basis of social security numbers of the participants. The social insurance register provided information on all medically certified and compensated sickness absence spells, temporary and permanent national disability pensions, and old age pensions in Finland. The registers of the Finnish Centre for Pensions contained information on employment periods, earnings-related pensions and unsalaried periods due to disability, rehabilitation or unemployment. Written consent from the individuals was not needed as only encrypted register data were obtained by the researchers carrying out the analyses in the Finnish Institute of Occupational Health.

Participants

Participants that were granted a partial sickness benefit (intervention group) were compared with those who received a full sickness benefit (comparison group). A total sample of individuals who had received either partial sickness benefit (n = 1 838) or full sickness benefit (n = 67 086) in 2007 - 2008 and whose compensated sickness absence period had ended between 1 January and 31 December 2008 was drawn from the national sickness insurance register. Since a full time sickness absence of 60 working days had to precede partial sick leave, only those with full sick leave ending with an uninterrupted period of at least 60 days of payment of the benefit were included in the total sample. Thus, in our sample, receivers of full sickness benefit had not received partial sickness benefit, but they would have been entitled to it as for the length of the preceding full time sickness absence.

Since eligibility for a partial sickness benefit required a prior work contract, we excluded from the analyses those who did not have any employment periods (n=2 and n=4 923) during the entire study period. We additionally excluded those who had died (n=24 in the partial sick leave group and n=2 600 in the full sick leave group) or moved to old age pension (n=1 and n=354, respectively), had not turned 16 at the time of the first data collection period (T1) (n=3) or whose sickness absence periods (ending in 2008) extended beyond the time-frame of data collection (n=66 and n=1 024). The final sample included 1 738 participants in the partial sick leave group and 56 754 participants in the full sick leave group. We focused our analyses in the four main diagnostic groups in which partial sickness benefit has most frequently been used, i.e. musculoskeletal diseases, mental disorders, traumas and tumors (M, F, S and T, and C and D-categories in ICD-10, respectively). All other diagnoses were merged in one group.

Outcome measure

Work participation was operationalized as the time the individuals were likely to have actually participated in gainful employment. It was approximated as the proportion (%) of time within 365 days when participants had an employment contract and did not receive either partial or full ill-health-related benefits (sickness benefits, rehabilitation allowances, disability pensions) or unemployment benefits. Work participation was calculated for T1 and T2. It was assumed that when receiving partial benefits, the participants worked half of the work time (which is typically the case in Finland).

Covariates

Data on sex, dates of birth and death, insurance district (region), annual gross income in 2007, diagnostic codes (ICD-10), and occupational branch were obtained from the sickness insurance register. Information on occupation was available for all participants in the intervention group and for a random sample of 7.7% of the participants in the comparison group.

Data analyses

The distributions of all variables were compared between the total full sickness benefit group (n = 67 086) and the subsample of those participants in the full sickness benefit group for whom the registers provided information on occupational branch (n = 4 347). Since no differences in the distributions were detected, we assumed that information on occupational branch was missing at random. Multiple imputation was used to compensate for the missing data on occupational branch in the comparison group. For this, we generated multiple imputed data sets (n=10) using the *proc mi* of SAS. The imputation model included all covariates.

Propensity score with 1:1 matching was used to match individuals on the probability that they would belong to the intervention (partial sick leave) group. Individuals that were matched to each other had equal or nearly equal (close enough) estimated propensity scores.

Difference-in differences- (DID-) and propensity score- (PS-) analyses are methods that are complementary to each other and can be applied in causal inference to counter selection bias and confounding [16]. We applied the DID method alone and in combination with PS-matching. Combining methods to counter bias and confounding from different sources and comparing the results has been encouraged [15]. The DID-method can be applied to control for fixed unobserved individual differences and common trends.

The DID-method allows one to estimate the difference in pre-post, within subject, differences between the intervention and the comparison group. The effect of partial sick leave on work participation was consequently estimated as the difference in pre-post-differences (differences between T2 and T1) between partial and full sick leave groups. The effect was estimated using general linear model with repeated measures design. F-statistic for the interaction term between the group assignment and change of work participation in time was applied as the difference-in-differences statistic.

Propensity score is defined as conditional probability of being exposed to a certain intervention given observed covariates [15, 17, 18]. It is applied to balance the covariates in two groups

and thus to reduce bias. We computed PS (i.e. probability of being exposed to partial sick leave) by logistic regression for all participants. The following set of variables and their interaction terms were included in the logistic regression model: age, sex, diagnostic category, income, occupation, insurance district, and work participation, sickness absence, rehabilitation periods and unemployment at T1. The best fit model was chosen.

Thereafter we matched the partial sick leave and full sick leave groups on the estimated propensity score using local optimal (greedy) algorithm [19]. The matching was performed within (sex x diagnostic category)-strata. Subsequently DID-analysis was also carried out in the matched subsample.

Several sensitivity analyses were carried out. The analyses were run separately for participants for whom the registers provided information on occupational branch and for the total sample in which imputed data on occupational branch were utilized for the comparison group. To examine the group difference in work participation at T1 (due to unemployment or sick leave) as source of reduced group comparability, the analyses were carried out separately among participants who did not receive unemployment benefits at T1 and among participants with 100% of work participation at T1.

Results

Descriptive characteristics of the study population

Information on the background characteristics of the intervention and comparison group in the total analysed sample is shown in Table 1. Women constituted 71% of the partial sick leave group and 53% of the full sick leave group. The partial benefit was most common among those who were aged between 35 and 54, whereas the full benefit among those aged from 45 to 65. The income level of those in the partial sick leave group was higher than of those in the full sick leave group. The partial sickness benefit was most often used in connection with mental disorders and musculoskeletal diseases, while the full benefit was most often used in

musculoskeletal diseases. The use of the partial benefit was most frequent in social and healthcare services and administrative and office work, whereas the full benefit was most commonly used in industrial and service work. No large regional differences in the use of the benefits were detected.

<Table 1>

Difference-in-differences in work participation between partial and full sick leave group

In both groups the level of work participation decreased during the follow up, the absolute reduction being larger in the full sick leave group (-26.5%) compared with the partial sick leave group (-21.2%) (Table 2). The absolute overall difference-in-differences in work participation was 5.3% (95% CI 3.1% to 7.5%).

The difference-in-differences in work participation tended to be larger in men than in women. In all age categories, work participation declined more in the full than in the partial sick leave group. The difference in the decline was significant in age-categories 45-54 and 55-65. There was no effect in those aged 35-44. In the youngest age category (16-34 years) the difference-in-differences was large but statistically non-significant.

A statistically significantly larger effect (12.8% 95% CI 9.0% to 16.5%) was found in mental disorders compared with the other diagnostic categories.

<Table 2>

The results found in the subsample of participants for whom the registers provided information on occupational branch were very similar to those in the total sample (data not shown). The exclusion of the participants who received unemployment benefits at T1 led to an absolute increase in the difference-in-differences in work participation (DID 7.6%, 95% CI 5.4% to 9.7%). The difference-in- differences in work participation increased further (DID 9.5%, 95%

CI 6.8% to 12.1%) when participants with reduced work participation (for any reason) at T1 were excluded from the analyses.

Difference-in-differences in work participation in the propensity score-matched subsample

The matching procedure resulted in a total of 1 660 matched pairs of participants. The propensity score matched partial sickness benefit receivers did not differ from full sickness benefit receivers with regard to age, gross income, number of unemployment days, sickness absence days, rehabilitation days or work participation at T1. There were some differences between the groups in the distribution of occupational branches and insurance districts (Appendix Table 1).

The results from the DID-analysis in the PS-matched subsample are presented in Table 3. The absolute overall difference-in-differences was increased to 9.8% (95% CI 5.9 to 13.7). A tendency for a larger DID in men than in women was also found in this subsample. The DID was still largest in those participants aged over 45 years, but in contrast to the total sample an effect was seen in the younger age categories as well. Differences between the diagnostic categories were reduced as compared to the total sample. The largest effect was still found in mental disorders. In addition, a statistically significant DID was also found in musculoskeletal diseases and tumours. Further adjustment for the differences in the distribution of occupation and insurance district between the intervention and comparison group, had no effect on the results of the DID-analysis.

< Table 3>

Discussion

Principal findings

We applied a quasi-experimental design to study the population level effects of the introduction of partial sickness benefit in Finland among a working population with long-term sickness absence. It was found that partial sick leave had a positive effect on work participation. Although the overall work participation declined from T1 to T2, at the population level the decline was 5% (absolute difference) smaller among the receivers of partial sickness benefit (intervention group) than among the receivers of full sickness benefit (comparison group). The beneficial effect of partial sick leave was seen especially among those aged from 45 to 54 and 55 to 65 and in mental disorders. No major sex difference was detected. When the groups were rendered more exchangeable, the effect on work participation was doubled, and effects were seen in other diagnostic categories than traumas and all age groups.

Validity of the study

An observational quasi-experimental study design can be applied to assess the effects of a planned event or intervention, when randomized controlled trials are not ethical or feasible. Observational studies can also better simulate real-world settings and offer more relevant information in view of policy-making [20]. The internal validity of observational studies is lower than that of randomized controlled trials due to possible selection according to exposure. For this reason, an analytical approach called potential outcomes or counterfactual framework was chosen. The term refers to the fact that in an ideal situation the exposed would be compared to themselves when unexposed. Since this comparison is impossible, we need a comparable or exchangeable comparison group. We utilized two methods (DID and PS) that have been previously recommended and applied to control for selection on both observed factors and unobserved fixed factors [15, 20, 21].

In the DID- method, it is assumed that the unobserved characteristics in the studied groups are stable and that the outcomes would change identically in these groups in the absence of intervention. Consequently, the intervention and comparison groups should be identical, except for the intervention status. However, it is sufficient that the groups are closely, though not exactly, similar [15]. We included in the comparison group only participants who would have been entitled to partial sickness benefit as for the length of the preceding sickness absence. We also applied a short wash-out period, to minimize the intragroup differences between the two time points. However, as full information on the eligibility of the participants for partial sickness benefit was not available in the registers (e.g. severity of the health problem and degree of remaining workability), we utilized matching on PS to further increase the exchangeability of the groups. Moreover, at the time of the study, the national rates in sickness absence were rather stable. The unemployment rate in Finland was relatively low during the intervention in 2008 (6.4%), however the rates were similar at T1 (7.7%-8.4%) and T2 (7.8%-8.4%).

We utilized nationwide population data with comprehensive individual-level register-based information on ill-health- and unemployment-related absences from work. Personal identification (social security) numbers enabled linking information from three separate source registers. These registers have originally been established for administrative purposes, but the data can also be used for research [22]. Among the advantages of register-based studies is a low likelihood of selection and attrition bias. The source registers of this study provided valid information on the receivers and payment days of the benefits. A weakness of the registers is that they typically provide only a limited number of background characteristics of the participants and other covariates. The process of assignment to partial sick leave is not random. Most likely it is complex and it is affected by many actors (the patient, physician, employer, and workplace) for which information cannot be found in the national registers. Nevertheless, the factors that were included in the analyses have earlier been found to be important predictors of the use of health-related social security benefits and also associated with work disability and return to work.

Information on diagnoses for sickness benefits was as well retrieved from registers and was based on medical assessment. In case of a long-term sickness absence (lasting more than 60 days) in Finland, the sickness benefit is paid in shorter periods, each being covered with a separate medical certificate. Diagnostic codes are transferred from these certificates to the administrative registers. We used the latest (and presumably the most accurate) diagnostic code provided for each long-term sickness absence in 2007-2008. Data on occupational branch had to be imputed for the majority of participants in the comparison group. Nevertheless, the sensitivity analyses suggested that using imputed data on occupation did not affect the results. In contrast to earlier studies on the topic, work participation was approximated in the current study by taking simultaneously into account the rate of different ill-health- and unemployment-related benefits. We operationalized work participation as proportion of time within a year not receiving ill-health related or unemployment benefits. Hence we had a relatively comprehensive indicator of the availability of the participants for the labour market.

Results in relation to earlier findings

The overall results of this study are congruent with earlier findings, indicating positive effects of partial sick leave on return to work and work retention [5-7, 12]. We found that partial sick leave had a positive effect on future work participation especially in mental disorders, but the results of the analyses in the subgroup suggested that the overall effect in the total sample might be underestimated.

Our findings on the usefulness of partial sick leave in mental disorders, though not directly comparable, are congruent with a study showing beneficial effects of partial sick leave on RTW in mental disorders after 60 days of full sick leave [10], but differ from an earlier study reporting no effect [9]. The literature suggests that returning and continuing at work may be more challenging for those with mental disorders than with somatic problems (e.g. musculoskeletal diseases) [23-25]. In addition, the outflow from disability benefits due to recovery has been lower among those with mental disorders than with musculoskeletal

diseases [4]. However, in our previous study we found an effect of partial sick leave on work disability pension in both diagnostic categories, the effect tending to be larger in mental disorders than in musculoskeletal diseases [12]. The diagnostic groups of musculoskeletal diseases and mental disorders may differ in the degree of comparability of the partial and full sick leave groups with regard to the background characteristics, severity of the health problem and remaining work ability, number of sickness absences as well as in transition to rehabilitation and unemployment. When the exchangeability of the groups was increased with propensity score matching, a beneficial effect on work participation was detected also in persons with musculoskeletal diseases and those with tumours.

Sickness absence is known to increase with age [26]. In addition, it has been found that return to work after long-term sickness absence is less likely at higher ages [27, 28]. Partial sick leave was found to be most frequently used and also most effective among middle-aged and older workers. It may well be that work arrangements associated with partial sick leave are more easily implemented by employees in a more established or stable work situation.

Conclusions

The overall results of the effectiveness of partial sick leave on work participation suggest that the new legislation on partial sickness benefit introduced in 2007 has potential to increase work participation of the working population with long-term sickness absence in Finland. A positive effect was seen especially in mental disorders. In the future – if applied in a larger scale – partial sick leave may turn out to be an effective tool in reducing temporary and permanent withdrawal of workers from the labour market due to health reasons.

Figure legend

Figure. Schematic presentation of the study design and difference-in-differences method. (T1 corresponds to pre-intervention period, T2 corresponds to post-intervention period).

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Table 1. Characteristics of participants in partial and full sick leave group at the time of intervention (n, %).

	Partial sick leave n =1738	Full sick leave n = 56 754
Sex (%)		
Female	1 236 (71.1)	30 058 (53.0)
Age (years) (%)		
16–34	217 (12.5)	10 901 (19.2)
35–44	430 (24.7)	11 231 (19.8)
45–54	753 (43.3)	18 740 (33.0)
55–65	338 (19.5)	15 882 (28.0)
Mean (SD)	46.2 (9.0)	45.7 (11.3)
Annual gross income (€) (%)		
- 30 000	1 237 (71.2)	46 119 (81.3)
30 001 – 60 000	409 (23.5)	9 593 (16.9)
60 001 -	39 (2.2)	732 (1.3)
Missing	53 (3.1)	310 (0.5)
Median	24 618	20 668
Diagnostic categories (%)		
Mental disorders	663 (38.2)	14 255 (25.1)
Musculoskeletal diseases	624 (35.9)	20 613 (36.3)
Tumours	112 (6.4)	3 031 (5.4)
Traumas	136 (7.8)	8 416 (14.8)
Other	203 (11.7)	10 439 (18.4)
Insurance district (%)		
Northern	219 (12.6)	7 764 (13.7)
Western	259 (14.9)	7 824 (13.8)
Eastern	194 (11.2)	8 525 (15.0)
South-Western	410 (23.6)	13 254 (23.3)
Southern	656 (37.7)	19 349 (34.1)
Missing	0 (0.0)	38 (0.1)
Occupational branch (%)		(non-imputed subsample n = 4 347)
Technical and scientific work etc.	193 (11.1)	409 (9.4)
Social and healthcare services	516 (29.7)	719 (16.5)
Administration and office work	293 (16.9)	413 (9.5)
Commercial work	113 (6.5)	288 (6.6)
Agriculture and forestry	50 (2.9)	214 (4.9)
Transport	60 (3.4)	269 (6.2)
Industrial and construction work, mining	309 (17.8)	1 146 (26.4)
Service work	204 (11.7)	889 (20.5)

Table 2. Comparison of work participation (%) between partial and full sick leave group (GLM repeated measures design).

		Work participation (%)						
	n	Pre-intervention period (T1) Mean (95%CI)	Post-intervention period (T2) Mean (95%CI)	Post-Pre difference (T2-T1) Mean (95%CI)	p	Difference in differences Mean (95%CI)	F-statistic	p
All[1]								
Partial sick leave	1 685	86.6 (85.2 to 88.1)	65.4 (63.4 to 67.4)	-21.2 (-23.4 to -19.1)	0.001	5.3 (3.1 to 7.5)	22.8	0.001
Full sick leave	56 406	79.4 (79.1 to 79.6)	52.9 (52.5 to 53.2)	-26.5 (-26.9 to -26.2)	0.001			
Males[2]								
Partial sick leave	490	86.6 (84.0 to 89.1)	62.7 (59.0 to 66.5)	-23.9 (-27.9 to -19.9)	0.001	6.3 (2.3 to 10.3)	9.3	0.002
Full sick leave	26 507	80.3 (80.0 to 80.7)	50.2 (49.7 to50.7)	-30.1 (-30.7 to -29.6)	0.001			
Females[2]								
Partial sick leave	1 195	85.4 (83.7 to 87.0)	66.9 (64.6 to 69.3)	-18.4 (-21.0 to -15.9)	0.001	4.9 (2.4 to 7.5)	14.2	0.001
Full sick leave	29 889	78.6 (78.2 to 78.9)	55.2 (54.7 to 55.7)	-23.4 (-23.9 to -22.9)	0.001			
16-34 years[1]								
Partial sick leave	210	89.3 (85.8 to 92.8)	75.5 (70.2 to 80.9)	-13.8 (-19.6 to -8.0)	0.001	2.8 (-1.1 to 10.6)	2.5	0.111
Full sick leave	10 759	84.6 (84.1 to 85.1)	66.1 (65.3 to 66.8)	-16.6 (-20.8 to -12.5)	0.001			
35-44 years[1]								
Partial sick leave	424	84.7 (81.9 to 87.5)	68.1 (64.2 to 72.0)	-16.6 (-20.8 to -12.5)	0.001	2.0 (-2.2 to 6.2)	0.9	0.352
Full sick leave	11 177	78.4 (77.9 to 79.0)	59.8 (59.1 to 60.5)	-18.6 (-19.4 to -17.8)	0.001			
45-54 years[1]								
Partial sick leave	725	86.9 (84.7 to 89.0)	65.7 (62.6 to 68.8)	-21.1 (-24.4 to -17.9)	0.001	4.7 (1.4 to 8.0)	7.9	0.005
Full sick leave	18 659	77.6 (77.2 to 78.1)	51.8 (51.2 to 52.4)	-25.9 (-26.5 to -25.2)	0.001			
55-65 years[1]								
Partial sick leave	326	89.6 (86.3 to 92.9)	57.0 (52.3 to 61.7)	-32.6 (-37.7 to -27.5)	0.001	5.7 (0.5 to 10.8)	4.7	0.03
Full sick leave	15 811	78.5 (78.0 to 78.9)	40.2 (39.5 to 40.8)	-38.3 (-39.0 to -37.6)	0.001			
Musculoskeletal diseases[3]								
Partial sick leave	598	87.0 (84.8 to 89.3)	60.3 (57.0 to 63.6)	-26.7 (-30.3 to -23.2)	0.001	0.7 (-2.9 to 4.3)	0.14	0.712
Full sick leave	20 537	79.7 (79.4 to 80.1)	52.3 (51.7 to 52.9)	-27.4 (-28.0 to -26.8)	0.001			
Mental disorders[3]								
Partial sick leave	645	84.6 (82.2 to 87.1)	67.0 (63.8 to 70.3)	-17.6 (-21.3 to -13.9)	0.001	12.8 (9.0 to 16.5)	43.8	0.001
Full sick leave	14 136	74.6 (74.0 to 75.1)	44.2 (43.5 to 44.9)	-30.4 (-31.1 to -29.6)	0.001			

Table 2. Continued.

		Work participation (%)						
	n	Pre-intervention period (T1) Mean (95%CI)	Post-intervention period (T2) Mean (95%CI)	Post-Pre difference (T2-T1) Mean (95%CI)	p	Difference in differences Mean (95%CI)	F-statistic	p
Traumas [3]								
Partial sick leave	132	86.7 (82.0 to 91.3)	68.1 (61.5 to 74.6)	-18.6 (-25.3 to -11.8)	0.001	-3.2 (-10.0 to 3.5)	0.89	0.348
Full sick leave	8 312	82.9 (82.3 to 91.3)	67.6 (66.7 to 68.4)	-15.3 (-16.2 to -14.5)	0.001			
Tumours[3]								
Partial sick leave	109	90.6 (85.9 to 95.4)	75.0 (67.4 to 82.5)	-15.7 (-23.5 to -7.9)	0.001	5.3 (-2.6 to 13.2)	1.7	0.190
Full sick leave	3 021	87.2 (86.3 to 88.1)	66.2 (64.8 to 67.6)	-21.0 (-22.4 to -19.5)	0.001			
Other diagnostic categories[3]								
Partial sick leave	201	87.4 (83.4 to 91.4)	63.6 (57.8 to 69.4)	-23.8 (-30.0 to -17.6)	0.001	6.2 (-0.05 to 12.5)	3.8	0.052
Full sick leave	10 400	80.2 (79.6 to 80.7)	50.1 (49.3 to 50.9)	-30.0 (-30.9 to -29.2)	0.001			

Adjusted for [1] age, sex, income, diagnosis, occupational group, insurance district, [2] age, income, diagnosis, occupational group, insurance district, [3] age, sex, income, occupational group, insurance district.

Table 3. Comparison of work participation (%) between partial and full sick leave group (GLM repeated measures design) in the PS-matched subsample.

	Work participation (%)			
	n (pairs)	Difference in differences Mean (95% CI)	F-statistic	p
All[1]	1 660	9.8 (5.9 to 13.7)	60.8	0.0001
Males[2]	489	12.4 (6.9 to 17.9)	28.1	0.002
Females[2]	1 171	7.2 (3.1 to 11.4)	34.0	0.0001
16-34 years	209	8.5 (0.5 to 16.6)	9.5	0.002
35-44 years	422	6.7 (0.7 to 12.6)	9.8	0.002
45-54 years	708	11.1 (6.3 to 15.9)	30.3	0.0001
55-65 years	321	12.9 (6.5 to 19.4)	12.2	0.001
Musculoskeletal diseases[3]	598	6.3 (1.5 to 11.2)	6.0	0.015
Mental disorders[3]	621	18.9 (14.2 to 23.5)	59.9	0.0001
Traumas[3]	131	0.3 (-9.3 to 9.9)	0.0	0.99
Tumours[3]	109	12.5 (1.8 to 23.2)	5.9	0.016
Other diagnostic categories[3]	201	11.1 (3.3 to 18.9)	7.6	0.006

Adjusted for
[1] age, sex, income, diagnosis, occupational group, insurance district,
[2] age, income, diagnosis, occupational group, insurance district,
[3] age, sex, income, occupational group, insurance district.

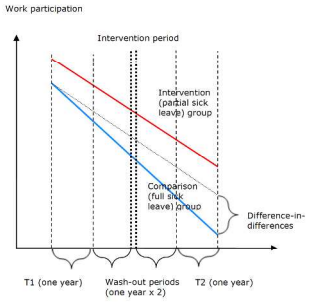

Figure. Schematic presentation of the study design and difference-in-differences method. (T1 corresponds to pre-intervention period, T2 corresponds to post-intervention period).
338x190mm (300 x 300 DPI)

APPENDIX

Table 1. Characteristics of participants in partial and full sick leave group at the time of intervention (n, %). Propensity score-matched subsample (n=1660 pairs).

	Partial sick leave	Full sick leave
Female (%)	1 171 (70.5)	1 171 (70.5)
Age (years)		
Mean (95% CI)	46.1 (45.7 to 46.5)	46.0 (45.5 to 46.5)
Annual gross income (€)		
Mean (95% CI)	27 302 (26 754 to 27 850)	26 274 (25 637 to 26 910)
Diagnostic categories (%)		
Mental disorders	621 (37.4)	621 (37.4)
Musculoskeletal diseases	598 (36.0)	598 (36.0)
Tumours	109 (6.6)	109 (6.6)
Traumas	131 (7.9)	131 (7.9)
Other	201 (12.1)	201 (12.1)
Occupational branch (%)		
Technical and scientific work etc.	178 (10.7)	223 (13.4)
Social and healthcare services	492 (29.6)	402 (24.2)
Administration and office work	281 (16.9)	230 (13.9)
Commercial work	112 (6.7)	137 (8.3)
Agriculture and forestry	490 (3.0)	71 (4.3)
Transport	58 (3.5)	79 (4.8)
Industrial and construction work, mining	300 (18.3)	301 (18.1)
Service work	190 (11.4)	217 (13.1)
Insurance district (%)		
Northern	206 (12.4)	234 (14.1)
Western	253 (15.2)	221 (13.3)
Eastern	188 (11.3)	258 (15.5)
South-Western	392 (23.6)	347 (20.9)
Southern	621 (37.4)	600 (36.1)
Number of unemployment days, T1		
Mean (95% CI)	2.8 (1.8 to 3.8)	3.6 (2.5 to 4.6)
Number of full sick leave days, T1		
Mean (95% CI)	17.0 (15.3 to 18.7)	17.9 (16.0 to 19.9)
Number of rehabilitation days, T1		
Mean (95% CI)	1.7 (0.9 to 2.5)	1.6 (0.8 to 2.4)
Work participation, T1		
Mean (95% CI)	94.1 (93.6 to 94.7)	93.7 (93.0 to 94.3)