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## Reliability of sickness certificates in detecting potential sick leave reduction by modifying working conditions: a clinical epidemiology study

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### Abstract

**Background:** Medical sickness certificates are generally the main source for information when scrutinizing the need for aimed intervention strategies to avoid or reduce the individual and community side effects of sick leave. This study explored the value of medical sickness certificates related to daily work in Norwegian National Insurance Offices to identify sick-listed persons, where modified working conditions might reduce the ongoing sick leave.

**Methods:** The potential for reducing the ongoing sick leave by modifying working conditions was individually assessed on routine sickness certificates in 999 consecutive sick leave episodes by four Norwegian National Insurance collaborators, two with and two without formal medical competence. The study took place in Northern Norway in 1997 and 1998. Agreement analysed with differences against mean, kappa, and proportional-agreement analysis within and between groups of assessors was used in the judgement. Agreements between the assessors and the self-assessment of sick-listed subjects were additionally analysed in 159 sick-leave episodes.

**Results:** Both sick-listed subjects and National Insurance collaborators anticipated a potential reduction in sick leave in 20–30% of cases, and in another 20% the potential was assessed as possible. The chance corrected agreements, however, were poor ( $k < 0.20$ ) within and between groups of National Insurance collaborators. The agreement between National Insurance collaborators and the sick-listed subjects was no better than chance. Neither extended medical information nor formal medical competence increased agreement in cases where modified working conditions might have reduced sick leave.

**Conclusion:** Information in medical sickness certificates proved ineffective in detecting cases where modified working conditions may reduce sick leave, and focusing on medical certificates may prevent identification of needed interventions. Strategies on how to communicate directly with sick-listed subjects would enable social authorities to exploit more of the sick leave reduction potential by modifying the working conditions than strategies on improving medical information.

## Background

The increasing rate of sick leave experienced in most Western European countries challenges insurance companies, employers, and public authorities to identify measures to reduce the associated burdens on individuals, workplaces, and finances. Sick-listed persons assume that modified working conditions can reduce sick leave [1,2], primary health care practitioners rank lack of light-duty availability as the most important barrier to improved return to work [3], and programmes for modifying working conditions are shown to facilitate return to work [4].

In Norway, the White Paper of Vocational Rehabilitation of 1991 focused on modifying working conditions to facilitate return to work when sick listed. Active sick leave has been offered from 1993 to promote early return to work and to encourage the use of many kinds of modifications to working conditions such as improved physical or psychosocial work factors and to provide more appropriate duties at work [5]. The Norwegian Social Insurance Scheme refunds sickness benefits when active sick leave is accepted. Early identification of sick-listed persons that might profit from many kinds of modified working conditions, including active sick leave, has become a major challenge to the Norwegian National Insurance Offices (NIOs). This identification process depends mainly on information found in sickness certificates from general practitioners (GP). In Norway a medical sickness certificate (Sickness Certificate 1, SC1) is required if the sick leave exceeds 3 days, and an extended medical certificate is required if the sick leave exceeds 8 weeks (Sickness Certificate 2, SC2) [6]. In addition to diagnosis, certified period, and extent of the sick leave, the majority of the SC1 contains information about the type of occupation and employee. Information on chronic diseases, previous sick leave episodes, prognosis, and comments is more scattered. The SC2 includes updated medical information on work ability, further diagnostic and treatment plans, and on prognosis.

This certifying process consumes considerable resources. A Norwegian study indicated that GPs spent 9% of their working hours on social security certification [7], and an audit study in Sweden found that 9% of all consultations included sick-listing considerations [8].

The majority of sick leave reduction strategies rely on the assumption that the information in Medical Certificates provides NIOs with sufficient information to identify sick-listed persons for relevant measures. However, despite the resources spent on sickness certificates, to our knowledge this assumption has not been tested according to daily practice. The objective of this study was, therefore, to explore the value of the information in the SC1 and in the more extensive SC2, to identify sick-listed persons where

the ongoing sick leave could probably be reduced by specific modifications to working conditions.

## Methods

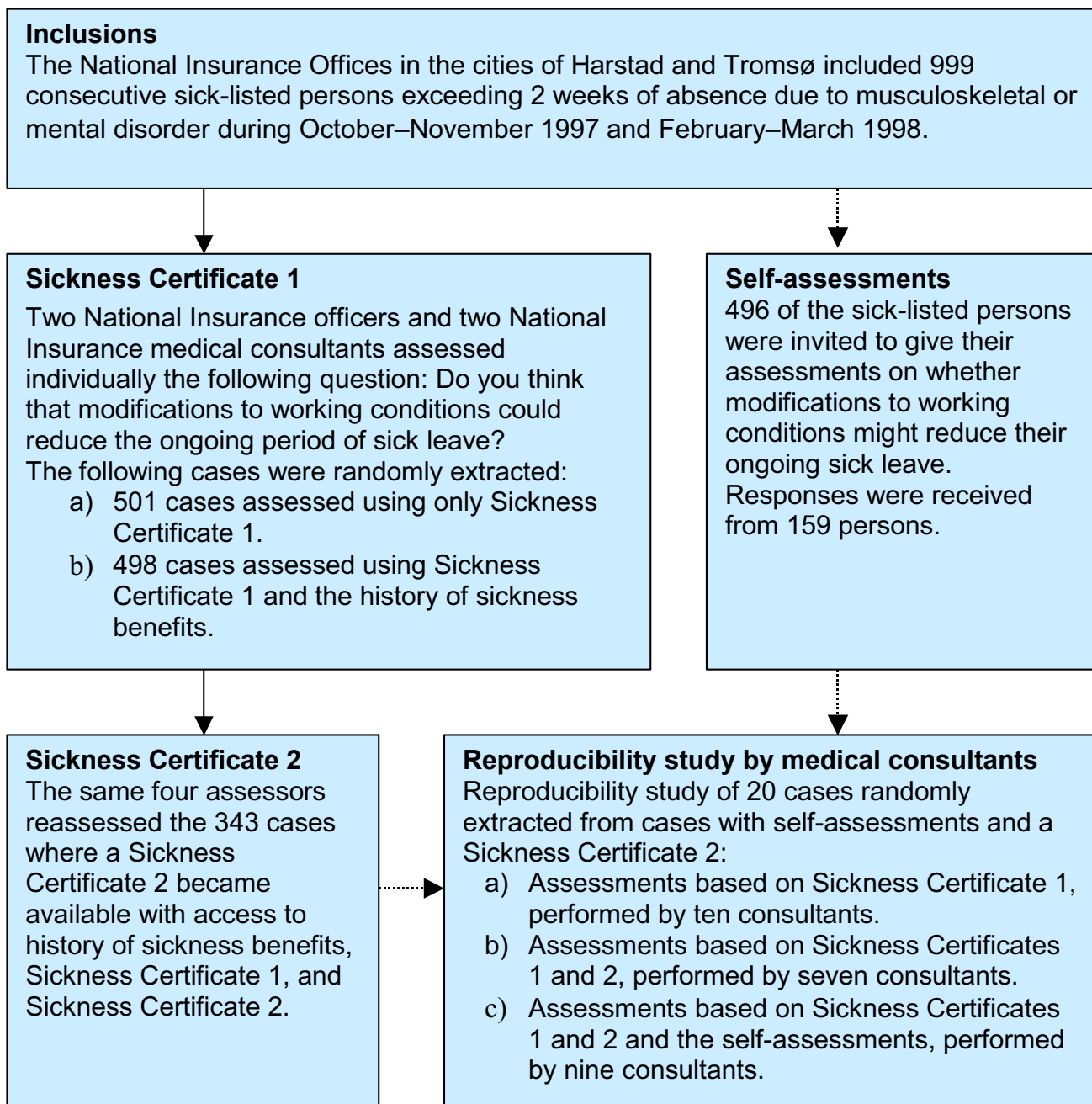
The study was designed to explore agreement on the following question: Do you think that modifications to working conditions could reduce the ongoing period of sick leave, either by shortening the total duration or by initiating part-time work? The question was assessed according to daily practice on different levels of medical information and with and without formal medical competence within the NIOs (Figure 1). The protocol specified that a *yes* presumed eligibility for and possible sick leave reduction by modifications to working conditions. The questionnaire gave eight alternatives for these possible modifications: (1) none, (2) adjustment of work environment, (3) adjustment of work duties, (4) increased autonomies, (5) psychosocial improvements, (6) increased appreciation, (7) vocational rehabilitation, and (8) unspecified others [2].

In October-November 1997 and February-March 1998 the NIOs in the cities of Harstad (23,000 inhabitants) and Tromsø (59,000 inhabitants) included a total of 999 consecutive sick-listed persons with sick-leave periods that exceeded 2 weeks. The mean age of the 392 sick-listed men was 41.5 years (SD 12.1 years), and 39.7 years (SD 11.4 years) for the 607 women. The minimum and maximum ages were 17 and 66 years, respectively, and median male and female ages were 42 and 39 years, respectively.

The diagnostic inclusion criteria were a musculoskeletal or mental disorder, L- and P-diagnoses according to the International Classification of Primary Health Care [9]. Musculoskeletal disorders were classified as the main reason for the ongoing sickness absence in 82.9% of the included persons. A SC2 subsequently became accessible in 343 of the included sick leave episodes.

Two National Insurance medical consultants and four National Insurance officers from three NIOs were recruited to perform the assessments. Both medical consultants assessed 983 of the included sick leave forms at 14 days of sick leave, and each of the officers assessed about half of the included sick leave forms. The pairs of officers were randomly drawn for each group of ten sick leave forms.

Half of the sick leave forms ( $n = 501$ ) selected randomly were assessed on the basis of available sickness certificates alone (Figure 1). The remaining half ( $n = 498$ ) were assessed with additional information registered from previous sick-leave episodes. The number of available sickness certificates for each sick-listed subject ranged from one (56.5%) to four (0.6%), with a mean of 1.5 at 14 days



**Figure 1**  
**Information levels for assessments.** Flow chart showing the different assessments of whether or not modified working conditions might reduce the ongoing sick-leave episode.

of sick leave. The 343 sick leave forms with SC2s were reassessed independently from the first rating, based on all available information.

The 2-week analyses correspond to the time when the National Insurance Service becomes responsible for sickness benefits, and analyses of SC2s correspond to medical information available for a formal conclusion of sickness benefits beyond 12 weeks.

A random selection of 496 of the included sick-listed subjects were invited to give their assessments when their sick leave passed 14 days. Completed questionnaires were returned by 161 (32.4%) of these subjects, and 159 had assessed whether work adjustments, in general, could reduce the ongoing period of sick leave. There were no significant differences between the 159 responders and the non-responders regarding sex, age, length of sick leave episodes during the previous 3 years, and the distributions of diagnoses and occupations [2].

To analyse the reproducibility of the NIO medical consultants, 20 randomly selected cases with self-assessments and SC2s were reassessed. Another 15 physicians working part time as NIO consultants were asked to complete the same questionnaire based on the information available after 2 weeks in these 20 cases, and ten of these consultants responded (Figure 1).

Six weeks later, in a conference on the topic, seven NIO medical consultants assessed the same 20 cases, now based on all routine information available including SC2s. On the same occasion, another nine consultants performed the same assessments but including the additional knowledge of the self-assessments of sick-listed subjects.

#### **Analyses and data management**

We considered agreement between and within NIO officers and medical consultants, and agreement between sick-listed subjects and NIO collaborators, to be appropriate estimates of the ability to identify the sick-listed subjects who might reduce their ongoing sick leave period by working under modified conditions [10]. In order to attend the variance, the possibility for reduction – either by shortening the length or by starting part-time work – was assessed on an 80-mm visual analogue scale (VAS), from *certainly no* (0 mm) to *certainly yes* (80 mm). Differences in assessments on the VAS between sick-listed subjects and NIO officers or medical consultants were analysed using a differences-against-mean (Bland-Altman) diagram [11].

Related to practical use, categorical agreement on whether modified working conditions could, might, or could not reduce the actual sick leave was analysed with kappa, observed agreement, and specific proportional agreement [12]. Categorisations of the VAS into *yes*, *uncertain*, and *no* were performed individually: each officer and consultant marked their interval for uncertain on six different VASs and gave their interpretation of ten example scales in these three categories. The mean individual upper limit of *no* varied from 34 to 38 mm, and the lower limit of *yes* varied from 43 to 50 mm after this procedure. The means of these limits, together with the assessments of three other

officers, were used to categorise the assessments of the sick-listed subjects.

All reproducibility assessments were performed according to these three categories. The information from questionnaires, sickness certificates, and histories of sickness benefits were registered in Epi-Info, which was used for ordinary descriptive and comparison statistics. Scatter plot and correlation analyses were performed using SPSS-10. Pearson's or Spearman's correlations were used to illustrate correlation if normality assumptions were satisfied or not. The summation of the  $3 \times 3$  tables and calculations of agreement with confidence intervals (CIs) of kappa [13] were performed in a Microsoft Excel model. Exact binomial 95% CIs were used for the other agreement measures.

#### **Approval**

The Regional Ethical Committee approved the protocol, and the Norwegian Data Inspectorate licensed the necessary register of sick-listed subjects.

#### **Results**

##### **Assessments of possible sick leave reduction**

The assessments of whether modified working conditions might reduce the ongoing sick leave showed a large range in the proportion of *yes* results within professions (Table 1), with the mean proportion being higher for NIO officers than for NIO medical consultants. The Pearson's correlation between mean assessments of NIO medical consultants and officers was low ( $r = 0.22$ ,  $p < 0.001$ ). Missing occupation information increased the proportion of *uncertain* estimates, whereas additional information from SC2s reduced the proportion of such estimates among officers ( $p = 0.02$ ), but not among consultants ( $p = 0.2$ ).

The assessments of the sick-listed subjects exhibited a tripe-clustered distribution that corresponded to the categorisation into *no* (50.9%), *uncertain* (19.5%), and *yes* (29.6%). The mean proportion of *yes* assessments in this group of sick-listed subjects was 28.1% (95% CI 21.3–35.8) for officers and 29.6% (95% CI 22.7–37.5) for consultants. Spearman's correlation was, however, low and insignificant between assessments of sick-listed subjects and mean assessments of groups of NIO assessors. The difference-against-mean analysis revealed that the mean assessments of both NIO officers and medical consultants failed to identify the majority of the cases where the sick-listed subjects predicted effects of modified working conditions (Figure 2).

##### **Inter- and intra-observer agreement**

The inter-observer agreements of whether modified working conditions might reduce the ongoing sick leave were

**Table 1: Assessments of potential sick leave reduction by modifications to working conditions.**

Assessment based on-	Number of sick leave forms	Officers answers of				Consultants answers of			
		Number of assessments <sup>a</sup>	Uncertain %	Yes % (95% CI)	Yes % Minimum Maximum	Number of assessments <sup>a</sup>	Uncertain %	Yes % (95% CI)	Yes % Minimum Maximum
Sickness Certificate 1 (SC1)	501	990	24.9	30.1 (26.1, 34.4)	23.9, 41.8	992	20.2	22.1 (18.6, 26.1)	8.5, 35.4
SC1 + additional history of sick-leave	498	991	24.4	30.5 (26.5, 34.8)	19.4, 43.7	989	21.1	20.6 (17.2, 24.5)	8.1, 39.8
Subgroup SC1 + occupation not notified	221	436	35.6	24.5 (18.9, 30.6)	13.8, 41.2	439	31.9	15.7 (11.2, 21.3)	6.0, 25.3
Subgroup SC1 + special notification from the practitioner	24	48	20.8	47.9 (27.4, 69.0)	23.1, 83.3	48	16.7	41.7 (22.1, 63.4)	25.0, 58.3
SC1 in Sickness Certificate 2 subgroup	343	679	25.5	32.7 (27.7, 37.9)	25.7, 39.4	684	19.2	25.4 (20.8, 30.3)	12.0, 38.8
Sickness Certificate 2	343	680	17.9	34.6 (29.6, 39.9)	26.2, 44.3	683	15.4	28.3 (23.6, 33.4)	19.8, 36.8

<sup>a</sup> Missing assessments produce inconsistencies between the number of sick-listed subjects and the number of assessments. Assessments by NIO officers and medical consultants of whether modified working conditions might reduce the ongoing sick leave based on different levels of information. Proportions of yes and uncertain results are presented as means.

low within and between the groups of NIO officers and medical consultants (Table 2). Inclusion of the SC2 increased the observed and chance-corrected agreement, but kappa was still less than 0.20 within and between groups of assessors.

The chance-corrected agreement, kappa, between the sick-listed subjects and NIO assessors was not different from zero, with one exception (Table 3). Within the group of seven consultants, kappa was less than zero. Inclusion of the SC2 reduced the observed and chance-corrected agreement with the sick-listed subjects.

Reproducibility tests within the two consultants showed that the intra-observer agreement was fair ( $k = 0.23$ ), and increased to moderate ( $k = 0.52$ ) with the inclusion of SC2 (Table 4). The inter-observer agreement between all consultants, however, never exceeded poor agreement, even with knowledge of the opinions of sick-listed subjects.

**Discussion**

This study explored the ability to identify sick-listed subjects for which work-related measures might reduce sick leave based on sickness certificate-mediated information from GPs, according to everyday work in Norwegian NIOs. Surprisingly, there was virtually no agreement beyond chance within or between groups of NIO officers and medical consultants about in which cases modified working conditions might contribute to reducing the ongoing sick-leave period. In addition, the chance-adjusted agreement between sick-listed subjects and officers or consultants regarding whether the sick-listed subjects could benefit from modified working conditions did

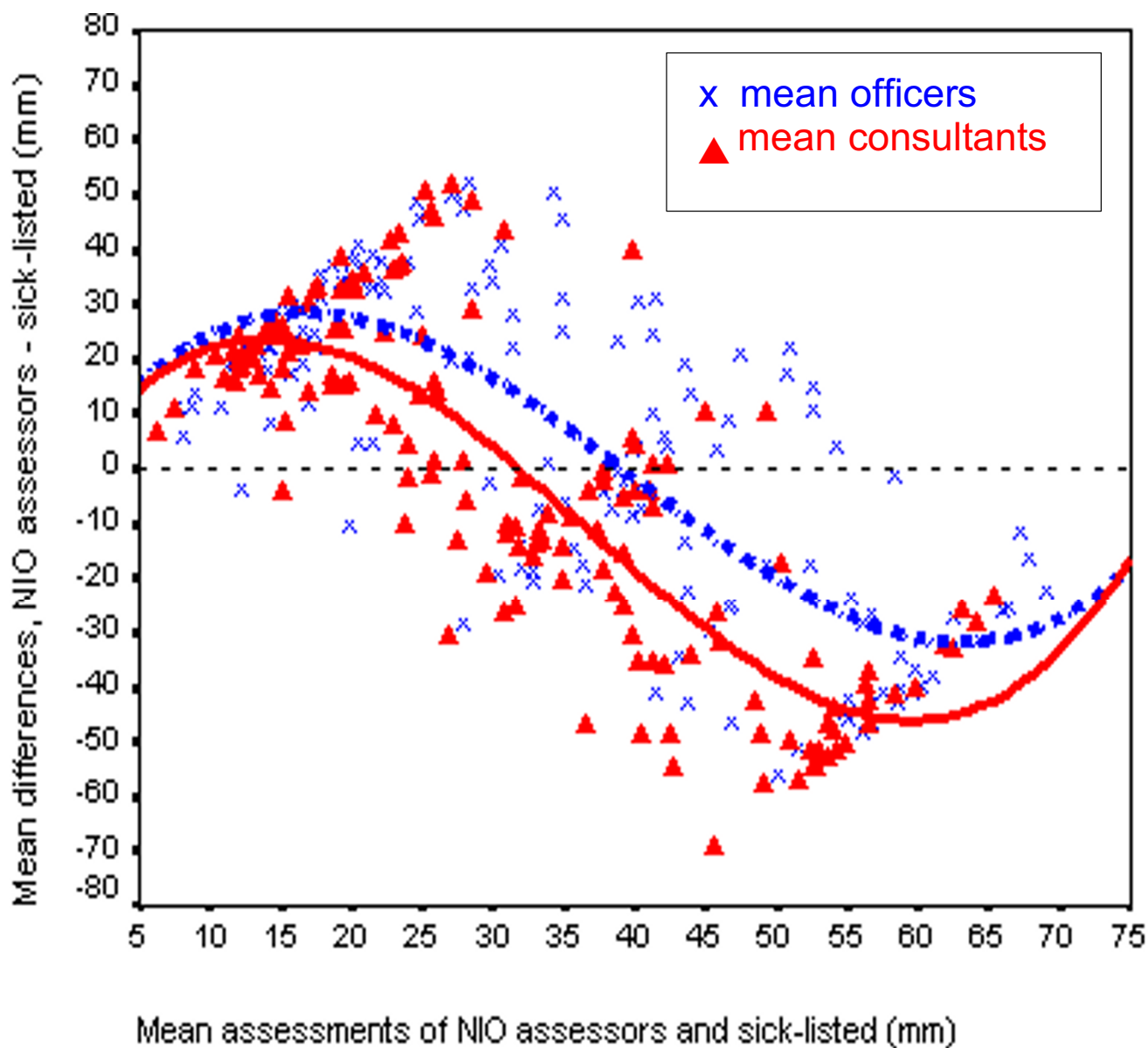
not differ significantly from zero. Neither additional medical and social information nor formal medical competence improved agreement within or between groups.

**Methods**

The representativity of the assessors is essential in the interpretation of the result. The selection of interested and experienced officers – rather than using randomly selected officers – might give an overestimation of the officers' capacity to identify candidates for modified working conditions. Additionally, in this open study, we would expect the NIO officers and consultants to perform at least as well as they do in their regular work.

The NIO medical consultants showed a wider range in their probability assessments than did the officers, and the bias index (Table 2) indicated a systematic different attitude to the potential effect of work adjustment. Nevertheless, we did not find any significant difference in agreement between the sick-listed subjects and each of the two medical consultants, or in agreement between groups of medical consultants and the sick-listed subjects. The scores of both medical consultants were within the range of those of the ten colleagues in the reproducibility part of the study.

The low response rate among the sick-listed subjects may have introduced a selection bias, but no significant differences were found in the distributions of sex, age, diagnoses between responders and non-responders. Any selection bias would probably favour a selection of those with an unambiguous opinion on whether or not they could benefit from modified working conditions. How-



**Figure 2**  
**Differences in assessed sick leave reduction potential by modifications to working conditions.** Bland-Altman plot of difference between mean assessments of probable sick leave reduction potential by National Insurance officers and National Insurance medical consultants, and the sick-listed subjects plotted against mean assessments of National Insurance collaborators and sick-listed subjects ( $n = 157$ ). The cubic regression fit lines indicate the mean differences.

ever, the agreement among NIO assessors in the responder group was no better than that in the non-responder group. We also did not find a better agreement between NIO assessors and sick-listed subjects in the subgroup of sick-listed subjects who assessed possible benefits with an unambiguous *yes* ( $>60$  mm) or *no* ( $<20$  mm) on the VAS. Taken together, these results indicate that

selection bias is unlikely to explain the low agreement between the sick-listed subjects and the NIO officers and medical consultants.

A different interpretation of the VAS might also be a potential hazard to the results. The processes of individual categorisation of *yes*, *uncertain*, and *no* by NIO officers and

**Table 2: Agreement on potential sick leave reduction by modifications to working conditions.**

Observer agreement	Number of sick leave forms	Pairs of assessments <sup>a</sup>	Bias index (BI)	Observed agreement (Po)	Kappa	Proportional agreement yes (Ppos)	Proportional agreement no (Pneg)
<b>Within officers</b>							
Sickness Certificate 1	999	985	0.05	0.40 (0.37, 0.43)	0.06 (0.02, 0.09)	0.37 (0.33, 0.41)	0.51 (0.47, 0.54)
Sickness Certificate 2	343	337	0.04	0.49 (0.44, 0.55)	0.19 (0.10, 0.27)	0.45 (0.38, 0.51)	0.63 (0.57, 0.68)
<b>Within consultants</b>							
Sickness Certificate 1	999	983	0.39	0.41 (0.38, 0.44)	0.05 (0.00, 0.10)	0.16 (0.13, 0.20)	0.54 (0.52, 0.57)
Sickness Certificate 2	343	340	0.32	0.49 (0.43, 0.54)	0.17 (0.08, 0.25)	0.42 (0.35, 0.49)	0.61 (0.56, 0.66)
<b>Between officers and consultants</b>							
Sickness Certificate 1 - historical sick leaves	501	2947	0.16	0.42 (0.40, 0.44)	0.08 (0.05, 0.11)	0.31 (0.29, 0.33)	0.54 (0.52, 0.56)
Sickness Certificate 1 + historical sick leaves	498	2953	0.16	0.42 (0.40, 0.43)	0.07 (0.04, 0.09)	0.29 (0.26, 0.31)	0.55 (0.53, 0.56)
Sickness Certificate 2	343	2031	0.10	0.48 (0.46, 0.51)	0.15 (0.12, 0.19)	0.43 (0.40, 0.45)	0.61 (0.59, 0.63)

<sup>a</sup> Missing assessments produce inconsistencies between the number of sick-listed subjects and the number of pairs of assessments. Observer agreement on whether work adjustments might reduce the ongoing sick leave assessed in the categories of yes, uncertain, and no, within and between National Insurance officers and consultants, regarding different levels of information. 95% confidence intervals (CIs) are given in brackets.

**Table 3: Agreement between sick-listed subjects and National Insurance assessors.**

Observed agreement between sick-listed and	Number of sick-listed	Pairs of assessments <sup>a</sup>	Bias index (BI)	Observed agreement (Po)	Kappa	Proportional agreement yes (Ppos)	Proportional agreement no (Pneg)
<b>-Officers</b>							
Sickness Certificate 1	159	317	0.09	0.38 (0.33, 0.43)	0.05 (-0.03, 0.13)	0.34 (0.27, 0.41)	0.49 (0.43, 0.55)
Sickness Certificate 2	60	120	0.08	0.33 (0.24, 0.42)	-0.05 (-0.18, 0.08)	0.23 (0.15, 0.33)	0.44 (0.33, 0.54)
<b>-Medical consultants</b>							
Sickness Certificate 1	159	316	0.01	0.39 (0.33, 0.44)	-0.01 (-0.10, 0.08)	0.28 (0.21, 0.35)	0.52 (0.47, 0.58)
Sickness Certificate 2	60	119	0.05	0.36 (0.28, 0.45)	-0.05 (-0.19, 0.09)	0.23 (0.14, 0.34)	0.48 (0.39, 0.57)
<b>-Extended group of medical consultants</b>							
Ten consultants							
Sickness Certificate 1	20	200	0.05	0.31 (0.24, 0.37)	-0.12 (-0.22, 0.02)	0.30 (0.23, 0.38)	0.39 (0.32, 0.46)
Seven consultants							
Sickness Certificate 2	20	137	0.17	0.31 (0.23, 0.39)	-0.18 (-0.31, -0.04)	0.35 (0.27, 0.44)	0.32 (0.24, 0.41)

<sup>a</sup> Missing assessments produce inconsistencies between the number of sick-listed subjects and the number of pairs of assessments. Observer agreement on whether work adjustments might reduce the ongoing sick leave assessed in the categories of yes, uncertain, and no, between sick-listed subjects and National Insurance officers and consultants. 95% CIs are given in brackets.

medical consultants secure their interpretation of the scale. The triple-clustered distribution of the assessments of sick-listed subjects reduces the possible influence of variation in interpretation of the scale. The subgroup analysis of those with unambiguous opinions also suggests that a different interpretation of the VAS did not influence our results.

The question asked might introduce a hierarchy, first eligibility for modified working condition, and secondly potential sick leave reduction if this was effectuated. The instructions to the assessors focused on reduced sick leave, and ambiguity of the question are probably not important to the result.

**Table 4: Reproducibility of assessed sick leave reduction.**

	Number of sick leave forms	Pairs of assessments <sup>a</sup>	Bias Index (BI)	Observed agreement (Po)	Kappa	Proportional agreement yes (Ppos)	Proportional agreement no (Pneg)
<b>Intra-observer agreement</b>							
Sickness Certificate 1	20	40	0.28	0.53 (0.36, 0.68)	0.23 (-0.03, 0.48)	0.29 (0.11, 0.52)	0.71 (0.56, 0.84)
Sickness Certificate 2	20	40	0.05	0.75 (0.59, 0.87)	0.52 (0.26, 0.78)	0.77 (0.56, 0.91)	0.82 (0.67, 0.91)
<b>Inter-observer agreement between</b>							
Ten consultants							
Sickness Certificate 1	20	860	0.08	0.43 (0.40, 0.47)	0.12 (0.07, 0.17)	0.48 (0.44, 0.52)	0.46 (0.43, 0.50)
Seven consultants							
Sickness Certificate 2	20	402	0.15	0.48 (0.43, 0.53)	0.07 (-0.02, 0.16)	0.59 (0.55, 0.64)	0.39 (0.33, 0.45)
Nine consultants							
Sickness Certificate 2 and sick-listeds' self-assessment	20	491	0.06	0.54 (0.50, 0.59)	0.20 (0.12, 0.28)	0.60 (0.56, 0.65)	0.55 (0.50, 0.60)

<sup>a</sup> Missing assessments produce inconsistencies between the number of sick-listed subjects and the number of pairs of assessments. Reproducibility of the assessments of National Insurance consultants on whether work adjustments might reduce the ongoing sick leave in the categories of yes, uncertain, and no, presented as intra- and inter-observer agreement for different levels of information. 95% CIs are given in brackets.

**Identifying sick-listed subjects who could profit from modified working conditions**

Sick-listed subjects, officers, and consultants expressed a firm belief that work adjustments would reduce sick leave, in line with results from other studies [1,14-16]. The poor agreement among and between NIO officers and medical consultants demonstrates that medical certificates include little information on factors important for predicting a potential sick-leave reduction by modified working conditions. The fact that agreement was no higher among medical consultants, with their medical competence, supports the impression that medical information is of little value to this topic. The effects of extended medical information on intra- and inter-observer agreement, however, indicate that there are some shared ideas concerning indicators that favour modified working conditions. The relevance of these ideas is questioned by the decrease in agreement with the sick-listed subjects when extended medical information was available. The time span between self-assessments and assessments based on SC2s barely influenced the result. If an effect had been found, waiting for extended medical information might obstruct the possible effect of modified working conditions more than it provides relevant information related to modifying working conditions. The modest relevance of medical information might explain the slow implementation of active sick leave [5], and why Ringdal et al could not demonstrate any effect on health insurance utilisation by a systematic evaluation of SC2s [17].

**Factors associated with sick leave**

The results from the present study indicate that information about symptoms, disorders, diagnosis, treatment, and the course of the illness, together with information on sex, age, and occupation have only marginal impact on the sick leave-reducing potential of modifying the working conditions, according to the sick-listed subjects themselves. Sick leave might be seen as a product of a reduced work ability depending on a combination of social and medical conditions and the work demands, where sickness certificates primarily legitimate disease as the cause of incapacity to work. Practitioners are traditionally focused on treating disease, and their insight into the facets of individual work demands and abilities may be no better than that of laypeople.

When initial sickness certification is shown to be predominantly patient-controlled, this can be interpreted as an acceptance of the patient as the expert [8,18] in weighing individual work capacity against work demand. These considerations will be influenced by several factors, since possibilities for replacement [14], attitudes towards pain [19], and psychosocial work environment [16,20] might explain why improving work conditions is important in a successful rehabilitation to work [21]. In this context information of sickness will be a necessary, but not a sufficient explanation of sick leave episodes, and such information cannot replace asking the sick-listed subjects whether modified working conditions might be appropriate in their case.



### **Might medical certificates obstruct the determination of useful modifications to working conditions?**

The absence of a common understanding of which type of information in medical certificates can help predict a potential effect of modified working conditions suggests that the opinions of sick-listed subjects are the most accurate. The differences against mean analyses and the low agreement between medical consultants that have knowledge about the self-assessments of sick-listed subjects indicate that judgements by medical expertise may obstruct possible modified working conditions. This view is supported by the findings of Reiso et al. [22], who demonstrated that among 266 newly sick-listed patients, GPs assessed work ability as much or very much reduced in 23 out of 29 patients who assessed their own work ability as not much or hardly reduced at all.

If a positive attitude to modified working conditions among sick-listed subjects is a prerequisite for success, efforts to select early interventions based on medical certificates is primarily a waste of resources. Further, it disqualifies two-thirds of the sick-listed subjects that potentially may profit from such intervention.

Considering the amount of attention devoted to the potential of sick-leave-reduction measures in Western Europe, there is a notable lack of studies focusing on how to identify the individual sick-listed persons who might profit from modified working conditions. Our findings question any intervention programme guided by medical certificates that does not also consider the opinions of sick-listed persons on working conditions, possibilities, and capacity. Our results support a focus shift from medical certification to dialogue between employee and employer in order to reap the benefits from modified working conditions, and studies with this focus should be carried out.

### **Conclusions**

According to ordinary practice the information within medical sickness certificates proved insufficient for detecting potential sick leave reduction by modifications to working conditions. Neither extended medical information nor formal medical competence increased the ability to identify potential effects of modified working conditions. Furthermore, the majority of sick-listed persons expecting a reduced sick leave following modifications to their working conditions would be missed when the selections were based on medical sickness certificates alone. Therefore, strategies for direct communication with sick-listed persons would most probably improve the ability of social authorities to reduce sick leave by modifying working conditions more than strategies for improving medical information.

### **Competing interests**

The authors N.F. and B.S.Ø are both part-time employed as National Insurance medical consultants.

### **Authors' contributions**

N.F. was in charge of designing and running the study, and performed most of the analyses and the writing of this manuscript. R.J. actively supervised all parts of the study, and B.S.Ø. contributed to planning and writing, and participated as an assessor in the study. All authors read and approved the final version of the manuscript.

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