EXTENDED REPORT

Course and prognosis of elbow complaints: a cohort study in general practice

S D M Bot, J M van der Waal, C B Terwee, D A W M van der Windt, L M Bouter, J Dekker

....

See end of article for authors' affiliations

....

Correspondence to:
Dr C B Terwee, Institute for Research in Extramural Medicine (EMGO Institute), VU University Medical Centre, Van der Boechorststraat 7, 1081 BT Amsterdam; cb.terwee@vumc.nl

Accepted 2 February 2005
Published Online First 11 February 2005

....

Objective: To describe the course of new episodes of elbow complaints in general practice, and to identify predictors of short term and long term outcome in terms of pain intensity and functional disability.
Methods: 181 patients with elbow complaints filled in questionnaires at baseline and at 3, 6, and 12 months of follow up. Baseline scores of pain and disability, characteristics of the complaint, sociodemographic and psychosocial factors, physical activity, general health, and comorbidity were investigated as possible predictors of outcome. Outcome measures were analysed separately using multiple regression analyses.
Results: 13% of the patients reported recovery at the 3 month follow up and 34% at 12 months. Irrespective of outcome and length of follow up, a longer duration of the complaint before consulting the general practitioner, having musculoskeletal comorbidity, and using ''retreating'' as coping style increased the likelihood of an unfavourable outcome. Less social support was associated with an unfavourable outcome at 3 months, and having a history of elbow complaints and using ''worrying'' as coping style were associated with an unfavourable outcome at 12 months. The explained variance of the models ranged from 46% to 49%.
Conclusions: Recovery of patients with elbow complaints in general practice was poor. Besides characteristic of the complaint, passive coping and less social support were related to a worse prognosis. The results of this study may help general practitioners to provide patients with more accurate information about their prognosis.

Elbow pain and associated disability are common, and affected individuals often consult their general practitioner (GP). Data of the second Dutch national survey of general practice[1 2] showed that the incidence of elbow complaints was around 7.2 per 1000 patients per year.[3] Elbow complaints seldom occur on their own.[4] Many patients report additional symptoms in the neck, shoulder, arm, or hand.[4] These complaints can be a considerable burden to both patient and society, owing to inability to work, loss of productivity, and difficulty in carrying out household activities.[5 6]

Individual characteristics and (work related) physical and psychosocial factors have been identified as risk factors for the onset of elbow complaints.[7–9] These factors may also act as putative prognostic factors for persistent pain and disability. Not much is known about the prognosis of elbow complaints after presentation in general practice. The vast majority of research on such complaints has been specifically aimed at lateral elbow pain (that is, lateral epicondylitis, tennis elbow, or extensor carpi radialis tendinitis).[10] Hudak *et al* reviewed published reports on the clinical course of lateral elbow pain and prognostic factors for outcome. Only four of 40 studies provided at least moderate strength of evidence, showing that the site of the lesion and previous occurrence predicted outcome.[10] We found only one additional prognostic study of outcome in elbow complaints carried out in general practice,[11] which showed that high physical strain at work, being employed in manual jobs, high baseline level of distress, a high level of pain at baseline, and a complaint on the dominant side were related to a poor outcome of lateral epicondylitis at one year follow up. So far, little attention has been paid to the potential prognostic value of psychosocial factors, such as coping with pain, kinesiophobia, and social

support in general, although these factors were found to be related to a high risk of chronicity in patients consulting their GPs for low back pain[12 13] or neck and shoulder complaints. Knowledge of predictors of outcome should lead to the early identification of those at risk for the development of chronic complaints.

Our objectives in this study were to describe the course of new episodes of elbow complaints in adults in general practice, and to identify predictors associated with short term and long term outcome in terms of pain intensity and functional disability.

METHODS
Design
A large observational cohort study was conducted in 61 general practices (97 GPs).[14] Forty nine of the GPs participated in the second Dutch national survey of general practice (NS2), carried out by the Netherlands Institute of Primary Health Care (NIVEL) in 2001.[1 2] GPs recruited patients with a new episode of a complaint at the neck, shoulder, elbow, wrist, or hand. An episode was considered to be ''new'' if patients had not visited their GP for the same complaint during the preceding three months. Inclusion criteria were age 18 years or older and being capable of filling in Dutch questionnaires. Patients were excluded if the presented symptoms were caused by a fracture, malignancy, prosthesis, amputation, or congenital defect, or if the patient was pregnant. In all, 638 patients (88%) who consulted their GP with a complaint at the neck or upper extremity complaints

....

Table 1 Patient characteristics at baseline (n = 181)

Characteristic	Number of patients*	Per cent
Sociodemographic factors		
Sex (female)	120	66
Age (years)	47.9 (11.6)	
Employed	112	63
Education level:		
primary	75	41
secondary	84	46
college/university	21	12
Married/living together	138	76
Body mass index	25.8 (3.9)	
Having children	88	49
Smoking (now, ever)	128	71
Baseline scores outcome measures		
Pain intensity (scale 0–10)	5.3 (2.1)	
Disability at baseline (scale 0–100)	34.6 (20.4)	
Characteristics of the complaint		
Duration of current episode:		
<1 week	9	5
1 week to 1 month	49	27
1 month to 6 months	77	43
>6 months	42	23
History of elbow complaints	97	54
Discomfort caused by complaint:		
no discomfort	5	3
now and then	30	17
regularly	57	31
almost continuously	89	49
Generalised complaint†	131	72
Complaint at dominant elbow	98	54
Complaint at both elbows	25	14
Use of medication	70	39
Symptoms:		
Tingling in hand/fingers	79	44
numbness feeling in hand/fingers	46	25
loss of strength	96	53
loss of hand coordination	16	9
tendency to shake hands	43	24
tendency to massage hands	81	45
Putative cause of the complaint:		
overload due to usual activities	100	55
overload due to unusual activities	23	13
overload due to sports	16	9
accident during sports/exercise	0	0
accident elsewhere	14	8
anxiety/stress	24	13
chronic disease	11	6
other cause	25	14
unknown	40	22
Comorbidity (musculoskeletal)		
No comorbidity	70	39
Complaints hip/knee	42	23
Complaints ankle/foot	28	15
Complaints back	76	42
Multiple musculoskeletal complaints	29	16
Other diseases/problems‡	79	44
Menopause§	28	23
Physical activity		
ACSM position stand¶	20	11
Norm healthy activity[16]	72	40
Psychosocial factors		
Coping with pain:		
pain transformation (scale 4–16)	8.6 (2.6)	
distraction (scale 5–20)	10.8 (3.3)	
reducing demands (scale 3–12)	6.1 (2.0)	
retreating (scale 7–28)	11.1 (4.0)	
worrying (scale 9–36)	16.6 (5.0)	
resting (scale 5–20)	9.6 (3.2)	
Distress (scale 0–12)		
Kinesiophobia:		
fear - avoidance (scale 0–100)	52.3 (16.7)	
importance of exercise (scale 0–100)	59.9 (20.7)	
Social support (scale 12–60)	19.1 (8.1)	

Table 1 Continued

Characteristic	Number of patients*	Per cent
General health		
Perceived health (scale 1–5)	3.0 (0.9)	
Quality of life (scale 1–5)	3.2 (0.9)	
Vitality (scale 0–100)	57.2 (20.2)	

*Value are mean (SD) for continuous scales or n.
†Patients with concomitant neck, shoulder, arm, hand, or wrist complaints.
‡Asthma, diabetes, cardiovascular diseases, cancer, psychological problems.
§Percentage of women.
¶ACSM, American College of Sports Medicine.[18]

as the primary complaint returned the baseline questionnaire. Of these, 181 reported elbow complaints (either as a primary of secondary complaint) and were included in the study. Follow up questionnaires were sent after three, six, and 12 months.[14]

The informed consent procedure and protocol were approved by the medical ethics committee of the VU University Medical Centre. Written informed consent was obtained from all patients.

Outcome measures

Perceived recovery was measured by asking patients if their complaint still bothered them. Patients that responded ''no'' were regarded as recovered. Other outcome measures were change in pain intensity and change in functional disability at the three months follow up (short term) and the 12 months follow up (long term). The intensity of the current pain (pain during the previous 24 hours) was measured on an 11 point numerical scale ranging from 0 (no pain) to 10 (unbearable pain). Functional disability was measured with the modified pain free function index, a 10 item elbow specific scale measuring difficulty with the performance of common daily activities,[15] scores ranging from 0 (not disabled) to 100 (completely disabled). Changes in pain intensity and functional disability were calculated by subtracting the scores at three months and 12 months from the baseline score.

Putative predictors

We distinguished seven categories of putative predictors measured at baseline:

- *Sociodemographic factors*: age, sex, body mass index (calculated from self reported weight and height), right/left handedness, marital status, smoking behaviour, and educational background.
- *Characteristics of the complaint*: duration of the current episode, presumed cause of the complaint, history of elbow complaints, involvement of one or both elbows, complaint at the dominant arm, frequency of discomfort by the complaint, symptoms (for example, tingling in hand/fingers, loss of strength), and the use of analgesics.
- *Comorbidity*: list of concomitant musculoskeletal complaints, and a list of complaints and diseases other than of the musculoskeletal system.
- *Physical activity*: We measured whether patients met the norm for healthy activity (yes or no), which recommends that all adults should have 30 minutes or more of moderate intensity physical activity on at least five days of the week,[16][17] and whether they met the American College of Sports Medicine (ACSM) position stand (yes or no), which recommends carrying out heavy physical exercise or sports at least three times a week.[18]

- *Psychosocial factors*: Distress was measured by the shortened version of the distress scale of the four dimensional symptom questionnaire,[19 20] on which a higher score indicates more distress. Coping was measured with the pain coping inventory (PCI),[21 22] consisting of six scales: pain transformation, distraction, reducing demands, retreating, worrying, and resting, a higher score indicating more use of the strategy concerned. Kinesiophobia was measured using two subscales ("fear avoidance beliefs" and "importance of exercise"), derived from the Tampa scale[23 24] and the fear avoidance and beliefs questionnaire,[25] with a higher score indicating more fear avoidance and finding exercise more important. Social support was measured with the social support scale[26] on which a higher score indicates less social support.

- *General health*: vitality was measured by the vitality subscale from the 36 item short form health survey (SF-36)[27]; perceived general health was measured with the first question of the general health perceptions subscale of the SF-36[27]; and perceived overall quality of life (QoL) was measured on a five point rating scale with response options "bad," "moderate," "good," "very good," or "excellent." Higher scores indicate more vitality, better perceived health. and better quality of life.

Statistical analyses

Univariate regression analyses were undertaken to examine the relation between each of the putative predictors and changes in pain and functioning at the three month and the 12 month follow up. Predictors of recovery could not be studied because of lack of power (only 20 and 51 patients, respectively, were recovered at follow up). Factors that were non-linearly related to the outcome were either dichotomised or divided into tertiles (low, medium, high), with the low category as the reference category. Putative predictors that were associated with the outcome (p<0.20) were
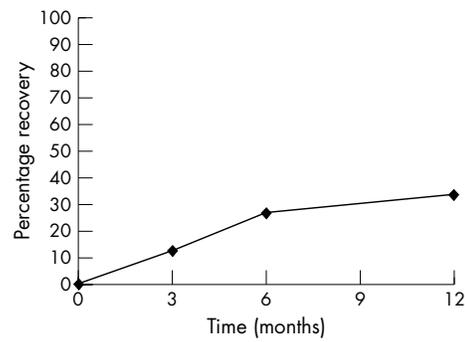

Figure 1 Percentage of recovery in patients with elbow complaints after three, six, and 12 months of follow up.

investigated in a multiple regression model. Age, sex, pain intensity, disability, and duration of the complaint were included in all multiple regression models independent of the p value. All factors were entered simultaneously in a multiple linear regression model. If the number of putative predictors to be entered in the model exceeded n/10, the factors were entered in blocks (sociodemographic factors first, characteristics of the complaints next, and the remaining factors last). A manual backward selection procedure was used to sequentially exclude factors and retain only factors with a p value of <0.10 (Wald statistic) in the final model, which could be regarded as independent predictors of outcome. The percentage of explained variance (R^2) was calculated to give an indication of the predictive power of the final models.

RESULTS

Baseline characteristics of the 181 patients are shown in table 1. The mean (SD) pain intensity score at baseline was 5.3 (2.1) and the mean disability score was 34.6 (20.4); 54% of the patients reported having had the complaint before in

Table 2 Predictors of change in pain intensity at three months ($R^2 = 0.46$) and 12 months ($R^2 = 0.47$): results of the multiple linear regression analyses

	3 Months (n = 157)				12 Months (n = 151)			
	n	b*	95% CI	p Value	n	b*	95% CI	p Value
Demographic factors								
Female (v male)	107	−0.94	(−1.57 to −0.31)	0.00				
older age (per year)	157	−0.03	(−0.06 to −0.01)	0.01				
Baseline score								
More severe pain (per point increase)	157	0.56	(0.42 to 0.71)	0.00	151	0.62	(0.45 to 0.79)	0.00
Characteristics of complaint								
Duration of current episode:								
<1 week	8	0.00			7	0.00		
1 week to 1 month	44	−1.45	(−2.92 to 0.02)	0.05	42	−1.63	(−3.35 to 0.09)	0.06
1 month to 6 months	66	−1.76	(−3.21 to −0.30)	0.02	64	−1.63	(−3.32 to 0.05)	0.06
>6 months	36	−2.19	(−3.70 to −0.68)	0.00	36	−2.36	(−4.14 to −0.59)	0.01
History of complaints (v no history)					83	−1.50	(−2.27 to −0.74)	0.00
Complaint at dominant side (v other side)	86	0.82	(0.22 to 1.41)	0.01				
Tendency to massage hands (v no tendency)					66	−0.88	(−1.55 to −0.21)	0.01
Comorbidity								
No musculoskeletal comorbidity (v comorbidity)	63	0.55	(−0.09 to 1.19)	0.09				
Multiple musculoskeletal complaints (v "no")	24	−0.98	(−1.83 to −0.12)	0.03	25	−1.23	(−2.14 to −0.31)	0.01
Psychosocial factors								
Coping: more retreating (per point increase)	155	−0.09	(−0.17 to −0.01)	0.03	150	−0.10	(−0.20 to −0.01)	0.04
Coping: more worrying (per point increase)					150	−0.10	(−0.18 to −0.02)	0.01
More fear voidance (per point increase)	156	0.02	(0.00 to 0.04)	0.05				
Social support†								
low	51	0.00						
medium	69	−0.70	(−1.37 to −0.02)	0.04				
high	35	−1.09	(−1.92 to −0.27)	0.01				

*b positive: favourable change in pain intensity since baseline per unit of the independent predictor; b negative: unfavourable change in pain intensity since baseline per unit of the independent predictor.
†Higher score means less social support.
b, regression coefficient; CI, confidence interval.

the previous year (that is, there was a history of the complaint).

In all, 158 patients (87%) completed the three months follow up questionnaire, and 152 patients (84%) completed the 12 month questionnaire. There were no significant differences between responders and dropouts in age, sex, functional disability, and pain intensity.

Course

After three months, 20 patients (13%) reported recovery, and 51 patients (34%) reported recovery after 12 months (fig 1). Of the patients who were not fully recovered at three months, 24% reported substantial improvement and 37% reported some improvement compared with baseline. At 12 months, 21% of patients without full recovery reported substantial improvement and 25% some improvement. At follow up the mean (SD) reduction in pain intensity was 1.3 (2.3) points at three months and 2.1 (2.6) points at 12 months (p<0.01).

The mean reduction in disability was 6.3 (16.2) points at three months and 11.9 (21.2) points at 12 months (p<0.01).

Predictors of outcome: univariate analysis

The results of the univariate regression analyses showing the associations between the putative predictors and change in pain intensity and change in functional disability after three or 12 months are presented in the appendix (the appendix can be viewed on the journal website at www.annrheumdis. com/supplemental). Age, a history of elbow complaints, having additional musculoskeletal complaints, using the coping strategy ''retreating'', and social support were associated with both outcomes at both follow up periods.

Predictors of outcome: pain

More intense pain at baseline, having a complaint in the dominant arm, and a higher score on the fear avoidance scale were significantly associated with a better outcome at three months (table 2). A worse outcome at three months was predicted by being female, higher age, a longer duration of the complaint at presentation, having multiple additional musculoskeletal complaints, using retreating as a coping strategy, and having less social support. For example, the improvement in pain intensity at three months for a women (−0.94) who had the complaint more than six months (−2.19) was 3.13 points less than for a man who had the complaint for less than one week, provided that the other predictors of the model were similar.

Predictors of a poorer outcome at 12 months were less pain at baseline, a longer duration of the complaint at presentation, having had the complaint before, having a tendency to massage your hands, having multiple musculoskeletal complaints, and scoring high on retreating and worrying (table 2). The explained variance was 0.46 at the three months follow up and 0.47 at 12 months.

Predictors of outcome: functional disability

Being employed, being more disabled at baseline, and having an accident as the presumed cause of the complaint were independently associated with a better outcome at three months (table 3). Factors that predicted a worse outcome were: having children in the household, more intense pain at baseline, a longer duration of the complaint at presentation, having multiple musculoskeletal complaints, a high score on the pain coping scale ''retreating,'' and less social support.

Being less disabled at baseline, having more intense pain at baseline, a longer duration of the complaint at presentation, chronic disease as the presumed cause of the complaint, additional complaints at the hip or knee, and a higher score on the pain coping scales ''retreating'' and ''worrying'' were significantly associated with a worse outcome at 12 months (table 3). The explained variance of the models for change in functional disability was 0.49 at three months and 0.47 at 12 months.

Table 3 Predictors of change in disability at three months ($R^2 = 0.49$) and 12 months ($R^2 = 0.47$): results of the multiple linear regression analyses

	3 Months (n = 157)				12 Months (n = 151)			
	n	b*	95% CI	p Value	n	b*	95% CI	p Value
Sociodemographic factors								
Employed (v unemployed)	95	5.43	(1.26 to 9.61)	0.01				
No children (v having children)	80	4.96	(0.98 to 8.93)	0.01				
Baseline score								
More severe pain (per point increase)	157	−1.88	(−3.13 to −0.63)	0.00	150	−1.37	(−2.99 to 0.25)	0.10
More disabled (per point increase)	156	0.58	(0.45 to 0.72)	0.00	151	0.71	(0.54 to 0.87)	0.00
Characteristics of complaint								
Duration of current episode:								
<1 week	8	0.00			7	0.00		
1 week to 1 month	44	−8.67	(−19.40 to 2.06)	0.11	42	−10.10	(−23.94 to 3.73)	0.15
1 month to 6 months	66	−9.10	(−19.44 to 1.25)	0.08	64	−11.30	(−24.87 to 2.27)	0.10
>6 months	36	−12.18	(−23.07 to −1.28)	0.03	36	−14.84	(−29.14 to −0.53)	0.04
History of complaints (v no history)					83	−9.77	(−15.97 to −3.57)	0.00
Putative cause: accident (v ''no'')	13	8.58	(1.09 to 16.07)	0.03				
Putative cause: chronic disease (v ''no'')					10	−10.07	(−21.27 to 1.12)	0.08
Comorbidity								
Complaints at hip/knee (v ''no'')					37	−9.21	(−16.04 to −2.38)	0.01
Multiple musculoskeletal complaints (v ''no'')	24	−9.66	(−15.56 to −3.77)	0.00				
Psychosocial factors								
Coping: more retreating (per point increase)	155	−0.88	(−1.42 to −0.34)	0.00	150	−0.92	(−1.72 to −0.12)	0.03
Coping: worrying (per point increase)					150	−0.68	(−1.33 to −0.03)	0.04
Social support†								
low	51	0.00						
medium	69	−4.69	(−9.38 to 0.01)	0.05				
high	35	−2.78	(−8.50 to 2.94)	0.34				

*b positive: favourable change in disability since baseline per unit of the independent predictor; b negative: unfavourable change in disability since baseline per unit of the independent predictor.
†Higher score means less social support.
b, regression coefficient; CI, confidence interval.

DISCUSSION

We have described the course of elbow complaints in general practice and examined potential predictors of outcome. Only 13% of reported full recovery after three months and just one third of the patients recovered after one year of follow up. These figures are consistent with those of Hay *et al*, who reported a low overall recovery rate (17%) after four weeks in primary care patients with lateral epicondylitis.[28] Other studies have used general improvement as outcome measures instead of complete recovery and have found percentages of 69–85% after one year.[11 29] In our study 90% of all patients reported at least some improvement after one year of follow up. The mean reduction in pain intensity was 1.3 (2.3) points at three months and 2.1 (2.6) points at 12 months. In clinical practice this may be considered to be meaningful: research has shown that a reduction of one point on a 0–10 point scale represents the minimum clinically important change in pain intensity (MIC).[30 31] The mean reduction in disability score was 6.3 (16.2) points at three months and 11.9 (21.2) points at 12 months. The MIC of this functional disability scale is unknown. However, in most circumstances the MIC appears to be approximately half a standard deviation.[32] In this case, half a standard deviation would be approximately 10 points, which means that the observed changes in functional disability were only clinically important after 12 months of follow up.

Irrespective of outcome measure and length of follow up, a worse prognosis was found for patients who had a longer duration of their complaint at baseline. This is in agreement with studies on the prognosis of musculoskeletal complaints in the neck or shoulder.[33–35] Not surprisingly pain intensity and functional disability at baseline were strongly associated with changes in these outcomes at follow up. Having more pain or disability at baseline leaves more room for a large reduction at follow up, but does not necessarily result in a better prognosis, as these patients may still have considerable pain or disability at follow up. For instance, a patient with a baseline pain score of 9 and a follow up score of 6 improved more than a patient with a baseline score of 3 and a follow up score of 1. This may also explain why a higher pain score at baseline predicted a poorer functional disability at follow up. Having had elbow complaints in the past predicted a worse outcome at long term follow up. This is similar to the results of Hudak *et al*.[10]

The passive coping styles retreating (for example, "make sure that I don't get upset"; "separate myself") and worrying ("focus on pain all the time"; "I think the pain will get worse") independently predicted poorer outcome. Passive coping strategies are thought to generate a preoccupation with bodily symptoms, which in turn may increase the sensation of pain and disability.[36 37] Several studies have found that a passive coping strategy is associated with a poor outcome in neck and back pain,[12 38] and in patients with rheumatoid arthritis.[36 39 40]

Less social support was associated with worse short term outcome in our study. Low levels of social support at the time of diagnosis predicted pain and functional disability in patients with rheumatoid arthritis at long term follow up.[37 41] Social resources may affect the health status of patients by enhancing the ability of an individual to cope with the stress of their disease.

In contrast to the results of Haahr and Anderson,[11] we found an association between sex and age and pain at three months follow up. Furthermore, they found that lateral epicondylitis at the dominant side predicted a worse prognosis at 12 months, while in our study it predicted a favourable outcome at three months. As well as a difference in study population (we studied patients with a variety of elbow complaints), it is possible that the difference in the follow up period may explain these contrasting findings.

We may have missed some predictors of short and long term elbow complaints or that we may have found some associations by chance. Treatment could be an important predictor of outcome.[29] In the study by Hay *et al* the recovery rate after four weeks differed substantially between treatment groups (4% to 42%).[28] In everyday clinical practice decisions to treat are often dependent on indicators of prognosis, such as the duration or severity of symptoms. Thus differences in outcome are not only related to the treatment given but also to differences in the severity of the condition. Consequently, interpretation of the predictive value of treatment variables is very difficult in observational research, as this information cannot be interpreted as evidence for the effectiveness of treatment. We therefore decided not to include treatment variables in our prognostic model. In addition, we did not included work related factors, because more than one third of the study population did not have paid work.

Lateral epicondylitis is the most common problem among patients with elbow complaints. The Dutch general practice guidelines recommend a wait and see policy for epicondylitis; injections or physiotherapy are only recommended in patients with persistent and severe pain or disability.[42] Although we have no information how well GPs adhere to these guidelines, we assume that in most cases the initial treatment will be based on an expectant policy, which includes time limited prescription of drugs and recommendations for temporarily avoiding pain provoking activities. Our results offer additional evidence on the prognostic value of coping and social support, which may be relevant to future updates of the guidelines. However, owing to the observational design of our study, our results provide only preliminary evidence for a causal association between the predictors found and changes in pain and functional disability in elbow complaints. The predictive capability of the model should be assessed in another population of patients with elbow complaints.

Our study suggests that few patients who consult their GP with a new episode of an elbow complaint have full recovery of their symptoms, though 90% of all patients reported at least some improvement after one year of follow up. The average pain and disability scores diminished after three and 12 months, although the improvement in disability can only be considered important after 12 months. Several factors were found to be independent predictors of outcome. As well as the characteristic of the complaint (for example, duration, history of complaints), passive coping and less social support were related to a worse prognosis. The results of our study may help GPs to identify patients at risk for the development of chronic complaints and provide them with more accurate information on their prognosis. More high quality studies in general practice are needed to confirm our results.

ACKNOWLEDGEMENTS

The electronic supplementary appendix can be found on the journal web site, www.annrheumdis.com/supplemental

. . . .

Authors' affiliations

S D M Bot, J M van der Waal, C B Terwee, L M Bouter, Institute for Research in Extramural Medicine, VU University Medical Centre, Amsterdam, Netherlands

D A W M van der Windt, Department of General Practice, VU University Medical Centre

J Dekker, Department of Rehabilitation Medicine, VU University Medical Centre

REFERENCES

1 **Schellevis FG**, Westert GP, de Bakker DH, Groenewegen PP, van der Zee J, Bensing JM. De tweede nationale studie naar ziekten en verrichtingen in de huisartsenpraktijk: aanleiding en methoden. *Huisarts en Wetenschap* 2003;**46**:7–12.

2 **Westert GP**, Schellevis FG, de Bakker DH, Groenewegen PP, Bensing JM, van der Zee J. Monitoring health inequalities through general practice: the Second Dutch National Survey of General Practice. *Eur J Public Health* 2004;**15**:59–65.

3 **Bot SD**, van der Waal JM, Terwee CB, van der Windt DA, Schellevis FG, Bouter LM, et al. Incidence and prevalence of complaints at the neck and upper extremity in general practice. *Ann Rheum Dis* 2005;**64**:118–23.

4 **Walker-Bone K**, Reading I, Coggon D, Cooper C, Palmer KT. The anatomical pattern and determinants of pain in the neck and upper limbs: an epidemiologic study. *Pain* 2004;**109**:45–51.

5 **Reville RT**, Neuhauser FW, Bhattacharya J, Martin C. Comparing severity of impairment for different permanent upper extremity musculoskeletal injuries. *J Occup Rehabil* 2002;**12**:205–221.

6 **Williams R**, Westmorland M. Occupational cumulative trauma disorders of the upper extremity. *Am J Occup Ther* 1994;**48**:411–20.

7 **Bernard BP**. Musculoskeletal disorders and workplace factors: a critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back. Publication No 97–141. Cincinnati: National Institute for Occupational Safety and Health, 1997.

8 **Haahr JP**, Andersen JH. Physical and psychosocial risk factors for lateral epicondylitis: a population based case-referent study. *Occup Environ Med* 2003;**60**:322–9.

9 **Walker-Bone KE**, Palmer KT, Reading I, Cooper C. Soft-tissue rheumatic disorders of the neck and upper limb: prevalence and risk factors. *Semin Arthritis Rheum* 2003;**33**:185–203.

10 **Hudak PL**, Cole DC, Haines AT. Understanding prognosis to improve rehabilitation: the example of lateral elbow pain. *Arch Phys Med Rehabil* 1996;**77**:586–93.

11 **Haahr JP**, Andersen JH. Prognostic factors in lateral epicondylitis: a randomized trial with one-year follow-up in 266 new cases treated with minimal occupational intervention or the usual approach in general practice. *Rheumatology (Oxford)* 2003;**42**:1216–25.

12 **Burton AK**, Tillotson KM, Main CJ, Hollis S. Psychosocial predictors of outcome in acute and subchronic low back trouble. *Spine* 1995;**20**:722–8.

13 **Klenerman L**, Slade PD, Stanley IM, Pennie B, Reilly JP, Atchison LE, et al. The prediction of chronicity in patients with an acute attack of low back pain in a general practice setting. *Spine* 1995;**20**:478–84.

14 **van der Waal JM**, Bot SD, Terwee CB, van der Windt DA, Bouter LM, Dekker J. Determinants of the clinical course of musculoskeletal complaints in general practice: design of a cohort study. *BMC Musculoskel Disord* 2003;**4**:3.

15 **Stratford P**, Levy D, Levy K, Miseferi D. Extensor carpi radialis tendonitis: a validation of selected outcome measures. *Physiotherapy Can* 1987;**39**:250–5.

16 **Kemper H**, Ooijendijk W, Stiggelbout M. Consensus about the Dutch recommendation for physical activity to promote health (Consensus over de Nederlandse norm gezond bewegen). *Tijdschrift voor Gezondheidswetenschappen* 2000;**78**:180–3.

17 **Pate RR**, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA* 1995;**273**:402–7.

18 **American College of Sports Medicine Position Stand**. the recommended quantity and quality of exercise for the developing and maintaining cardiorespiratory and muscular fitness in healthy adults. *Med Sci Sports Exerc* 1990;**22**:265–74.

19 **Terluin B**. The Four Dimensional Symptom Questionnaire (4DSQ) in general practice. *De Psycholoog* 1998;**33**:18–24.

20 **Terluin B**, van Rhenen W, Schaufeli WB, de Haan M. The four-dimensional symptom questionnaire (4SDQ): measuring distress and other mental health problems in a working population. *Work Stress* 2004;**18**:187–207.

21 **Kraaimaat FW**, Evers AW. Pain-coping strategies in chronic pain patients: psychometric characteristics of the pain-coping inventory (PCI). *Int J Behav Med* 2003;**10**:343–63.

22 **Kraaimaat F**, Bakker A, Evers A. Pain coping strategies in chronic pain patients: the development of the Pain Coping Inventory (PCI). *Gedragstherapie* 1997;**30**:185–201.

23 **Goubert L**, Crombez G, Vlaeyen J, an Damme S, van den Broeck A, van den Houdenhove B. The Tampa Scale for Kinesiophobia: Psychometric characteristics and norms. *Gedrag en Gezondheid* 2000;**28**:54–62.

24 **Goubert L**, Crombez G, Van Damme S, Vlaeyen JW, Bijttebier P, Roelofs J. Confirmatory factor analysis of the Tampa Scale for Kinesiophobia: invariant two-factor model across low back pain patients and fibromyalgia patients. *Clin J Pain* 2004;**20**:103–10.

25 **Waddell G**, Newton M, Henderson I, Somerville D, Main CJ. A Fear-Avoidance Beliefs Questionnaire (FABQ) and the role of fear-avoidance beliefs in chronic low back pain and disability. *Pain* 1993;**52**:157–68.

26 **Feij J**, Doorn C, van Kampen D, van den Berg P, Resing W. Sensation seeking and social support as moderators of the relationship between life events and physical illness/psychological distress. In: Winnubst JAM, Maes S, eds. *Lifestyles stress and health*. Leiden: DSWO Press, 1992:285–302.

27 **Ware JE**, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care* 1992;**30**:473–83.

28 **Hay EM**, Paterson SM, Lewis M, Hosie G, Croft P. Pragmatic randomised controlled trial of local corticosteroid injection and naproxen for treatment of lateral epicondylitis of elbow in primary care. *BMJ* 1999;**319**:964–8.

29 **Smidt N**, van der Windt DA, Assendelft WJ, Deville WL, Korthals-de Bos IB, Bouter LM. Corticosteroid injections, physiotherapy, or a wait-and-see policy for lateral epicondylitis: a randomised controlled trial. *Lancet* 2002;**359**:657–62.

30 **Cepeda MS**, Africano JM, Polo R, Alcala R, Carr DB. What decline in pain intensity is meaningful to patients with acute pain? *Pain* 2003;**105**:151–7.

31 **Salaffi F**, Stancati A, Alberto SC, Ciapetti A, Grassi W. Minimal clinically important changes in chronic musculoskeletal pain intensity measured on a numerical rating scale. *Eur J Pain* 2004;**8**:283–91.

32 **Norman GR**, Sloan JA, Wyrwich KW. Interpretation of changes in health-related quality of life: the remarkable universality of half a standard deviation. *Med Care* 2003;**41**:582–92.

33 **Hoving JL**, de Vet HC, Twisk JW, Deville WL, van der Windt D, Koes BW, et al. Prognostic factors for neck pain in general practice. *Pain* 2004;**110**:639–45.

34 **Kjellman G**, Skargren E, Oberg B. Prognostic factors for perceived pain and function at one-year follow-up in primary care patients with neck pain. *Disabil Rehabil* 2002;**24**:364–70.

35 **Kuijpers T**, van der Windt DA, van der Heijden GJ, Bouter LM. Systematic review of prognostic cohort studies on shoulder disorders. *Pain* 2004;**109**:420–31.

36 **Covic T**, Adamson B, Hough M. The impact of passive coping on rheumatoid arthritis pain. *Rheumatology (Oxford)* 2000;**39**:1027–30.

37 **Evers AW**, Kraaimaat FW, Geenen R, Jacobs JW, Bijlsma JW. Pain coping and social support as predictors of long-term functional disability and pain in early rheumatoid arthritis. *Behav Res Ther* 2003;**41**:1295–310.

38 **Linton SJ**. Occupational psychological factors increase the risk for back pain: a systematic review. *J Occup Rehabil* 2001;**11**:53–66.

39 **Evers AW**, Kraaimaat FW, Geenen R, Bijlsma JW. Psychosocial predictors of functional change in recently diagnosed rheumatoid arthritis patients. *Behav Res Ther* 1998;**36**:179–93.

40 **Smith CA**, Wallston KA, Dwyer KA, Dowdy SW. Beyond good and bad coping: a multidimensional examination of coping with pain in persons with rheumatoid arthritis. *Ann Behav Med* 1997;**19**:11–21.

41 **Waltz M**, Kriegel M, van't Pad BP. The social environment and health in rheumatoid arthritis: marital quality predicts individual variability in pain severity. *Arthritis Care Res* 1998;**11**:356–74.

42 **Assendelft WJ**, Rikken SA, Mel M, Schoonheim PL, Schoenmaker PK, Dijkstra HR, et al. NHG-standaard Epicondylitis. *Huisarts en Wetenschap* 1997;**40**:21–6.

Appendix. Predictors of change in pain intensity and functional disability at 3 months (n=157) and 12 months (n=151) among patients with elbow complaints: results of the univariate analyses

predictor	pain intensity						functional disability					
	3 months			12 months			3 months			12 months		
	b	95% CI	p	b	95% CI	P	b[a]	95% CI	p	b[a]	95% CI	p
socio-demographic factors												
female (vs male)	-0.44	[-1.20; 0.32]	0.25	-0.35	[-1.27; 0.57]	0.45	-0.76	[-6.31; 4.79]	0.79	0.79	[-6.58; 8.17]	0.83
older age (per year)	-0.04	[-0.07; -0.01]	0.01*	-0.03	[-0.07; 0.01]	0.16*	-0.27	[-0.48; 0.05]	0.02*	-0.29	[-0.60; 0.02]	0.07*
employed (vs unemployed)	0.75	[0.03; 1.48]	0.04*	0.83	[-0.04; 1.70]	0.06*	4.82	[-0.43; 10.07]	0.07*	4.28	[-2.74; 11.31]	0.23
smoking never (vs yes/ever)	-0.11	[-0.88; 0.66]	0.78	0.14	[-0.80; 1.08]	0.77	-2.93	[-8.50; 2.64]	0.30	-1.41	[-8.92; 6.10]	0.71
education level:												
primary	0.00			0.00			0.00					
secondary	0.13	[-0.62; 0.89]	0.73	0.19	[-0.71; 1.10]	0.67	3.28	[-2.23; 8.79]	0.24	4.03	[-3.24; 11.30]	0.28
college/university	-0.73	[-1.89; 0.43]	0.21	-0.52	[-1.91; 0.87]	0.46	-0.64	[-9.05; 7.77]	0.88	4.15	[-7.00; 15.29]	0.46
married/living together (vs sinlge/widowed)	-0.20	[-1.04; 0.65]	0.65	0.18	[-0.84; 1.19]	0.73	-2.51	[-8.62; 3.60]	0.42	2.16	[-5.92; 10.25]	0.60
body mass index > 25 (kg/m2) (vs ≥ 25)	-0.53	[-1.25; 0.19]	0.15*	-0.25	[-1.09; 0.60]	0.56	2.50	[-2.69; 7.69]	0.34	1.26	[-5.62; 8.15]	0.72
not having children (vs having children)	0.45	[-0.26; 1.16]	0.21	0.51	[-0.33; 1.36]	0.23	5.17	[0.03; 10.32]	0.05*	6.63	[-0.18; 13.45]	0.06*
baseline scores outcome measures												
more intense pain (per point)	0.39	[0.23; 0.55]	0.00*	0.34	[0.15; 0.53]	0.00*	0.29	[-0.94; 1.52]	0.64	0.76	[-0.84; 2.37]	0.35
more disabled (per point)	0.02	[0.00; 0.04]	0.06*	0.01	[-0.01; 0.03]	0.44	0.34	[0.23; 0.46]	0.00*	0.40	[0.25; 0.55]	0.00*
characteristics complaint												
duration of current episode:												
< 1 week	0.00			0.00			0.00			0.00		
1 week - 1 month	-2.17	[-3.84; -0.50]	0.01*	-0.60	[-2.67; 1.48]	0.57	-2.30	[-14.73; 10.13]	0.71	2.98	[-13.84; 19.79]	0.73
1 month - 6 months	-2.38	[-4.01; -0.76]	0.00*	-0.45	[-2.47; 1.57]	0.66	-2.32	[-14.42; 9.78]	0.71	4.53	[-11.87; 20.93]	0.59
> 6 months	-2.82	[-4.52; -1.12]	0.00*	-2.19	[-4.29; 0.10]	0.04*	-6.56	[-19.20; 6.08]	0.31	-7.63	[-24.65; 9.38]	0.38
history of complaints (vs no history)	-0.49	[-1.29; 0.22]	0.18*	-2.11	[-2.90; -1.33]	0.00*	-4.73	[-9.84; 0.38]	0.07*	-13.99	[-20.47; -0.51]	0.00*
discomfort caused by complaint:												
no discomfort	0.00			0.00			0.00			0.00		
now and then	1.13	[-1.04; 3.31]	0.31	-1.03	[-3.86; 1.79]	0.47	-1.43	[-18.53; 15.68]	0.87	-15.76	[-38.30; 6.78]	0.17*
regularly	1.29	[-0.81; 3.39]	0.23	0.01	[-2.71; 2.72]	1.00	-5.87	[-22.47; 10.74]	0.49	-16.19	[-37.86; 5.48]	0.14*
almost continuously	1.08	[-0.99; 3.14]	0.30	0.01	[-2.66; 2.68]	0.99	0.48	[-15.90; 16.87]	0.95	-9.84	[-31.18; 11.49]	0.36

predictor	pain intensity						functional disability					
	3 months			12 months			3 months			12 months		
	b	95% CI	p	b	95% CI	p	b	95% CI	p	b	95% CI	p
localised complaint (vs generalised complaint)[b]	-0.04	[-0.83; 0.75]	0.92	1.33	[0.39; 2.27]	0.01*	1.12	[-4.60; 6.85]	0.70	8.08	[0.45; 15.71]	0.04*
complaint at both elbows (vs at one elbow)	-0.11	[-1.18; 0.97]	0.84	-1.15	[-2.35; 0.05]	0.06*	0.30	[-7.40; 7.99]	0.94	-7.32	[-17.20; 2.57]	0.15*
complaint at dominant arm (vs other arm)	0.76	[0.06; 1.47]	0.03*	0.11	[-0.74; 0.96]	0.80	1.93	[-3.24; 7.10]	0.46	7.00	[0.25; 13.76]	0.04*
no use of medication (vs use)	-0.27	[-0.99; 0.46]	0.47	0.45	[-0.42; 1.32]	0.31	-3.04	[-8.27; 2.20]	0.25	3.96	[-2.99; 10.91]	0.26
putative cause of the complaint (vs 'no'):												
overload due to usual activities	0.16	[-0.55; 0.87]	0.66	-0.14	[-0.99; 0.72]	0.75	2.35	[-2.81; 7.51]	0.37	0.33	[-6.53; 7.20]	0.92
overload due tounusual activities	0.52	[-0.60; 1.63]	0.36	0.75	[-0.50; 2.00]	0.24	-5.31	[-13.34; 2.71]	0.19*	-2.53	[-12.59; 7.54]	0.62
overload due to sports/exercise	0.74	[-0.54; 2.03]	0.26	0.84	[-0.95; 2.63]	0.36	2.67	[-6.65; 11.99]	0.57	3.80	[-10.61; 18.22]	0.60
accident during sports/exercise	*no sports accident*			*no sports accident*			*no sports accident*			*no sports accident*		
accident elsewhere	0.83	[-0.46; 2.11]	0.21	0.62	[-0.95; 2.19]	0.44	15.96	[6.98; 24.93]	0.00*	15.57	[3.20; 27.94]	0.01*
anxiety / stress	0.66	[-0.43; 1.74]	0.24	-1.31	[-2.61; -0.02]	0.05*	-0.53	[-8.41; 7.35]	0.89	-4.72	[-14.99; 5.55]	0.37
chronic disease	-1.41	[-2.85; 0.03]	0.06*	-0.96	[-2.67; 0.74]	0.27	-8.54	[-18.98; 1.90]	0.11*	-11.01	[-24.62; 2.61]	0.11*
other cause	-0.48	[-1.34; 0.38]	0.27	-0.20	[-1.21; 0.80]	0.69	-3.54	[-9.76; 2.68]	0.26	-6.37	[-14.49; 1.74]	0.12*
unknown	0.02	[-1.03; 1.06]	0.97	-0.38	[-1.59; 0.82]	0.53	-1.19	[-8.75; 6.36]	0.76	-0.71	[-10.21; 8.80]	0.88
symptoms (vs 'no'):												
prickling/tingling in hand/fingers	-0.50	[-1.21; 0.22]	0.17*	-0.66	[-1.52; 0.20]	0.13*	1.17	[-4.04; 6.39]	0.66	-0.78	[-7.69; 6.13]	0.82
numbness feeling in hand/fingers	0.02	[-0.83; 0.87]	0.96	-0.70	[-1.69; 0.28]	0.16*	0.02	[-6.10; 6.14]	1.00	-3.17	[-11.02; 4.68]	0.43
loss of strength	0.46	[-0.25; 1.17]	0.20*	0.32	[-0.53; 1.17]	0.45	6.13	[1.07; 11.20]	0.02*	9.41	[2.74; 16.08]	0.01*
loss of hand coordination	0.69	[-0.48; 1.86]	0.25	-0.82	[-2.28; 0.64]	0.27	2.40	[-6.10; 10.89]	0.58	-3.38	[-15.14; 8.38]	0.57
tendency to shake hands	0.09	[-0.74; 0.91]	0.83	0.21	[-0.80; 1.23]	0.68	2.87	[-3.06; 8.81]	0.34	4.26	[-3.89; 12.41]	0.30
tendency to massage hands	0.01	[-0.71; 0.73]	0.98	-0.55	[-1.41; 0.30]	0.20*	1.25	[-3.94; 6.45]	0.63	1.93	[-4.95; 8.80]	0.58
musculoskeletal co-morbidity (vs 'no')):												
no co-morbidity	0.63	[-0.09; 1.35]	0.08*	1.01	[0.16; 1.86]	0.02*	-0.03	[-5.29; 5.22]	0.99	0.63	[-6.31; 7.58]	0.86
complaints hip / knee	-0.84	[-1.67; -0.01]	0.05*	-1.21	[-2.18; -0.24]	0.02*	-2.93	[-8.97; 3.11]	0.34	-6.58	[-14.45; 1.29]	0.10*
complaints ankle/foot	-0.87	[-1.85; 0.11]	0.08*	-1.19	[-2.36; -0.03]	0.05*	-5.80	[-13.01; 1.42]	0.11*	-8.29	[-17.70; 1.12]	0.08*
complaints back	-0.15	[-0.88; 0.58]	0.68	-0.75	[-1.61; 0.12]	0.09*	1.13	[-4.15; 6.41]	0.67	-0.97	[-7.92; 5.99]	0.78
multiple musculoskeletal complaints	-1.46	[-2.42; -0.50]	0.00*	-1.90	[-3.02; -0.78]	0.00*	-5.89	[-12.98; 1.19]	0.10*	-4.98	[-14.28; 4.33]	0.29
other diseases/ problems (vs 'no')	0.30	[-0.41; 1.02]	0.41	-0.61	[-1.46; 0.25]	0.16*	2.68	[-2.49; 7.86]	0.31	0.49	[-6.42; 7.40]	0.89
menopause[c] (vs 'no')	-0.18	[-1.14; 0.79]	0.72	0.57	[-0.67; 1.81]	0.36	-0.99	[-8.75; 6.76]	0.80	2.80	[-7.71; 13.31]	0.60
physical activity (norm met)												
ACSM position stand[d] (vs not met)	0.03	[-1.06; 1.12]	0.96	-0.08	[-1.47; 1.30]	0.91	0.07	[-7.82; 7.95]	0.99	-3.91	[-15.02; 7.19]	0.49
Norm Healthy Activity (vs not met)	-0.22	[-0.94; 0.50]	0.54	-0.07	[-0.86; 0.87]	0.99	-5.70	[-10.84; -0.56]	0.03*	-4.34	[-11.23; 2.55]	0.22

predictor	pain intensity						functional disability					
	3 months			12 months			3 months			12 months		
	b	95% CI	p	*b*	95% CI	p	*b*	95% CI	p	*b*	95% CI	p
psychosocial factors												
coping with pain (per point increase):												
more pain transformation	-0.01	[-0.15; 0.13]	0.86	-0.14	[-0.30; 0.01]	0.08*	0.17	[-0.83; 1.18]	0.73	-0.10	[-1.37; 1.18]	0.88
more distraction	-0.04	[-0.15; 0.06]	0.43	-0.02	[-0.14; 0.10]	0.76	-0.11	[-0.86; 0.64]	0.77	-0.14	[-1.14; 0.85]	0.78
more reducing demands	-0.04	[-0.23; 0.15]	0.67	-0.13	[-0.33; 0.08]	0.23	0.34	[-1.02; 1.69]	0.62	0.19	[-1.46; 1.85]	0.82
more retreating	-0.08	[-0.17; 0.00]	0.06*	-0.15	[-0.25; -0.04]	0.01*	-0.70	[-1.33; -0.07]	0.03*	-0.98	[-1.82; -0.14]	0.02*
more worrying	0.00	[-0.07; 0.07]	0.95	-0.11	[-0.19; -0.03]	0.01*	-0.39	[-0.90; 0.13]	0.14*	-0.89	[-1.56; -0.22]	0.01*
more resting	0.02	[-0.09; 0.13]	0.73	-0.03	[-0.16; 0.10]	0.69	0.07	[-0.73; 0.87]	0.87	0.27	[-0.76; 1.30]	0.61
more distress (per point increase)	-0.06	[-0.15; 0.04]	0.27	-0.14	[-0.26; -0.03]	0.01*	-0.56	[-1.27; 0.15]	0.12*	-0.97	[-1.91; -0.04]	0.04*
kinesiophobia (per point increase):												
more fear and avoidance	0.01	[-0.01; 0.04]	0.21	-0.01	[-0.04; 0.01]	0.31	0.10	[-0.06; 0.25]	0.23	0.04	[-0.17; 0.25]	0.70
importance of exercise	0.00	[-0.02; 0.01]	0.75	0.00	[-0.02; 0.02]	0.85	0.04	[-0.09; 0.16]	0.55	0.03	[-0.13; 0.20]	0.68
social support[e]												
low	0.00			0.00			0.00			0.00		
medium	-0.49	[-1.30; 0.33]	0.24	0.22	[-0.74; 1.17]	0.65	-1.62	[-7.43; 4.19]	0.58	3.23	[-4.41; 10.87]	0.40
high	-1.12	[-2.08; -0.15]	0.02*	-1.24	[-2.36; -0.12]	0.03*	-7.80	[-14.71; -0.89]	0.03*	-10.15	[-19.02; -1.27]	0.03*
general health												
better perceived health (per point increase)	0.12	[-0.27; 0.52]	0.54	0.35	[-0.10; 0.81]	0.13*	0.57	[-2.30; 3.44]	0.69	1.09	[-2.59; 4.77]	0.56
moderate/bad quality of life (vs good-excellent)	-0.45	[-1.43; 0.53]	0.36	-1.56	[-2.69; -0.42]	0.01*	-2.68	[-9.79; 4.44]	0.46	-8.52	[-17.12; 0.07]	0.05*
more vital (per point increase)	0.01	[-0.01; 0.03]	0.38	0.01	[-0.01; 0.03]	0.19*	0.03	[-0.10; 0.16]	0.66	-0.01	[-0.18; 0.16]	0.94

b, regression coefficient; CI, confidence interval; vs, versus; * p<0.20

[a] a positive *b* means a favourable change in pain/disability per unit of the putative predictor; a negative *b* means an unfavourable change in pain/disability per unit of the putative predictor

[b] patients with only an elbow complaint versus patients with an additional complaint at the upper extremity

[c] selection of women

[d] American College of Sports Medicine Position Stand

[e] a higher score on the social support scale means less social support