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by Martimo K-P, Shiri R, Miranda H, Ketola R, Varonen H, Viikari-Juntura E

Affiliation: Finnish Institute of Occupational Health, Topeliuksenkatu 41 a A, FI-00250 Helsinki, Finland. kari-pekka.martimo@ttl.fi

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Self-reported productivity loss among workers with upper extremity disorders

by Kari-Pekka Martimo, MD,[1, 2] Rahman Shiri, MD, PhD,[1] Helena Miranda, MD, PhD,[1] Ritva Ketola, MSc, PhD,[1] Helena Varonen, MD, PhD,[3, 4] Eira Viikari-Juntura, MD, PhD[1]

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Objective Upper extremity disorders (UED) are prevalent in working populations. This study investigates the prevalence, magnitude, and associated factors of on-the-job productivity loss among workers with UED.

Methods Workers with incipient upper extremity symptoms were invited to participate in our study after the disorder was verified by a physician and no immediate sick leave was required. Of the 177 eligible patients, 168 (95%) were included in the study. They were asked to describe their symptoms, personal characteristics, and work-related factors. Self-assessed productivity measured the impact of UED on the achieved work output.

Results Of the 168 participants, 56% reported a productivity loss; the average reduction thereof was 34%. Productivity loss was associated with pain intensity [odds ratio (OR) for the third tertile 2.8, 95% confidence interval (95% CI) 1.2–6.5], pain interference with work (OR for the third tertile 5.7, 95% CI 2.2–14.3) and fear-avoidance beliefs (OR 2.8, 95% CI 0.9–8.9). Pain interference with sleep was associated with productivity loss only among those aged 46 years or older, whereas high job strain showed an association with productivity loss only among workers aged 20–45 years. In the younger group, productivity loss was more associated with a combination of any two of the following three factors than the presence of only one: pain intensity, job strain, and physical loads at work.

Conclusions UED cause substantial loss of productivity at work. The most important associated factors are related to pain and its impact on work and sleep, but also to psychological aspects of pain and work. Our findings suggest that the factors associated with productivity loss differ in younger and older workers.

Key terms musculoskeletal disorder; MSD; presenteeism; ergonomics; physical factor; psychosocial factor; fear-avoidance belief.

Upper extremity disorders (UED) are common among working people. In a population-based study among Finnish adults, the prevalence of a clinically diagnosed UED was highest for rotator cuff tendinitis and carpal tunnel syndrome (both 3.8%), followed by lateral epicondylitis (1.1%), bicipital tendinitis (0.5%), and medial epicondylitis (0.3%) (1). UED cause remarkable disability resulting in lost productivity. For example, in Washington State from 1990–1998, the average time lost from work was 170–251 days per one compensation claim related to UED (2).

While sickness absenteeism and permanent disability are significant components of decreased productivity, they represent only a part of its total cost. A considerable proportion of a company's health-related productivity loss derives from work presenteeism (ie, decreased work performance while at work) (3). A systematic review including 37 studies on presenteeism concluded that several health conditions, such as asthma and allergies, as well as health risk factors (eg, obesity and physical inactivity) are associated with reduced on-the-job productivity (4). Only one study in the review assessed productivity loss related to musculoskeletal symptoms (5). In this study, 9% of the female and 11% of the male computer workers with upper extremity, neck or back pain reported reduced productivity at work during the preceding month. Each employee lost on average 17 work hours a month because of musculoskeletal symptoms, exceeding the loss due to sickness absence.

1 Finnish Institute of Occupational Health, Helsinki, Finland.
2 Mehiläinen Occupational Health Care, Helsinki, Finland.
3 Department of General Practice and Primary Care, University of Helsinki, Helsinki, Finland.
4 Kirkkonummi Health Centre, Kirkkonummi, Finland.

Correspondence to: Dr K-P Martimo, Finnish Institute of Occupational Health, Topeliuksenkatu 41 a A, FI-00250 Helsinki, Finland. [E-mail: kari-pekka.martimo@ttl.fi]

Other studies have also shown that health-related productivity loss mainly derives from decreased performance at work, rather than from sickness absence. In a Dutch study, every fourth computer worker with neck–shoulder or hand–arm symptoms reported productivity loss, whereas a much smaller proportion (3–9%) needed a sick leave (6). Moreover, productivity loss may well occur after returning to full duty after sickness absence, as shown by another Dutch study, in which 60% of the workers with musculoskeletal disorders (MSD) were affected by reduced productivity immediately after the sick leave, and 40% one year after returning to work (7).

Escorpizo has suggested that work productivity, within the context of work-related MSD, is determined by: the health condition itself; the capacity, desire, and difficulty to work; as well as work-life balance and non-occupational factors (8). Prior studies have identified the following risk factors for MSD-related productivity loss among computer workers: (i) symptom persistence, (ii) being overweight, (iii) smoking, (iv) having a high general distress level, (v) experiencing depressive symptoms, (vi) amount of time spent at the computer and various computer tasks involved (viii) position of the computer's mouse and operating time thereof, (ix) high work demands, and (x) inactivity (9, 10). In addition, several studies have found, somewhat unexpectedly, that younger employees report more health-related productivity loss than their older counterparts (5, 11, 12).

Most of the earlier studies have assessed productivity loss related to self-reported symptoms, whereas the number of studies on productivity loss associated with clinically diagnosed MSD is limited (13, 14). The nature of the musculoskeletal condition presumably affects productivity and the risk factors for productivity loss related to various disorders may vary. Little is known about the effect of the musculoskeletal diagnoses on productivity loss.

The aim of this study was to assess the prevalence and magnitude of self-reported productivity loss at work among those who sought care for upper extremity symptoms and were diagnosed with a clinical disorder. We also investigated the associations between productivity loss and individual characteristics, life-style, and work-related factors.

Material and methods

Study design and setting

This cross-sectional study describes the baseline of a randomized controlled trial on early recognition and rehabilitation of UED. The study was carried out in collaboration with the occupational health units of three medium- to large-sized companies with a study base of 25 000 employees. The study started in February 2006, and the last subject was recruited in December 2007. The study was approved by the Coordinating Ethics Committee at the Helsinki University Hospital.

Participants

We considered as potentially eligible all subjects aged 18–60 years seeking medical advice in the occupational health services (OHS) for upper extremity symptoms that had started or become exacerbated less than 30 days prior to the medical consultation ("early symptoms"). Within three days after seeking medical advice in the OHS, the subject was examined at the Finnish Institute of Occupational Health by an occupational physician. Clinical diagnosis was made, applying standardized clinical protocols for each symptom entity (15). For possible cases of carpal tunnel syndrome, nerve conduction velocity testing was also performed.

The study exclusion criteria included the following: (i) need for immediate sick leave, (ii) scheduled or prior surgery due to UED, (iii) active autoimmune disease, (iv) malignancy diagnosed within a year or presently under therapy, (v) fibromyalgia, (vi) congenital or traumatic deformity of upper extremity, (vii) pregnancy, and (viii) planned retirement during follow-up. Based on the power calculations related to the intervention part of the study, our target was to recruit in total 500 subjects. All subjects included in the study signed an informed consent form.

Outcome

The outcome of this study was productivity loss, assessed with two questions about the impact of UED on work performance during the preceding full work day (16). The first question was: "Assess the impact of your upper extremity symptoms and mark with a scale from 0 (practically nothing) to 10 (regular quantity) how much work you were able to perform when compared to your normal workday". The second question was: "Assess the impact of your upper extremity symptoms and mark with a scale from 0 (very poor quality) to 10 (regular quality) the quality of your work when compared to your normal workday".

The dichotomous variable for productivity loss (yes/no) was formed so that those who scored a value 0–9 for either of the two questions were classified as having "reported productivity loss" and compared to those who scored 10 for both questions. The magnitude of productivity loss (ie, how much productivity was reduced) was calculated using the formula [1 – (quality/10) × (quantity/10)] × 100%, modified from Hoeijenbos et al (13).

Clinical diagnoses

The clinical diagnoses were lateral or medial epicondylitis, specific shoulder disorder (rotator cuff tendinitis or impingement syndrome), de Quervain's tenosynovitis or other wrist tenosynovitis, non-specific upper extremity pain, and "other disorder" consisting mostly of entrapments of the median or ulnar nerve. Epicondylitis, the most prevalent disorder in this study, was chosen as a reference category to ensure enough power in the comparisons.

Pain characteristics and prior sick leave

The subject was asked to rate the intensity of the pain caused by UED on a scale of 0 ("no pain") to 10 ("the worst possible pain") and pain interference with work, leisure time, and sleep during the last seven days (0 corresponding to "no interference at all" and 10 to "the worst possible interference"). For data analyses, we categorized the ratings into three equal-sized groups using the tertile method. The third tertile for pain intensity and pain interference with work corresponded to a score of 6–10. We also asked about sick leaves due to UED during the preceding 12 months.

Other covariates

In order to assess physical exposures at work, the occupational physician interviewed the subject about the frequency of lifting loads weighing ≥5 kg, working with the hand(s) above shoulder level, and whether work required frequent elevations of the arms. The physician also asked about keying, prolonged forceful gripping, as well as pinch grip that either required forceful exertion or deviating wrist posture. Each factor was dichotomized using a cut-off of "being exposed for 10% of the work time during a workday".

Job strain was measured with the Job Content Questionnaire (17). The scale comprised altogether 14 items – 5 for job demands and 9 for job control. Responses were given on a 5-point scale ranging from "strongly agree" to "strongly disagree". To create a job strain-variable, we dichotomized job demand and job control scales at the median, and compared the category "high job strain" (high demand and low control) to the other categories.

Smoking habits were categorized into three groups (never smokers, former smokers, and occasional or current smokers). Waist circumference was measured and classified into one of three categories: <94 cm ("normal"), 94–101.9 cm ("increased"), and ≥102 cm ("substantially increased") for men, and <80, 80–87.9, and ≥88 cm, respectively, for women (18). Physical activity (any physical activity for more than 30 minutes causing increased sweating and breathing) was categorized into two classes: "two or less" and "three or more" times a week.

Fear-avoidance beliefs were assessed using four items adapted from Waddell et al (19, 20): "physical activity makes my symptoms worse"; "if my symptoms become worse, it means that I should stop what I was doing"; "my pain is caused by work"; and "I should not continue in my present job because of the symptoms". Each item had seven alternatives from 0 ("totally disagree") to 6 ("totally agree"). A sum variable was calculated and dichotomized at an upper quartile value (score ≥18 out of 24 considered as elevated). In addition, the individual item on perceived work-relatedness of the disorder (ie, "my pain is caused by work") was also analyzed separately and categorized into three classes using the tertile method.

Statistical methods

Logistic regression models were used to study the determinants of productivity loss. The results are presented with odds ratios (OR) with 95% confidence intervals (95% CI). Multivariable models included age, gender, and those variables associated with productivity loss with a P-value <0.20 in the gender-adjusted or age- and gender-adjusted models. Due to the collinearity of pain intensity and pain interference, we did not perform mutual adjustment; their effects were assessed in separate models adjusted for the other covariates. In addition to the separate effects of pain intensity, high job strain, and physical load factors on productivity loss, we also estimated their joint effects, since we hypothetized that these variables may act synergistically. By including interaction products in the multivariable model, we also tested multiplicative interactions. We investigated the possible effect modification by age with stratified analyses using a median age of 45 years as the cut-off. STATA software, version 8.2 (StataCorp LP, College Station, TX, USA) was used for the analyses.

Results

Even though the target of 500 study subjects was not achieved, recruitment was concluded as planned at the end of 2007. This was due to the smaller than expected number of subjects fulfilling the inclusion criteria, as well as a relatively slow recruiting process in general. Altogether 222 subjects participated in the study. Of these, 46 subjects were excluded because they did not meet the criteria for eligibility, leaving 177 subjects in the study. After excluding an additional nine subjects with missing information on productivity, 168 subjects (95%) were included in the analyses. The most common occupations were nurses and other healthcare workers (64%), secretaries and other clerical workers (25%), and warehouse workers (8%). The majority (87%) were female, and the average age was 45.3 years (table 1).

The most prevalent UED were epicondylitis and specific shoulder disorder (table 1). The subjects reported pain intensity and pain interference with work to be on average 4.7 (maximum 10) and 4.8, respectively. Pain interference with sleep was on average lower (3.3). Of the total 168 participants, 37% reported sickness absence due to UED during the last 12 months and 27% reported high job strain. Keying and lifting loads were the most common physical work load factors. Every seventh subject had elevated scores on fear-avoidance beliefs, and every second perceived their disorder to be work-related.

Table 1. Description of study group (N=168), proportion (%) or mean (SD).

Characteristic	Mean or proportion		
	%	Mean	SD
Age (years)		45.3	9.8
Female gender	86.9	..	.
Smoking status			
Former smoker	27.0	..	.
Occasional or current smoker	19.2	..	.
Waist circumference			
Normal	50.9	..	.
Increased	24.2	..	.
Substantially increased	24.9	..	.
Physical activity			
<2 times/week	50.6	..	.
≥3 times/week	49.4	..	.
Medical conditions			
Epicondylitis	29.2	..	.
Specific shoulder disorder	28.0	..	.
Non-specific upper limb pain	25.6	..	.
Wrist tenosynovitis	10.1	..	.
Other	7.1	..	.
Pain intensity	..	4.7	2.2
Pain interference			
With work	..	4.8	2.7
With leisure time	..	4.5	2.5
With sleep	..	3.3	3.0
Productivity loss			
prevalence	56.0	..	.
magnitude	..	18.7	22.7
Physical load factors			
Lifting loads (≥5 kg)	27.7	..	.
Hand(s) above shoulder level	8.4	..	.
Arm elevations	4.8	..	.
Forceful gripping	6.0	..	.
Pinch grip	6.6	..	.
Keying	49.4	..	.
High job strain	27.4	..	.
Elevated score on fear-avoidance beliefs	14.3	..	.
Sickness absence (past 12 months)	36.9	..	.

More than half of the subjects (56% of women, 59% of men) reported that the UED had decreased their productivity. The average production loss was 34% during the previous work day, corresponding to a mean 19% loss in productivity among all study subjects (table 1).

Neither age nor gender were associated with productivity loss (table 2), nor were smoking habits, waist circumference, or physical activity. Subjects in the diagnostic category "other", mainly with median or ulnar nerve entrapment, had the highest risk of productivity loss (table 2).

Pain intensity, pain interference with work, and fear-avoidance beliefs were associated with productivity loss (table 2). Pain interference with sleep was also associated with productivity loss, but only in the older age group.

Of the physical exposures at work, only lifting at work showed an association with productivity loss (table 2). High job strain and prior sick leave were associated with productivity loss, but only among the younger subjects. If the younger subjects were convinced about work-relatedness of the disorder (response in the third tertile), the prevalence of productivity loss was higher (OR 4.5, 95% CI 1.2–16.6). No similar association was found in the older subjects.

Only pain intensity and fear-avoidance beliefs showed associations with productivity loss in a mutually adjusted model with gender, age, pain intensity, physical exposures at work, previous sickness absence, high job strain, and fear-avoidance beliefs (table 3). Pain interference with work was also associated with productivity loss with an OR of 2.5 (95% CI 1.1–5.7) for the 2nd tertile and 5.7 (95% CI 2.2–14.3) for the 3rd tertile, when it replaced pain intensity in the model. In younger workers, only high job strain remained statistically significant after adjustment for the other factors, while in older workers, only pain interference with sleep was significant.

Table 4 shows the separate and joint effects of physical workload factors, pain intensity, and job strain on productivity loss. Mainly among the younger subjects, a combination of any two of these factors was more associated with a higher productivity loss than the presence of only one factor. High job strain seemed to contribute the most to the productivity loss and physical exposures the least. When the interaction products were included in the logistic regression models, only the inclusion of interaction between physical loads and pain intensity improved the goodness-of-fit of the model.

Table 2. Odds ratios (OR) of productivity loss adjusted for gender and age or gender alone according to background characteristics. (95% CI = 95% confidence interval)

Characteristic	20–45 years [a]			46–64 years [a]			All [b]	
	N	OR	95% CI	N	OR	95% CI	OR	95% CI
Gender								
Female (reference category)	67	..	.	79	..	.	..	.
Male	13	1.5	0.4–4.9	9	0.9	0.2–3.6	1.2	0.4–3.0
Age (continuous)		–			–		1.00	0.97–1.04
Diagnosis								
Epicondylitis (reference category)	25	..	.	24	..	.	..	.
Shoulder disorder	21	1.4	0.4–4.6	26	1.6	0.5 –4.9	1.5	0.6–3.5
Wrist tenosynovitis	8	4.2	0.6–26.3	9	0.8	0.2–3.7	1.7	0.5–5.3
Non-specific pain	23	2.3	0.7–7.4	20	1.5	0.4–5.0	1.9	0.8–4.4
Other	3			9	3.5	0.6–20.4	6.2	1.2–31.4
Pain intensity								
1st tertile (reference category)	26	..	.	27	..	.	..	.
2nd tertile	28	3.3	1.1–10.3	27	4.0	1.3–12.6	3.7	1.6–8.2
3rd tertile	26	3.1	0.99–9.6	30	2.9	0.98–8.6	3.0	1.4–6.6
Pain interference with work								
1st tertile (reference category)	23	..	.	31	..	.	..	.
2nd tertile	24	1.9	0.5–6.4	30	3.6	1.2–10.5	2.7	1.2–5.9
3rd tertile	32	6.7	2.0–22.3	23	5.1	1.5–16.9	6.2	2.6–14.4
Pain interference with leisure time								
1st tertile (reference category)	21	..	.	31	..	.	..	.
2nd tertile	32	1.4	0.4–4.2	25	2.2	0.7–6.5	1.7	0.8–3.7
3rd tertile	27	1.4	0.4–4.3	28	2.2	0.7–6.2	1.8	0.8–3.8
Pain interference with sleep								
1st tertile (reference category)	26	..	.	26	..	.	..	.
2nd tertile	31	0.7	0.2–2.2	25	4.2	1.3–13.5	1.6	0.7–3.4
3rd tertile	23	1.0	0.3–3.2	33	6.0	1.9–18.6	2.5	1.1–5.5
Physical exposures at work								
Lifting loads, ≥5 kg								
No (reference category)	52	..	.	68	..	.	..	.
Yes	28	1.9	0.7–5.1	18	2.3	0.7–7.2	2.1	0.99–4.5
Arm elevations or above shoulder								
No (reference category)	67	..	.	77	..	.	..	.
Yes	13	2.1	0.5–7.6	9	1.6	0.3–6.8	1.9	0.7–4.9
Forceful or pinch grip								
No (reference category)	69	..	.	80	..	.	..	.
Yes	11	1.5	0.4–5.8	6	1.6	0.2–9.1	1.5	0.5–4.4
Keying								
No (reference category)	39	..	.	45	..	.	..	.
Yes	41	1.4	0.5–3.5	41	0.4	0.2–1.1	0.7	0.3–1.4
Previous sickness absence (past 12 months)								
No (reference category)	46	..	.	60	..	.	..	.
Yes	34	3.4	1.3–8.7	28	1.5	0.5–3.7	2.2	1.1–4.3
High job strain								
No (reference category)	50	..	.	64	..	.	..	.
Yes	23	3.9	1.3–11.8	20	0.5	0.2–1.4	1.3	0.6–2.8
Elevated score on fear-avoidance beliefs								
No (reference category)	69	..	.	75	..	.	..	.
Yes	11	4.6	0.9–23.1	13	2.8	0.7–10.9	3.5	1.2–9.9

[a] Adjusted for gender.
[b] Adjusted for gender and age.

Discussion

In this study among active workers in various physical as well as sedentary occupations, clinically diagnosed UED was associated with a considerable loss of productivity at work. More than half of the subjects reported that the disorder impaired their productivity. On average, workers with UED lost one third of their regular productivity, which in a normal work day would correspond to 2.5 hours of lost working time.

Previous findings have reported a lower prevalence and magnitude of productivity loss than in our study (5, 6). The main reason may be that the prior studies included subjects with self-reported symptoms, whereas in our study, subjects with the symptoms had sought medical advice and for most of them, the physician diagnosed a specific UED. Hence, their condition was more severe than just experiencing pain.

Our results are consistent with current knowledge (9, 10) that pain intensity, pain interference with work, and lifting at work are associated with self-reported productivity loss. To date, no studies have reported about the role of fear-avoidance beliefs in productivity loss. Conceptually, fearful beliefs may contribute considerably to productivity loss since they serve as an adaptive reaction to pain – some work activities are avoided, if they are expected to produce pain and feared to exacerbate the "injury". Negative beliefs about work effects on chronic low back pain have been shown to increase the risk of both work loss and disability in daily activities (19). In general, fear-avoidance beliefs are strong predictors of future disability (21). However, to our knowledge, this study is the first to report fear-avoidance beliefs affecting productivity loss in non-chronic conditions.

One item from the fear-avoidance questions was whether the subjects perceived their disorder to be caused by work. It has been shown earlier that musculoskeletal symptoms are often considered as work-related, and that the perceived work-relatedness has an association with impaired self-assessed workability, independent of the clinical condition or other predictors, for example (22).

Unlike previous studies, we did not find an association between age and productivity loss (6, 11, 12). However, we found that age modified the effects of other factors, particularly the combined effects of physical work, job strain, and pain intensity, on productivity loss. The strongest determinants of productivity loss in younger workers were having two of the following factors: intensive pain, high job strain, and physical work. Older workers' productivity was not affected by a combination of these factors.

Similar results, indicating that younger workers may be more susceptible to the effects of work, have been found, for example in a prospective study on the predictors of low-back pain (23) as well as in relation to sickness absence (24). The age modification in productivity loss may partly be explained by health-based selection. Other possible explanations are younger employees' (or their supervisors') higher expectations for daily performance, as well as older workers' better skill at compensating for health-related productivity loss.

This study had strengths but also weaknesses. The study subjects were actively working people who sought medical advice for their upper extremity symptoms. The companies in this study were chosen so that enough variation in the work-related exposures was found. The OHS staffs were asked to recommend

Table 3. Mutually adjusted odds ratios of productivity loss according to background characteristics. (OR= odds ratio, 95% CI = 95% confidence interval)

Characteristic	OR	95% CI
Gender (male versus female)	1.2	0.4–3.6
Age, for each 1-year	1.0	0.96–1.04
Pain intensity (reference category 1st tertile)		
2nd tertile	3.6	1.5–8.3
3rd tertile	2.8	1.2–6.5
Physical exposure at work ("yes" versus "no")	1.1	0.5–2.3
Previous sickness absence (past 12 months)	1.6	0.7–3.5
High job strain	0.9	0.4–2.0
Elevated scores on fear-avoidance beliefs	2.8	0.9–8.9

Table 4. Separate and joint effects of physical load factors, pain intensity and job strain on productivity loss by age group. (OR = odds ratio, 95% CI = 95% confidence interval)

Characteristic	20–45 years			46–64 years		
	N	OR[a]	95% CI	N	OR[a]	95% CI
Physical loads and job strain						
None	30	1	.	44	1	.
Only physical loads	20	1.4	0.4–4.5	19	1.6	0.5–5.1
Only high job strain	12	3.3	0.8–13.6	13	0.6	0.2–2.2
Both	11	6.7	1.2–36.8	6	0.4	0.1–2.2
Physical loads and pain intensity						
None	23	1	.	29	1	.
Only pain intensity	22	1.5	0.4–5.0	29	0.9	0.3–2.7
Only physical loads	14	0.7	0.2–2.8	12	0.5	0.1–2.1
Both	21	4.3	1.1–16.8	13	2.7	0.6–12.0
Pain intensity and job strain						
None	27	1	.	35	1	.
Only pain intensity	23	2.5	0.8–8.0	27	1.5	0.5–4.3
Only high job strain	8	3.7	0.7–19.4	6	0.4	0.1–2.4
Both	15	8.2	1.8–37.2	13	0.6	0.2–2.3

[a] Adjusted for gender.

study participation to all potentially eligible subjects, but we have no information as to whether this was the case. Neither do we know how many subjects declined participation. After being examined at the Finnish Institute of Occupational Health, none declined. This was originally an ergonomic intervention study, and it could be that those with more severe symptoms (and lower productivity) declined to participate. Further, it has been shown that healthcare workers who are stressed participate less often in surveys (25). There is also an indication that productivity loss reduces study participation (12). If these hold true also in our study, selection may have occurred and deflated our results. Particularly, the effect of job strain on productivity loss may have been underestimated.

The included subjects were examined by a trained physician with standardized diagnostic criteria. Mainly validated questions were used to collect information on various background variables. However, unmeasured confounding due to, for example, work-family imbalance or motivational issues may have affected our results. Moreover, we did not attain the targeted number of study subjects. Due to the relatively small population, the results are not very precise, as indicated by the width of the confidence intervals. In addition, because most of the patients in this study were employed in healthcare or an office environment, the generalizability of the results is somewhat limited. Therefore, more research is needed on productivity loss and MSD in other work environments, such as manufacturing.

The difficulty of quantifying productivity, particularly in information and service-type jobs, has led to a multitude of measurement instruments based on self-reporting (26, 27, 28). We adapted Brouwer's QQ (quantity and quality) method, originally designed to be used for any disease, by limiting it to UED. The strength of the QQ method is that the effect of the health condition on the quantity and the quality of productivity can be differentiated. Moreover, unlike in many other questionnaires, there is a reference against which the loss can be compared (ie, the respondents are asked to rate the attained quantity and quality of daily work compared to that of a regular workday) (28). Naturally, there are other reasons for lost productivity that are not related to health. However, the QQ method takes into account these other reasons for production loss by using the regular work performance as an internal standard (29). The validity of the QQ method has been studied in comparison with other measurements (16, 30). Self-reported productivity on the QQ has been shown to correlate well with objective work output (30).

Moreover, the self-assessments were unlikely to have been affected by recall problems since the recall period of productivity was short in this study. For most of the participants, the preceding full regular working day was the day before, or at least within one week of, the consultation. The short timeframe also means that the productivity loss assessed in our study does not necessarily reflect longer lasting productivity loss. Considering the nature of clinical UED, it is, however, unlikely that the situation changes rapidly from one day to another.

Concluding remarks

Our results showed that UED among working people cause considerable productivity loss at work. Therefore, measuring productivity loss at work should be included in studies that evaluate the effectiveness of therapeutic or preventive interventions on upper extremity symptoms among working age people. Pain intensity and its impact on work and sleep, psychological factors, as well as physical and psychosocial factors at work should all be included as potential targets for intervention in order to improve the management of disability caused by UED. Work-related factors seem to be important determinants of perceived disability especially among younger employees. Finally, estimating the costs of productivity loss at work provides a new opportunity to support the improvement of working conditions and care for medical conditions, as it facilitates the integration of the occupational health agenda with corporate objectives and quality improvement.

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