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Validity and reliability of self-reported retrospectively collected data on sick leave related to musculoskeletal diseases

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Objectives The aim was to study the reliability and validity of retrospective data, collected by self-report, on sick leave related to musculoskeletal diseases.

Methods The study groups consisted of 66 and 306 subjects, for the reliability and validity studies, respectively. They were all part of a wider study of risk factors for musculoskeletal disorders, the REBUS study, conducted in Stockholm in 1993. Reliability was tested using a test-retest design regarding self-reported sick leave related to musculoskeletal diseases in 1970—1993. The validity study comprised the period 1990—1994. Self-reported and registered sick-leave data related to musculoskeletal diseases were collected and analyzed regarding concordance. Data about current musculoskeletal disorders and different work-related conditions were collected and analyzed regarding possible effect- and exposure-dependent misclassification.

Results The test-retest reliability study showed the percentage of agreement to be between 0.88 and 0.97, and the kappa values were between 0.73 and 0.93. The validity study of the concordance between the self-reported and registered data showed high agreement and specificity, but the sensitivity was sometimes lower. All the kappa values exceeded 0.50. No effect- or exposure-dependent misclassification was found.

Conclusions The validity of retrospectively collected self-reported sick-leave data was sufficient for use as a measure of musculoskeletal morbidity in the analyses of associations with work-related conditions. Because of the relatively low sensitivity, such data will underestimate the prevalence of sick leave and should not be used for surveys of morbidity.

Key terms agreement percentage, Cohen's kappa, negative prediction value, positive prediction value, reliability, sensitivity, specificity, validity.

Sickness absence is often used as a measure of morbidity (1, 2), although both work- and nonwork-related factors, besides sickness, have been reported to influence the magnitude of sick leave (3). Absence from work can be considered to be a measure of the seriousness of symptoms (4). Sick leave influences the entire life situation of a person, including economy, and is also of great importance to society.

Sick leave lasting more than 7 consecutive days, in Sweden, has to be certified by a physician, and a medical diagnosis has to be established. In Sweden, sick-leave

occasions are registered at the regional social insurance offices. Because of patient integrity, ethics, and the difficulties encountered with old data systems, it is seldom possible to obtain appropriate data for epidemiologic studies from these offices. Accordingly, particularly when information is needed for several years retrospectively, studies often have to rely on self-reported data.

The validity of self-reported sick-leave data has been studied very little. One study compared self-reported sick leave related to back pain during the preceding 12 months with registered sick-leave data among male coal-mine

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workers (5). The sensitivity was 82% and the specificity 84%. Another study compared self-administered questionnaire sick-leave data with sickness-absence records over a period of 6 months among male workers at different production sites in an animal feed factory (6). For sick leave related to back pain, a sensitivity of 88% and a specificity of 97% were found.

More information is required about the reliability and validity of self-reported sick-leave data. Studies should include women and persons from various parts of the labor market. If possible, information about time further back than 1 year should be studied. The aim of the current methodological study was to evaluate the test-retest reliability and validity of self-reported retrospective sick-leave data versus registered sick-leave data for subjects in different occupations. The specific aim was to evaluate the accuracy of self-reported sick-leave data as outcome variables for studies of associations between musculoskeletal morbidity and work-related exposure.

Methods and procedures

General outline of the REBUS studies

A population-based study, REBUS-69 (Rehabiliterings-Behovs-Undersökningen i Stockholms län) undertaken in Stockholm in 1969 (7), was the basis of a follow-up, undertaken in Stockholm in 1993—1994, REBUS-93 (8).

REBUS-69 comprised 2500 persons, then between 18 and 65 years of age. The aim of REBUS-69 was to investigate rehabilitation needs, while the aim of REBUS-93 was to investigate associations between work-related and nonwork-related conditions and musculoskeletal morbidity occurring from 1969 on (9). Only subjects presumed to be occupationally active in 1993—1994 (ie, under the age of 59 years, living in Sweden, and possible to contact) were invited to participate (N=783). People with serious disabilities or illnesses and diagnosed musculoskeletal disorders in 1969 were excluded. Sixty-two percent (484 persons) of the invited persons participated in REBUS-93, which took place from May 1993 to September 1994. The mean age was 48.1 years for the women and 48.5 years for the men with a range of 41—59 years. The study protocol included questionnaires concerning present and past musculoskeletal disorders and conditions at work and supplementary interviews about musculoskeletal disorders and psychosocial conditions.

The different parts of the study are presented in figure 1.

Current study

Reliability. To study the reliability of self-reported sick leave, an investigation of reproducibility (test-retest) was conducted. All participants in the REBUS-93 study had been mailed a questionnaire containing questions about sick leave related to musculoskeletal disorders in the neck, shoulders, hands or wrists, and lower back during

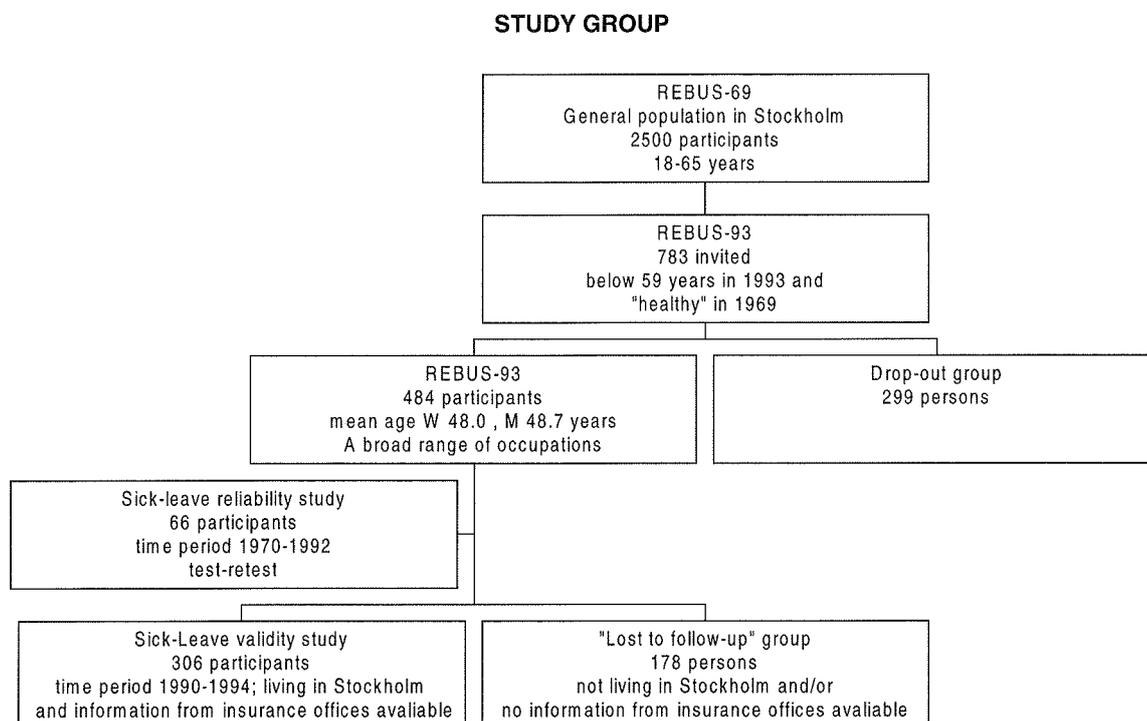


Figure 1. Outline of the REBUS studies with special attention to a methodological study of self-reported, retrospectively collected data on sick leave related to musculoskeletal diseases.

1970—1992. They were asked to fill it out before the investigation day. On the investigation day, 66 persons filled out a new questionnaire containing the same questions. These subjects were selected if time at the end of the day allowed for additional investigations. In order to study whether the reliability was influenced by the number of days between the test and retest, the subjects were subdivided into 2 groups, one with ≥ 7 days between the test and retest and the other with < 7 days in between. The reproducibility in the 2 groups was compared regarding sick-leave data.

To study whether the reliability was unchanged from the first part of the follow-up period (1970—1981) to the latter part (1982—1994), the data were also analyzed by these 2 time periods. Because of considerable co-morbidity between anatomical regions in the perceived localization of musculoskeletal disorders (10, 11) (eg, between the neck-shoulder and hand-wrist regions and between the back and neck), the hand-wrist, neck-shoulder, and lower back regions were pooled into 1 group of musculoskeletal diseases. Another reason for pooling the data was to make the analyses more effective regarding the number of persons on sick leave.

Validity. For a study of the validity, information about registered sick leave was requested from the regional social insurance offices in Stockholm for the 484 subjects in the REBUS-93 study. Since only information from 1990 on was available, the time period for the validity study was 1990—1994. For 160 women and 146 men, applicable information was available. The mean age was 48.0 years for the women and 48.7 years for the men. The group represents a broad range of occupations, and all the participants were living in the Stockholm region. The remaining 178 subjects, plus 2 subjects for whom data in the REBUS-93 material were not adequate, formed the "lost-to-follow-up" group. There were 3 reasons for lack of data. First, no register data on sick leave were available from the insurance offices ($N=158$), mainly because the subjects were not living in Stockholm any longer, second, register data about sick leave were available from the insurance offices, but the diagnosis was missing ($N=20$), and, third, self-reported sick-leave data were available, but the year of this sick leave was missing ($N=2$). This lost-to-follow-up group was compared with the study group in respect of gender, socioeconomic group, current musculoskeletal disorders, and self-reported sick leave related to musculoskeletal diseases.

Registered sick leave. Data about registered sick leave during the past 4 years were available from the regional social insurance offices in Stockholm. These data were used as "true" values (ie, as the standard for the validation). The information consisted of the dates, duration, and diagnosis for all sick leave during the time period.

The definition of registered musculoskeletal sick leave was 1 event of sick leave exceeding 7 consecutive days during any of the past 4 years in relation to a musculoskeletal diagnosis. Sick leave related to diseases in the lower extremities (foot, knee, leg, hip) was excluded from the study.

Self-reported sick-leave data. Data about self-reported musculoskeletal sick leave during any time between 1990 and 1994 were supplied from the questionnaire or from the interview conducted by a physiotherapist. The reports should have covered ≥ 1 of the body regions hand-wrist, neck-shoulder, and lower back. The definition of self-reported sick leave was ≥ 1 events of sick leave exceeding 7 consecutive days during any of the past 4 years in relation to a musculoskeletal diagnosis.

The data were analyzed using the following 6 levels of concordance between self-reported and registered data: (i) for both self-reported and registered sick leave, the subject should have been on sick leave exceeding 7 consecutive days because of a musculoskeletal diagnosis; (ii) for both self-reported and registered sick leave, the subject should have been on sick leave because of a musculoskeletal diagnosis, but concordance concerning the number of days on sick leave was not required; (iii) the subject should have reported sick leave because of a musculoskeletal diagnosis, but for registered sick leave any diagnosis was accepted and concordance concerning sick-leave days was not required (additional analyses were carried out with stricter requirements for diagnosis concerning both self-reported but registered data concordance concerning the number of days on sick leave was not required); (iv) the subject should have reported sick leave because of neck-shoulder sickness and also have registered information about sick leave with a neck-shoulder diagnosis; and (v) the subject should have reported sick leave because of (low) back sickness and also have registered information about sick leave related to back diagnosis.

Data about current musculoskeletal disorders and some work-related physical and psychosocial exposures were used to analyze the existence of effect- or exposure-dependent misclassification. As a measure of current musculoskeletal disorders, reports of disorders in one of more of the following body parts were used: neck, shoulders, elbows, hand-wrists, thoracic region, and low back.

Questionnaire and interview. A questionnaire was used for collecting data retrospectively about sick leave from 1970 on. The participants were asked about sick leave of > 7 consecutive days in relation to various musculoskeletal diseases. They were also asked to state the year of the sick leave. For the 12 months preceding the investigation, data about sick leave were collected by

interview. The body regions in question, for both the questionnaire and the interview, were the neck, shoulders, arms, hand-wrist, thoracic regions (interview only), and lower back.

The Nordic questionnaire (Kuorinka et al, 1987) was used to collect data about musculoskeletal symptoms over the preceding 7 days (current disorders). This information was used to analyze the existence of effect-dependent misclassification (ie, the validity of self-reported sick-leave data in groups with or without current musculoskeletal disorders).

Data about work-related physical loads and socioeconomic group were collected by means of another questionnaire and used to analyze the existence of exposure-dependent misclassification (ie, the validity of self-reported sick-leave data in groups exposed to different conditions at work). Three items from the physical workload questionnaire [ie, estimated general physical exertion (the 6—20 Borg scale for rating perceived exertion) (12), carrying loads at work, and repetitive hand and finger movements] were used in the validity study. Two items from the psychosocial interview, time pressure and social support from the closest superior, were used. The study group was dichotomized by the median value for each chosen physical and psychosocial work-load variable, and the high- and low-exposure groups were

compared regarding the validity of self-reported sick-leave data versus registered sick-leave data.

Data analyses

Reliability. Agreement between the 2 questionnaires was evaluated by calculating the percentage of agreement and Cohen's kappa (13). The kappa value can be regarded as a measure of agreement beyond the influence of chance. Differences between the subgroups (≥ 7 days' and < 7 days' time lag between filling in the questionnaires) and sick-leave periods (1970—1981 and 1982—1994) concerning the percentage of agreement were analyzed using the difference in the proportions with approximate 95% confidence intervals (95% CI) (14).

Validity. The validity of the self-reported sick-leave data was analyzed using the register data as criterion. The measures used were sensitivity, specificity, percentage of agreement, Cohen's kappa (with 95% CI), positive predictive value, and negative predictive value. The influence of current disorders and exposures (physical and psychosocial) on these values was also calculated using the difference in proportions with 95% CI (14). The method "difference in proportions" was also used when the possible differences between the study group and the lost-to-follow-up group were analyzed.

Table 1. Test-retest reliability of self-reported sick leave of > 7 days, for neck, shoulder, hand-wrist or low-back sickness in 1970—1992 among 66 persons (34 men and 32 women).

Gender	Questionnaire 1 (%)	Questionnaire 2 (%)	Agreement between questionnaire 1 and questionnaire 2 (%)	Kappa value
Men	29	26	97	0.93
Women	34	41	88	0.73

Results

Reliability

The concordance between the test and retest was high (table 1).

When the subjects were divided into 2 subgroups with regard to the time lag between answering the 2 questionnaires [for ≥ 7 days (N=28) average time lag of 15 days;

Table 2. Validity of the retrospective self-reported sick-leave data related to musculoskeletal diseases of the back and upper limbs. The prevalence of self-reported and registered sick leave is given for 304 persons (144 men, 160 women). The data were analyzed in relation to different levels of concordance as follows: A = both the number of sick-leave days and diagnosis (musculoskeletal sickness), B = diagnosis only, C = sick leave or not (any diagnosis). In the separate analysis of neck-shoulder disorders (D) and (low) back problems (E), concordance concerning diagnosis but not number of days of sick leave was required. (95% CI = 95% confidence interval)

	Register data (%)		Self-reported data (%)		Agreement (%)		Sensitivity		Specificity		Positive predictive value		Negative predictive value		Kappa			
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	95% CI ^a	Women	95% CI ^b
	9	14	13	15	93	89	0.85	0.64	0.94	0.93	0.65	0.58	0.98	0.94	0.65	0.45—0.85	0.54	0.36—0.73
B	10	16	13	16	94	92	0.86	0.76	0.95	0.95	0.79	0.63	0.98	0.96	0.69	0.51—0.88	0.70	0.54—0.85
C	12	18	13	16	96	94	0.88	0.79	0.97	0.98	0.79	0.88	0.98	0.96	0.81	0.66—0.96	0.80	0.68—0.93
D	3	9	6	9	97	93	1.0	0.64	0.97	0.96	0.50	0.60	1.0	0.97	0.50	0.34—0.97	0.58	0.36—0.81
E	4	7	8	9	95	94	0.83	0.73	0.96	0.96	0.45	0.57	0.99	0.98	0.56	0.28—0.85	0.61	0.38—0.84

^a For the men.

^b For the women.

for <7 days (N=38) average time lag of 3 days], the kappa values and the percentage of agreement obtained were 0.89 and 89% and 0.88 and 95%, respectively (for the men and women together). The reliability of the data from the first part of the time period was similar to that of the latter (ie, the kappa from 1970—1981 being 0.77 and the percentage of agreement being 94); sick-leave data from 1982—1992 had a kappa value of 0.91 and a percentage of agreement of 97 (men and women together). The difference in the percentage of agreement was not statistically significant.

Validity

The validity part of the study showed a high percentage of agreement (89—97%) and moderately high kappa values (0.50—0.81) (table 2). Both the sensitivity and the positive predictive values were moderate, whereas the specificity and negative predictive values were high. When the demand for concordance concerning days of sick leave and diagnosis were abandoned (2nd and 3rd levels), the positive predictive values and kappa values improved considerably. In the analysis for the body regions neck-shoulder and (low) back separately, almost all the values improved when compared with the 1st level of concordance, except for the kappa and positive predictive value of the men (table 2).

Exposure-dependent misclassification

Only small differences in validity were found between the groups with high and low physical or psychosocial exposure. Concerning time pressure, the confidence interval did not cover 0 among the men, but for the other calculations, using differences in proportions, all the confidence intervals covered 0, indicating no statistically significant differences.

Effect-dependent misclassification

Between the groups with no or current musculoskeletal disorders, no differences indicating the existence of dependent misclassification was found.

Lost-to-follow-up group

The men in the lost-to-follow-up group were slightly older than those in the study group (48.1—46.7 years). No differences between the lost-to-follow-up group and the study group were found concerning socioeconomic group, self-estimated amount of sick leave, or current musculoskeletal disorders.

Discussion

The results of this study indicate that the test-retest reliability of self-reported retrospective sick-leave data is

high. Regarding data from more than 10 years back in time, the reliability is slightly poorer, partly depending on the low number of sick-leave events reported. This result may be due to a lower report rate when the recall period increases (15).

No effect- or exposure-dependent misclassifications were found in the validity study. Biased associations, caused by an insufficient validity of self-reported sick-leave data, when this type of data is used as the outcome in studies about associations between different work-related conditions and musculoskeletal diseases, are therefore less likely. Moreover, the high specificity indicates that the underestimation of risks, arising from nondifferential misclassification, will only be minor if the prevalence of disease is not too low. This finding is in agreement with that of Zwering (16), who found that self-reported occupational injury data, with a recall period of 1 year, could be used in studies of associations between occupational injuries and a variety of risk factors. The work conditions selected for the investigation of exposure-dependent misclassification have been identified in many studies as risk factors for musculoskeletal disorders (17, 18). However, the data used to reveal exposure-dependent misclassification are crude since they are based on self-reports, which only allow dichotomization of the data, and they only reflect limited parts of work-life. Thus conclusions on exposure-dependence need further support in other studies.

As the sensitivity is only moderate, self-reported sick-leave data is not recommended, based on the results obtained from this study, for surveys of morbidity due to musculoskeletal diseases up to 4 retrospective years.

Results similar to those of our study concerning specificity have been obtained by others when studying the validity of self-reported sick-leave data versus registered sick leave for low-back disorders. The sensitivity was higher in these studies, however, probably because of shorter observation periods (6—12 months) (5, 6).

Prevalence of sick leave related to musculoskeletal disorders

A comparison with other studies is hazardous, as the time period (4 years) has not been used by other authors and the restriction of sick leave to occasions with >7 days off work also limits the possibilities of comparing current results with earlier studies. Insurance policy also varies between countries, probably exerting a skew effect on the magnitude of sick leave. The prevalence of sick leave related to back pain during 6 months (any duration of sick leave) was reported to be 8.2% (6). Biering-Sørensen (2) found that 6.7% were absent from work because of low-back pain during 1 year. Among state employees in 2 large cities in Sweden, 10.7% reported sick leave, related to low-back, neck or shoulder diseases, during 1 year in answer to a questionnaire (19).

In the current study 6% of the subjects were on sick leave because of back diseases, and 11.6% because of musculoskeletal diseases, on at least 1 occasion during a period of 4 years according to register data.

The rate of overall sick leave in Sweden has decreased substantially since 1991, and this decrease may explain the relatively low prevalence in this study. When comparing the rate of total sick leave in this study with other compilations (from central insurance offices and the Swedish Employers' Confederation), the current study group had about 2% less sick leave than the average Swedish population.

Self-reported data

The main problem encountered in collecting data retrospectively is the issue of forgetfulness (20). Some subjects remembered their sick leave but did not remember the number of days. The time limit (>7 days) was chosen to reduce the risk of recall error. It was presumed that sick-leave periods exceeding 7 days would be more easily recalled since they have to be certified by a physician. For shorter occasions, the person herself or himself reports the reason for sick leave. With respect to the accuracy of the physician's diagnosis, there is a risk that only 1 of several disorders reported by the patient is recorded by the physician (21). When asked, years later, about sick leave related to musculoskeletal sickness, the person may not be aware of, or remember, the diagnosis selected by the physician.

Register data

In this study, registered sick leave was used as a proxy for "true" sick leave in the assessment of the validity of self-reported data. These register data may however have in-built errors which must be analyzed. Such potential errors may occur at 2 levels, namely, accuracy of diagnosis and underreporting of sick leave to the social insurance offices. Many physicians, with different specialities, have reported the diagnosis, and none of them knew that the diagnosis was to be used in this study. In previous studies, one by Burdorf et al (6) and another by Agius et al (5), in which only a few occupational physicians were involved, a higher sensitivity of self-reported low-back sick leave was found. The problem of patients suffering from more than 1 sickness at the same time has been illustrated by Ingmar & Lindahl in a study of death certificates (21). The increase in positive predictive values when concordance concerning diagnosis was no longer required indicates that the diagnosis may be a problem for both self-reported and registered data.

Since 1 January 1992, all payments of sickness benefit have been made directly by employers during the first 14 days. The employers, however, are required to report all sickness absence to the regional insurance offices, but it is not always done. Large companies, which employ

about 80% of all employees in Sweden, issue reports regularly and consistently. Reporting of sick leave by small companies may be more unsystematic. During the period 1992—1994 there was a considerable decrease in the amount of reported sick leave. The economic recession, risk of unemployment, and cutbacks in sickness benefits have resulted in a drop of about 30% in the amount of days on sick leave from 1991 to 1993 (material published in Swedish by the Swedish Employers' Confederation; collected among voluntarily participating companies). In our material, a decrease of about 40% can be seen from 1991 to 1993. This value is higher than expected from the average employer data, and therefore sick leave reports from the social insurance offices may be slightly underestimated. Registered sick leave related to musculoskeletal diseases also decreased by about 40% from 1991 to 1993 in our study. If the true decrease in sick leave had been 30%, as expected, it would have meant that 2 cases had not been reported to the social insurance offices. In the current study 7 subjects reported sick leave that was not confirmed in the registers. One reason may be that the person did not live in the Stockholm area at the time of the sick leave. If, on the other hand, all these persons were truly sick-listed but no reports were made to the social insurance offices, they were misclassified in the registers as nonsick. Correcting the data for these subjects altered the validity values only a slight degree, by a few percent. It can therefore be concluded that the possible effect of this suggested lack of validity of the registered sick-leave data has only been of minor importance.

Methodological issues

The large lost-to-follow-up group was due both to the fact that many of the REBUS study persons did not live in Stockholm any longer, and therefore no information at all was available, and to the fact that there was a lack of data about diagnosis and duration of sick leave in the material from the social insurance offices. The lack of diagnosis may be explained by the manual processing required in writing down diagnoses, whereas the rest of the information is computerized. The kappa values never decreased to under 0.50 in spite of the low prevalence. Thus the influence of chance in this study can be considered rather low.

Concluding remarks

On the basis of this study, it is suggested that self-reported data, 4 years back, on sick leave related to general musculoskeletal diseases can be used as outcome data in epidemiologic studies when associations between different work-related issues and musculoskeletal morbidity are investigated. Data about more specific body areas, neck-shoulder and lower back, can also be used with nearly the same validity. In view of the low sensitivity,

self-reported sick-leave data cannot be recommended for surveys of morbidity.

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