

# Extrapyramidal signs in cognitively intact elderly people

RICHARD PRETTYMAN

Department of Psychiatry for the Elderly, University of Leicester, The Bennion Centre, Glenfield General Hospital, Groby Road, Leicester LE3 9DZ, UK. Fax: (+44) 116 2502770

## Abstract

**Aim:** to investigate the prevalence of extrapyramidal signs in elderly people and their relationship to disease.

**Setting and subjects:** 151 non-demented subjects age 65 and over living within a defined geographical area in Nottingham who were participating in the MRC multicentre Cognitive Function and Ageing Study.

**Measurements:** subjects were assessed at home. Extrapyramidal signs were rated according to a standardized neurological examination using items from the Unified Parkinson's Disease Rating Scale.

**Results:** bradykinetic and hypokinetic abnormalities are a frequent finding, especially in the oldest old. Over 50% of subjects aged 80 or over demonstrated at least one such sign. Only 10% of subjects had any recorded neurological disease.

**Conclusions:** the frequency of recognized neurological and other disease is insufficient to account for the rate of subtle extrapyramidal abnormalities found. These findings may thus represent intrinsic age-related changes in neurological functioning, this being consistent with previously described pathological changes in the substantia nigra and striatum in normal ageing.

**Keywords:** ageing, neurological deficit, parkinsonism

## Introduction

Although signs of parkinsonism are often regarded as common in older people, there are only limited published data on the prevalence of the various manifestations of extrapyramidal disturbance. This issue is relevant when one considers the extent to which neurological deficit in old age reflects discrete pathological states rather than intrinsic age-related changes. In order to clarify the relationship between abnormal neurological signs and disease, numerous studies have investigated the prevalence of parkinsonism and other signs determined, using varying degrees of standardization, within groups of individuals at various ages. The interpretation of some of these findings has been complicated by the use of highly selected samples [1, 2] or emphasis on relatively young subjects [3, 4]. Nevertheless, data such as these are essential points of reference when deciding whether extrapyramidal signs in an older person are diagnostically important.

The aim of the present study was to clarify the relationship between ageing and the presentation of signs of extrapyramidal dysfunction by means of a standardized neurological assessment of non-demented elderly people who were otherwise unselected with respect to morbidity.

## Methods

### Subjects

The Medical Research Council-funded multicentre Cognitive Function and Ageing Study provided an opportunity to assess aspects of neurological function in a community-derived sample of non-demented but otherwise unselected community-dwelling elderly people (age >65 years) in Nottingham. The original sample of 2500 was drawn from Family Health Service Authority lists for a defined geographical area and was weighted to include a greater proportion of individuals aged 75 or over. The data presented here refer to a randomly selected subset of 150 of those individuals who were cognitively intact at inception and had not become significantly cognitively impaired at 2-year follow-up (AGECAT [5] organicity index >3). There were 91 subjects (56 women, 35 men) aged 65–79 years ('young-old') and 60 (39 women, 21 men) aged 80 or over ('old-old').

### Procedures

All subjects were assessed at home by a single investigator using a standardized clinical evaluation

schedule. Extrapyrarnidal signs were assessed using items derived from the motor section of the Unified Parkinson's Disease Rating Scale [6]. The ordinal ratings obtained were dichotomized for this analysis: subjects with no degree of abnormality for a particular sign were classed as 'normal' and subjects with any degree of abnormality were classed as 'abnormal'. The presence of established neurological and other disorders was ascertained on the basis of a positive history or unequivocal evidence from the examination.

### Analysis

Data were analysed using the SPSS for Windows 6.0 package.  $\chi^2$  tests were used to compare the proportions of subjects in each of the two age groups for each neurological sign. The proportions of subjects in each of the groups with identified neurological and other diagnoses were compared by means of  $\chi^2$  or Fisher's exact tests as appropriate.

### Results

The mean age of the younger subjects was 73.1 years and that of the older subjects 85.4 years. The prevalence of neurological and other diagnoses amongst the subjects by age group is shown in Table 1. The category of 'cardiovascular' disease included valvular heart disease, hypertension and all manifestations of atherosclerotic vascular disease except for cerebrovascular disease, which was recorded separately. 'Skeletal disease' included all forms of degenerative and inflammatory arthropathy and osteoporosis. No neurological diagnoses other than Parkinson's disease, stroke, epilepsy and peripheral neuropathy were recorded in the subjects. There were no significant differences between the groups in respect of the prevalence of any of these diagnoses.

Data collected on neuroleptic and other medications known to be associated with extrapyramidal side-effects revealed that two subjects (ages 78 and 80) were taking prochlorperazine.

The frequencies of extrapyramidal signs amongst the two groups are presented in Table 2. Impaired finger tapping, impaired heel tapping, impaired rapid tongue movements, hypomimia, flexed posture, slow or shuffling gait and action tremor in the arms were all significantly more common amongst the 'old-old' group. Of the 107 subjects with at least one of the above signs, the mean age was 78.2 years. This was significantly older ( $t = 1.97$ ;  $P = 0.05$ ) than that of the group of subjects without any signs whose mean age was 74.2 years. Overall, rest tremor was the least frequent abnormality. There were no significant differences between male and female subjects in the prevalence of any of these signs.

### Discussion

These findings are consistent with those of a recently described study of community-dwelling elderly people which found that parkinsonism was common, the prevalence increasing from around 15% in 65-74-year-olds to around 52% in those aged over 85 years [7]. These rates greatly exceed recent estimates of the prevalence of idiopathic Parkinson's disease at around 1% of persons aged over 65 years [8, 9, 10], suggesting that this form of motor abnormality may be a different and more intrinsically age-related phenomenon.

Support for this hypothesis can be found from *post mortem* studies of elderly subjects who have not exhibited clinically diagnosed neurological disease during life: there is evidence that with increasing age there is a decline in cell numbers in the corpus striatum [11] and substantia nigra [12] and increasing accumulation of melanin [13] and reduction in nucleolar volume [14] in neurons of the substantia nigra; the latter finding suggesting a decrease in protein synthesis consistent with reduced cellular activity. Other pathological studies [15, 16] have demonstrated a rising prevalence of Lewy bodies in the substantia nigra with increasing age in subjects without clinical evidence of disease, and a correlation between this and a reduction in numbers of pigmented neurons. More direct

Table 1. Prevalence of neurological and other diagnoses

Diagnosis	Age group (years)		
	65-79 ( <i>n</i> = 91)	80+ ( <i>n</i> = 60)	All ( <i>n</i> = 151)
Parkinson's disease	1 (1%)	1 (2%)	2 (1%)
Stroke	2 (2%)	5 (8%)	7 (5%)
Epilepsy	2 (2%)	2 (3%)	4 (3%)
Peripheral neuropathy	0	1 (2%)	1 (1%)
Diabetes mellitus	3 (3%)	4 (7%)	7 (5%)
Cardiovascular disease	18 (20%)	17 (28%)	35 (23%)
Skeletal disease	42 (46%)	33 (55%)	75 (50%)

Table 2. Prevalence of extrapyramidal signs

Sign	No. (and %) by age group		
	65–79 years ( <i>n</i> = 91)	80+ years ( <i>n</i> = 60)	All ( <i>n</i> = 151)
Impaired finger tapping	22 (24%)	32 (53%) <sup>h</sup>	54 (36%)
Impaired heel tapping	9 (11%) <sup>a</sup>	19 (35%) <sup>b</sup>	28 (20%) <sup>d</sup>
Impaired rapid tongue movements	29 (32%)	31 (52%) <sup>f</sup>	60 (40%)
Hypomimia	13 (14%)	32 (53%) <sup>h</sup>	45 (30%)
Flexed posture	8 (9%)	25 (42%) <sup>c</sup>	33 (22%) <sup>c</sup>
Slow or shuffling gait	11 (12%)	17 (29%) <sup>c</sup>	28 (19%) <sup>c</sup>
Body bradykinesia	2 (2%)	6 (10%); NS	8 (5%)
Rigidity in arms	4 (4%)	7 (12%) <sup>c</sup> ; NS	11 (7%) <sup>c</sup>
Action tremor in arms	9 (10%)	17 (28%) <sup>g</sup>	26 (17%)
Rest tremor in arms	4 (4%)	3 (5%); NS	7 (5%)

<sup>a</sup>*n* = 85; <sup>b</sup>*n* = 55; <sup>c</sup>*n* = 59; <sup>d</sup>*n* = 140; <sup>e</sup>*n* = 150.

Significant differences between 'young-old' and 'old-old' groups: <sup>f</sup>*P* < 0.05; <sup>g</sup>*P* < 0.01; <sup>h</sup>*P* < 0.001 ( $\chi^2$  test, *df* = 1).

evidence of functional change in the extrapyramidal system comes from the finding of an age-related decline in the concentration of tyrosine hydroxylase, one of the enzymes involved in dopamine synthesis, in the caudate nucleus, putamen and nucleus accumbens [12]. Bradykinetic abnormalities, which were amongst the most common abnormalities in this study, are most strongly correlated with reduced nigrostriatal F-6-fluorodopa uptake in a positron emission tomography study of patients with Parkinson's disease [17].

An alternative hypothesis is that subtle neurological deficit of the kind described here is associated with cerebrovascular disease: there is a long-established association between ageing and pathological changes in the cerebral vasculature [18, 19, 20] as well as a rising prevalence of recognized risk factors for cerebrovascular disease [21, 22]. Although there was no significant excess of vascular diagnoses within the older group, this possibility cannot be excluded because of the crude method of ascertaining cerebro- and other vascular disease. A study using more refined and sensitive methods of assessing vascular integrity is required to fully investigate this hypothesis.

The high prevalence of skeletal disease in both groups was broadly consistent with the findings of studies investigating the epidemiology of joint disease [23] in old age. Locomotor dysfunction due to skeletal disease may have caused some spurious abnormalities within the neurological assessment, for example on tests of fine repetitive movement. However, as the rate of skeletal disease amongst the older subjects did not differ significantly from that of the younger subjects, this seems unlikely to account for the observed differences.

In conclusion, a subtle abnormality of extrapyramidal function is common in older people, particularly the oldest old. This probably reflects either a primary

age-related change in the structure and function of the substantia nigra and basal ganglia or a secondary effect attributable to cerebrovascular changes. Study of the relationship between clinical features, such as those comprising the Parkinson's Disease Society Brain Bank diagnostic criteria, and pathological diagnosis in Parkinson's disease suggests that an akinetic/rigid presentation has less positive and negative predictive value than other clinical features of Parkinson's disease [24]. Thus a high 'background level' of predominantly bradykinetic/hypokinetic extrapyramidal deficit indicates that care is needed in diagnosing Parkinson's disease in very old people in whom the presence of a rest tremor may be the most specific sign.

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## Key points

- Bradykinetic and hypokinetic motor abnormalities are common in elderly people, especially the very old.
- Rates of diagnosed neurological disease are insufficient to account for this.
- A hypothesis of intrinsic age-related change in extrapyramidal function is supported by evidence from pathological studies of normal ageing.

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