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## Objective

The objective of this study was to investigate comorbidities in cervical dystonia (CD) and effect of CD to retirement in Finland.

## Background

Dystonia is a movement disorder characterized by abnormal movements or postures created by sustained or intermittent involuntary muscle contractions (1). CD is most common form of dystonia, the prevalence being 394 persons per million in Finland.

The most prominent feature of CD is abnormal posture of head and tremor. Besides the motoric symptoms, non-motoric symptoms, especially psychiatric comorbidities and pain have been reported to occur in CD (2). The onset of CD is usually before 60 years of age, and even though CD does not reduce life expectancy, it may cause severe functional and psychosocial impairment in everyday life (3,4).

In a questionnaire study in Finland, CD was reported to cause earlier retirement than in average population (5). Employment status is also affected by CD, and 69% of patients was reported to have reduced overall productivity (7, 8).

We studied what other diagnoses are registered with patients with primary focal CD in care registry. Moreover, the effect of CD to pension months before age of 65 years from provinces of Uusimaa and Pirkanmaa 2007-2016 (total population 2 043 819) was assessed. The study was based on care registry ICD-10 data, retirement data and patient records from university hospitals of Tampere and Helsinki.

## Methods

The patient material comprised of patients ranged 16-85 years old with primary focal cervical dystonia from university hospitals of Helsinki and Tampere. Patients had received treatment because of dystonia during years 2007-2016. The diagnosis was confirmed from patient records according to classification of dystonia (1). For each patient four gender and age matched controls was assigned.

The comorbidity was assessed by retrieving all ICD-10 codes from care registry of National Institute of Health and Welfare (THL) for CD patients and controls. The diagnoses with less than 3 visits per diagnosis were removed. In primary analysis, first three characters of ICD-10 codes were used to define category, and for selected categories, a fourth character was used to define category.

The retirement data was obtained from Finnish Centre for Pensions. The number of retirement months before of age 65 years was calculated and further divided into groups under 45 years, 45-55 years and 55-65 years, as well as type of retirement (old-age pension or sickness pension, partial or full-time pension), and the diagnoses of retirement.

Mann-Whitney U -test was used to compare the number of pension months and age of retirement. Chi-square test was used to compare the diagnoses between patients and control group. Bonferroni correction was used to account for multiple comparisons.  $p < 0,05$  was considered to be statistically significant.

## Results

From years 2007-2016 1013 records of 937 adult primary focal CD patients were screened. The results were compared to 3746 age and gender matched controls.

The registered comorbidities of CD patients as compared to controls were screened from care registry ICD-10 codes. 13 diagnosis codes were left with significantly different occurrence between CD patients and controls (Table 1). Recurrent and single episode of depression were combined as depressive disorders and phobic and other anxiety disorders were combined as anxiety disorders. Most prominent comorbidities were depression and anxiety, cervical disk disorders and dorsalgia. The diagnosis codes of tension neck and essential tremor were also more common with CD patients.

**Table 1. Comorbidities with cervical dystonia patients**

Diagnosis	Patient n= 937	Control n = 3746	OR (95% CI)	p-value
Cervical disc disorders	23 (2,5%)	16 (0,4%)	5,9 (3,1 - 11,1)	<10 <sup>-5</sup>
Dorsalgia	100 (10,7%)	213 (5,7%)	2 (1,5 - 2,5)	<10 <sup>-4</sup>
Unspecific soft tissue disorders	53 (5,7%)	94 (2,5%)	2,3 (1,7 - 3,3)	<0,05
Essential tremor	44 (4,7%)	2 (0,1%)	92,2 (22,3 - 381,2)	<10 <sup>-5</sup>
Tension neck	19 (2%)	18 (0,5%)	4,3 (2,2 - 8,2)	<10 <sup>-5</sup>
Depressive disorders	120 (12,8%)	166 (4,4%)	3,2 (2,5 - 4,1)	<10 <sup>-5</sup>
Anxiety disorders	61 (6,5%)	61 (1,6%)	4,2 (2,9 - 6)	<10 <sup>-5</sup>
Somatoform disorders	16 (1,7%)	12 (0,3%)	5,4 (2,5 - 11,5)	<0,005
Specific personality disorders	17 (1,8%)	17 (0,5%)	4,1 (2,1 - 8)	<0,05
Dental caries	134 (14,3%)	363 (9,7%)	1,6 (1,3 - 1,9)	<0,05
Abdominal and pelvic pain	74 (7,9%)	148 (4%)	2,1 (1,6 - 2,8)	<0,0005

OR, odds ratio, CI, confidence interval

### Retirement rate

348 (37%) CD patients and 550 (15%) controls had been on full-time or partial sickness pension. The final retirement age, as calculated of patients of over 65 years, was significantly lower with dystonia patients than controls (56,1 ± 8,3 vs. 59,8 ± 6,7 years,  $p < 10^{-5}$ , Mann-Whitney U test).

In average, CD patients had significantly more full-time retirement months before of age 65 years than controls (32,8 ± 67,2 vs. 13,3 ± 47,1 months,  $p > 10^{-5}$ ). The average months of sickness pension were higher in all age groups in CD patients compared with control group. CD patients had also significantly more partial sickness pension months than controls (4,6 ± 21,1 vs. 1,0 ± 9,0 months,  $p > 10^{-5}$ ). (Figure 1)

The patients with dystonia and anxiety/depression had significantly more of retirement months than dystonia patients without anxiety/depression (54,8±80 vs 29,3±64,3 months). Similarly, CD patients with anxiety/depression had more sickness pension months than control patients with anxiety/depression (39,4±72,9 months), however, the difference did not reach significance. (Figure 2)

### The diagnoses of retirement with CD patients

Of all studied CD patients, 19% were retired because of dystonia. As compared to 10 most common retirement diagnoses in control group, besides dystonia diagnosis, the diagnosis codes for depression and anxiety were more common with CD patients than controls. Other diagnoses had mostly similar occurrence. (Table 2)

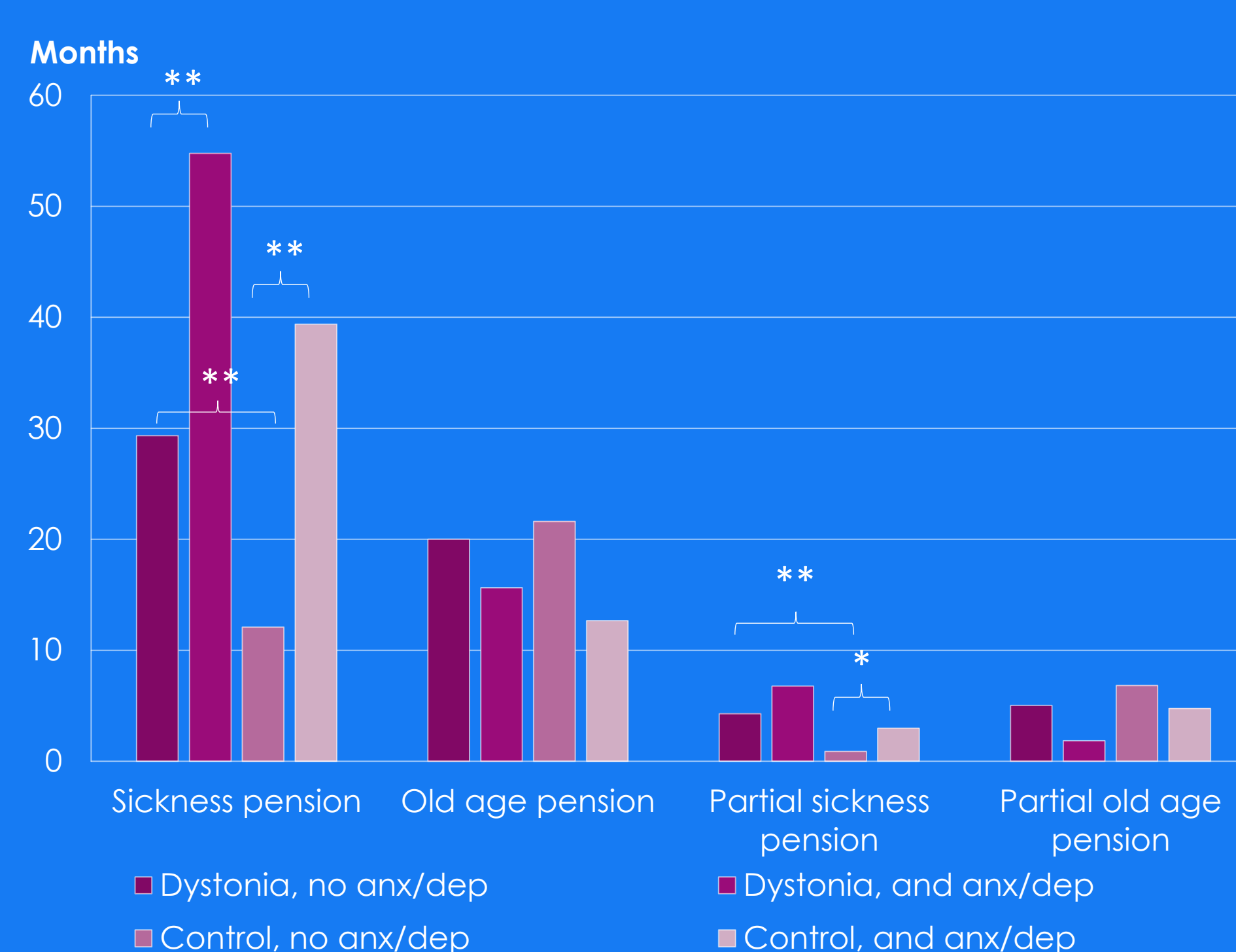
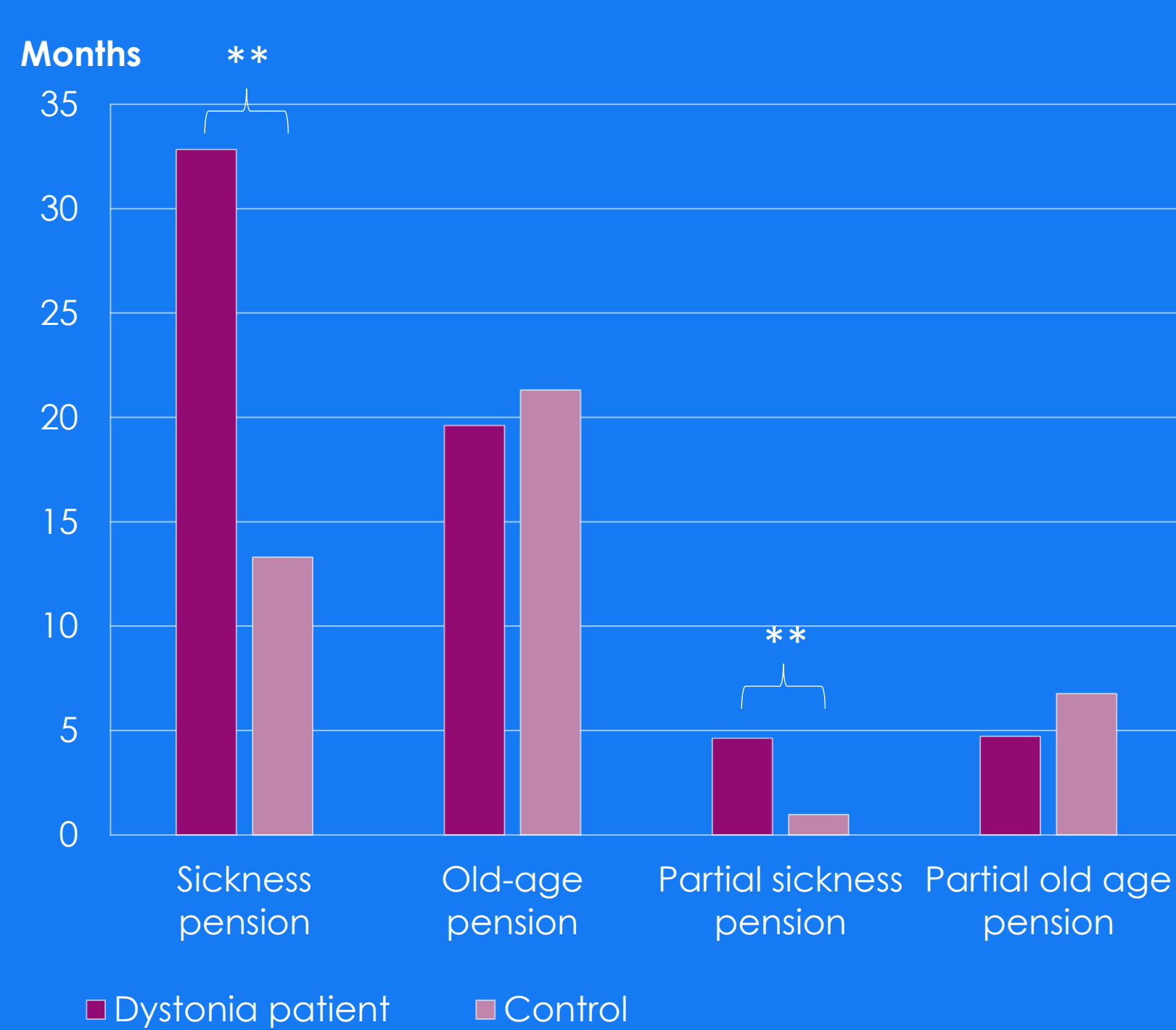


Figure 1. Average pension months before age of 65 years. \*\*  $p < 10^{-5}$

Figure 2. Retirement months with patients and controls with and without anxiety or depression. \*  $p < 10^{-3}$ . \*\*  $p < 10^{-5}$

**Table 2. 10 most common retirement diagnoses in cervical dystonia patients.**

Diagnosis	Patient n = 937	Control n = 3746	OR (95% CI)	p
Dystonia	178 (19%)	0 (0%)	-	<10 <sup>-4</sup>
Major depressive disorder, single episode	48 (5%)	72 (2%)	2,76 (1,9 - 4)	<10 <sup>-4</sup>
Major depressive disorder, recurrent	26 (3%)	43 (1%)	2,46 (1,5 - 4)	n.s.
Other anxiety disorders	22 (2%)	23 (1%)	3,89 (2,2 - 7)	<0,005
Shoulder lesions	14 (1%)	25 (1%)	2,26 (1,2 - 4,4)	n.s.
Thoracic, lumbar intervertebral disc disorders	13 (1%)	37 (1%)	1,41 (0,7 - 2,7)	n.s.
Specific personality disorders	12 (1%)	16 (0%)	3,02 (1,4 - 6,4)	n.s.
Osteoarthritis of knee	11 (1%)	48 (1%)	0,92 (0,5 - 1,8)	n.s.
Bipolar disorder	8 (1%)	6 (0%)	5,37 (1,9 - 15,5)	n.s.
Dorsalgia	8 (1%)	17 (0%)	1,89 (0,8 - 4,4)	n.s.

OR, odds ratio, CI, confidence interval

## Conclusions

Cervical dystonia reduces considerably working ability and leads to earlier retirement.

Anxiety and depression are most notable comorbidities, even though their occurrence was less than previously reported. As we did not actively screen for psychiatric symptoms, it is likely, that the true comorbidity of psychiatric disorders is lot higher, and a considerable proportion of them are not diagnosed or reported in care registry.

The co-occurrence of psychiatric disorders further reduces more working ability.

Our results suggest that more health care resources should be administered in treatment of CD to longer maintain working ability of CD patients.

Psychiatric comorbidities should be taken into consideration in CD treatment.

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