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Personality Characteristics and Motor Skills Attributed to Occupations in Parkinson Disease

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Abstract

Background—It has previously been speculated that a distinct premorbid personality characterized by introversion, rigidity, and over cautiousness might be associated with Parkinson disease (PD). Only 1 previous study has assessed personality before PD onset, and other data collected retrospectively do not exclude reverse causation.

Objective—We relied on the longest held job reported in an interview to infer personality traits and motor skills for 355 incident PD patients and 335 population controls enrolled in a PD study in California.

Methods—Jobs were coded according to the 1980 US Census Occupational Code and assigned scores for various demands, skills, and aptitudes required by the job.

Results—None of the occupational temperament or interest factors required, expected, or exhibited by workers were related to statistically significantly higher odds of having PD per unit increase in scores, whereas there was some suggestion of differences when the extremes were examined. Analyses of physical aptitude factors showed that PD cases were less likely to have worked in jobs that involved certain motor skills.

Conclusions—This study uses a novel approach to assess personality traits using occupational characteristics. Most job attributes thought to reflect conservativeness; risk taking, stress resistance, and flexibility were not associated with PD in a linear manner. Thus, these occupation-derived traits do not seem to support the existence of a distinct parkinsonian personality. However, the negative associations with jobs requiring certain motor skills are intriguing, and may suggest very early premotor features or a lack of continuous motor training as a risk factor for PD.

Keywords

Parkinson disease; personality; motor skills; premorbid; occupation

Based mainly on anecdotal data, it has long been proposed that a distinct personality type might precede and possibly predict the onset of Parkinson disease (PD), a debilitating

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neurodegenerative disorder characterized by progressive death of dopaminergic neurons and accumulation of Lewy bodies in the midbrain[1–3] that, together with dysfunction in serotonergic and noradrenergic systems, causes motor[4,5] and a host of nonmotor symptoms.[6,7] In patients diagnosed with idiopathic PD, changes in mood, behavior, and personality have long been noted to cooccur with the disease.[8] The hypothesized premorbid Parkinsonian personality is purportedly characterized by traits such as introversion, rigidity, stoicism, and overcautiousness or risk avoidance.[9] If specific traits in fact precede the onset of motor symptoms in PD by decades or more, they may possibly be very early manifestations of neuropathologic dysfunction in the dopaminergic system before other signs of the disease.

Some,[10–12] but not all,[2,13] previous epidemiologic studies that assessed personality traits at or after PD diagnosis support the notion of a characteristic Parkinsonian personality. The only study to date that assessed personality before PD onset did not support an expected association between PD and an introverted personality.[14] Thus, it is not well established whether the personality patterns attributed to PD are in fact lifelong traits that are distinctive long before a diagnosis based on motor symptoms is made or are a consequence of disease[9]; that is, become manifested when significant disruption in the dopaminergic system occurs, or, alternatively, are a consequence of treatment for PD.[12,15]

Epidemiologic studies have consistently demonstrated inverse associations between cigarette smoking and PD risk. Although this may be due to neuroprotection, it has also been hypothesized that behavioral and genetic factors may influence the propensity to initiate and maintain the habit in PD patients. Some researchers suggested that risk-taking and novelty-seeking behaviors are modulated by dopamine.[16] This has led to speculations that PD patients may not experience normal pleasurable rewards throughout their lives due to innate or very early dysfunction in the dopamine pathway that contribute to personality or behavioral patterns. If premorbid characteristics in personality exist in PD, they may be of value for identifying groups at risk for PD early in the disease course, especially among those with a family history of PD, or alternatively provide hints about genetic predispositions or early dysfunction in the dopaminergic system.

To assess personality traits in patients with PD, the majority of descriptive and analytical studies have used personality inventories and questionnaires[10–14,17]; 1 study inferred personality traits from patients' reported hobbies or favorite activities.[18] Some,[19–21] but not all,[22] of the case-control studies that assessed personality retrospectively, found differences in personality traits reported by PD cases and controls.

As most people spend a substantial portion of their adult years working in specific jobs or occupations, and given that research has suggested that career choice is influenced by a number of factors, including personality,[23] inferring personality characteristics and abilities from the longest held job might enable us to observe distinct patterns if they exist for PD. This approach has the added advantage that large portions, if not all, of work history precede the diagnosis of PD by more than decades, and thus might be indicative of premorbid personality and abilities. In this study, we use lifetime occupational histories collected from study subjects enrolled in a population-based study of PD to examine whether inferred personality and motor abilities differ between PD patients and controls.

MATERIALS AND METHODS

Study Population

The Parkinson's Environment and Gene study was a population-based case-control study that recruited participants from largely rural areas of California; details of this study are

provided elsewhere.[24] In brief, PD cases newly diagnosed between January 1998 and January 2007 that resided in Fresno, Tulare, and Kern Counties, and had lived in California for at least 5 years before diagnosis, were recruited into our study within 3 years of diagnosis. Altogether, 28 of the 31 practicing local neurologists (90%) who provided care for PD patients assisted in recruiting cases for this study. We solicited collaboration from Kaiser Permanente, Kern and Visalia Medical Centers and the Veteran's Administration, PD support groups, local newspapers, and local radio stations that broadcast public service announcements.

Of the 1167 PD cases who were initially invited, 604 were not eligible: 397 patients because their diagnosis date fell outside the 3-year range before contact; 51 denied having received a PD diagnosis; 134 lived outside the tricounty area; and 22 were too ill to participate. Of the 563 eligible cases, 473 (84%) were examined by a UCLA movement disorder specialist at least once, and confirmed as having clinically probable or possible PD; the remaining 90 potential cases could not be examined or interviewed (54% withdrew, 32% were too ill or died, and 14% moved out of the area before the examination or did not honor a scheduled appointment). We examined but excluded another 93 patients due to other causes of Parkinsonism, leaving us with 379 cases; of these, 368 provided information needed for analyses.

Controls >65 years of age were identified from Medicare lists in 2001, but due to Health Insurance Portability and Accountability Act implementation prohibiting the use of Medicare enrollees, 70% of our controls were recruited from randomly selected tax assessor residential units (parcels) in each of the 3 counties. We mailed letters of invitation to a random selection of residential living units and also attempted to identify head-of-household names and telephone numbers for these parcels using the services of marketing companies and internet searches.

We contacted 1212 potential population controls by mail and/or phone for eligibility screening using the following criteria: (1) not having PD; (2) being at least 35 years of age; (3) currently residing primarily in 1 of the 3 counties; and (4) having lived in California for at least 5 years before the screening. Only 1 person per household was allowed to enroll. Four hundred fifty-seven controls were ineligible, 409 were too young, 44 were terminally ill, and 4 primarily resided outside of the study area. Of the 755 eligible population controls, 409 (54%) declined participation, they were too ill to honor an appointment, or moved out of the area before interview; 346 (46%) were enrolled and 341 provided information needed for analyses.

Data Collection

Trained interviewers who were unaware of case/control status conducted structured telephone interviews to obtain demographic and exposure data from study participants. Detailed questionnaires that asked about lifetime occupational history were mailed to participants in advance of their interview and reviewed in person or over the phone. For every paid and unpaid job held for 6 months or more, participants were queried on the start and end date, hours worked per week, and job title and tasks. All participants provided informed consent; the study was approved by the UCLA Institutional Review Board.

Measures

For each study participant, we selected the job held for the longest duration (in years), reasoning that this job would reflect most closely lifetime occupation as done in previous work.[25,26] Total years worked in the longest held job was standardized for age by expressing years worked as a percentage of total adult lifetime (ie, age 18 to 65 y) working years. For

each job, we assigned a 3-digit 1990 US Census Occupational Classification Code (occupational code) indicating occupation within levels of Census subcategories using job title, job description, or other details provided by participants for the job, and using information available on the US Census website (http://www.census.gov/). We converted 1990 US Census occupational codes to 1980 codes, accounting for approximately 50 differences between the years using a crosswalk available from the US Census Bureau. Participants that reported solely having been a housewife (n = 8), a volunteer (n = 2), disabled (n = 1), military (n = 1), or having held no occupation (n = 7) were excluded from analyses. Thus, the following analyses are based on 355 cases (96.5%) and 335 controls (98.2%).

Next, using the 1980 Census code as a link, we assigned to each participant's longest held job scores for selected occupational characteristics that were derived and compiled by researchers[27,28] based on the Dictionary of Occupational Titles (DOT), fourth Edition and available in a data set.[27] The DOT was originally developed to be used by employment services offices to evaluate the fit between a worker and an occupation; subsequent editions have been augmented with variables created by researchers using factor analyses describing features of the occupation, such as job complexity and requirements of the worker such as job skills. Thus, many of the DOT variables are expressed in terms of necessary or desirable characteristics a worker should have, implicitly describing what these experts interpreted the occupation to require. These scores thus provide a numeric measure for various demands, skills, and aptitudes associated with each job, including (1) temperament factors indicating abilities to adjust to certain working conditions according to personality traits; (2) interest factors signifying interests, tastes, and preferences for certain kinds of activities entailed in job performance and possibly influencing job choice; and (3) aptitude factors representing specific verbal, numerical, motor, dexterity, and other capacities or abilities required of an individual to facilitate learning of some job task or duty.

On the basis of attributes purportedly associated with a Parkinsonian personality (ie, rigidity, cautiousness, inflexibility, introversion, conservativeness), we selected the following temperament factors: (1) ability to perform a variety of duties, often changing from 1 task to another of a different nature without loss of efficiency or composure; (2) ability to deal with people beyond giving and receiving instructions; (3) adaptability to situations involving feelings, ideas, or facts in terms of a personal viewpoint; (4) ability to make generalizations, judgments, or decisions based on measurable or verifiable criteria; (5) ability to perform under stress when confronted with emergency, critical, unusual, or dangerous situations; (6) ability to perform repetitive work or to continuously perform the same work according to set procedures, sequence, or pace; and the following interest factors: (7) preference for activities of an abstract and creative nature; (8) preference for activities of a concrete, routine, or organized nature. Higher scores on the temperament and interest factors indicate a greater percentage of workers expected to choose or to be found in an occupation for which the factor is considered relevant. We hypothesized that if personality traits or behavioral preferences can be inferred from long-term jobs/occupations and are associated with premorbid PD as suggested in the literature, on average, more cases than controls would be expected to have held jobs with lower scores for characteristics 1 to 5 and 7, and higher scores for characteristics 6 and 8.

Second, we examined whether there were differences in certain physical aptitude factors associated with the longest held job. We selected variables for motor coordination, finger dexterity, and manual dexterity. For ease of interpretation, we reordered the original scores so that a higher score would indicate a greater extent or degree for the physical aptitude to be involved in a specific occupation, and a lower score to signify lower level of the aptitude.

Means and standard deviations (SDs) for each occupational temperament or interest and physical aptitude score are summarized according to census occupational category in Appendix 1. In controls, most correlations between the characteristics were trivial (ie, r = 0.04 for the ability to perform under stress and the ability to make generalizations, judgments, or decisions based on measurable or verifiable criteria) or small (ie, r = −0.24 for abstract and creative abilities and ability to perform repetitive work); the most strongly correlated characteristics were preference for activities of a concrete, routine, or organized nature and ability to deal with people beyond giving and receiving instructions (r = −0.42); and ability to perform repetitive work and preference for activities of a concrete, routine, or organized nature (r = 0.75). As these scores have only relative meaning, for analytic purposes, we standardized scores and compared results from regression analysis according to changes in SD units.

Statistical Analysis

Job characteristics were categorized into quartiles (with the fourth quartile indicating the greatest extent or degree of the characteristic and the first quartile indicating the least), and also assessed on a continuous scale. We used multivariable logistic regression methods to assess associations between PD and temperaments, interests and aptitudes, modeling each characteristic separately. We adjusted for age (continuous), sex, education (<12 y, 12 y, >12 y), race/ethnicity (white, non-white), and smoking (never, former, current). Odds ratios (OR) and 95% confidence intervals (95% CI) estimate the x-fold increase in risk of developing PD per unit increase or decrease in SD for each occupational characteristic. We also used stratified models to assess whether effect estimates were modified by age of onset/age at interview for controls (≤60y, >60y), education (high school education or less, more than high school education), job prestige (average or lower, higher than average), and sex. For all analyses we used SAS version 9.1 (SAS Institute Inc., Cary, NC).

RESULTS

Study participants were predominantly white, >65 years of age, and without a family history of PD (Table 1). Cases were slightly older than controls, more likely to be men, and had completed fewer years of education. Cases were also more likely to have never smoked cigarettes.

In our study population, the job of longest duration was held for an average of 44% of adult working lifetime, with PD cases having worked approximately 2 years longer in that job than controls (PD cases 20.3 ± 11.1 y; controls 18.5 ± 11.2 y). PD cases had begun working at their longest held job an average of 34.4 years before diagnosis; controls for 35.1 years before interview. According to the census occupational classifications of study participants' jobs, cases were slightly less likely to have worked in professional specialty occupations, and were more likely to have worked in farming, forestry, or fishing occupations. Cases and controls were equally as likely to have worked in technical, sales, and administrative and managerial occupations (Table 2).

None of the occupational temperament or interest factors required, expected or exhibited by a high percent of workers in a job showed statistically significant higher odds of being associated with PD when modeled per unit (SD) increase in scores (Table 3). However, when comparing the highest (fourth) to lowest (first) quartile, PD cases were approximately 40% less likely to have worked in occupations involving greater abstract and creative abilities (OR = 0.61; 95% CI, 0.38–0.95) or the ability to make generalizations, judgments, or decisions based on measurable or verifiable criteria (OR = 0.57; 95% CI, 0.36–0.91). In addition, cases also tended to be less likely to have worked in jobs requiring being more adaptable to situations involving feelings, ideas, or facts from a personal viewpoint (OR =

0.71; 95% CI, 0.45–1.11; $P = 0.13$) (Table 3). We did not find that education or job prestige modified the observed associations, except for that of abstract and creative abilities, results tended to be driven by participants with a more than high school education.

Cases generally were less likely to have worked in jobs that required greater motor skills, and these differences were more apparent among participants with a high school education or less (Table 4). Furthermore, female, (OR = 0.74; 95% CI, 0.60–0.91) but not male cases (OR = 1.02; 95% CI, 0.83–1.25) were less likely to have worked in jobs requiring finger dexterity or motor coordination (female, OR = 0.76; 95% CI, 0.62–0.94; male, OR = 0.96; 95% CI, 0.77–1.20). Negative associations between jobs requiring motor skills and PD were stronger in those with an older age of onset/interview (>60 y); specifically, older controls were more likely to have worked in jobs demanding finger dexterity, manual dexterity, and motor coordination than older cases (Table 4).

CONCLUSIONS

In our study population, patients with PD tended to have spent most of their working years in jobs that demanded less motor skills compared with population controls; this was particularly true for participants with a high school education or less, for women, and for those who developed PD after 60 years of age (older onset PD). There was a suggestion that those who developed PD tended to work less in occupations requiring abstract thinking and creativity and an ability to make generalizations, judgments, or decisions, providing limited support for the hypothesis that some personality traits might be associated with PD many years before the onset of motor symptoms, that is, in some domains measuring flexibility and abstract thinking. The possibility that oversampling of more highly educated controls in the study population alone explains this observation is refuted by education-stratified results for abstract and creative abilities. These results do support the notion that participants in the more highly educated strata tend to not choose jobs involving these abilities. Most job attributes that might reflect the traits of conservativeness, risk taking, stress resistance, and flexibility were however, not found to be associated with PD. Thus, these occupation-derived traits do not seem to support the existence of a distinct Parkinsonian personality type. Our results are in agreement with recent observations in a large historical cohort study reporting that an introverted personality did not increase PD risk; this is the only other study that was able to assess this personality trait before PD onset without bias due to preclinical or clinical disease state.[14]

A prodromal phase believed to precede PD diagnosis by as little as 2 and possibly more than 20 years is supported by imaging, pathology, clinical, epidemiologic, and animal studies.[29–32] As our study participants had worked in their longest held jobs for almost 44% of their adult working years, and cases had started these jobs on average 34 years before their PD diagnosis (35 y before interview for controls), we are reasonably confident that the characteristics and abilities assessed through the longest held job reflect traits present before the traditional preclinical stages of the disease. Exclusion of 11% of participants with a longest held job duration <10 years only minimally changed the OR estimates we reported. To the extent that occupational preferences or abilities are reflective of either personality characteristics or motor functions, job choice and the longest job held allows us to assess premorbid traits, or hypothesize that continued training of specific abilities may prevent PD. As this approach avoids the assessment of traits and abilities retrospectively, it avoids temporal ambiguity about cause and effect. An additional advantage of this approach is that, although occupational histories were collected from study participants after disease diagnosis/at study entry, there is no reason to believe that reporting of occupation should be biased by case/control status, nor should reporting be differentially accurate between cases and controls. Although preferences for occupations likely relate to socioeconomic and

cultural factors, our study population was predominantly white, of similar cultural backgrounds, and, as noted, we did not find differences in results when we stratified by educational level. Furthermore, results were not markedly different when analyses were restricted to white participants. As our study population was drawn from a largely agricultural region in California, a greater proportion of study participants work in farming occupations than the California or United States population,[33] and thus, results from this study may not be generalizable to populations from more predominantly urban areas.

Our observation that PD patients chose or were encouraged into jobs requiring less motor skills could be explained by very early neurological/neurochemical dysfunction that may have influenced such preferences. In other words, if vulnerability in the dopamine system already existed among those who later developed PD, it may have had an effect on motor skills long before the classic motor symptoms of PD developed. If some people with PD were less able to fulfill job tasks that required motor skills, or were less able to learn tasks involving motor skills that were part of early job training, this may have possibly governed a decision not to work in jobs that demanded these skills. An early difference in the functioning of the neuronal dopamine circuitry may not only increase the vulnerability to injury, but might also be reflected in certain personality traits. However, this study indicates that perhaps very early network dysfunction in PD impacts work activities due to motor manifestations more than it affects temperament and interests.

The trait-oriented model for career choice is a prominent theoretical perspective that holds that there is a congruence between individual differences in personality, vocational interests, abilities, and choice of occupation,[34,35] such that personality motivates work choices, and jobs are matched to self-perceived needs. As a substantial portion of adult years are spent working,[36] occupation (and education) has been used as a means to assess lifelong intellectual stimulation, for example, in testing hypotheses relating to cognitive reserve capacity and risk of developing dementias and Alzheimer disease.[37,38] We have used participants' choice of occupation to reflect underlying personality characteristics, but we cannot rule out the alternate explanation that premorbid personality motivates occupational choices.

Although our study uses a novel approach to assess personality characteristics, jobs provide only a very indirect proxy for these traits and abilities, as they reflect no more than average qualities attributed to a group. Thus, a limitation of our approach is that scores for trait characteristics and job demands are averages across fairly broad census occupational categories, and do not capture potentially large variations within a given job. In our study, the only occupational characteristic positively associated with PD was the "ability to deal with people beyond giving and receiving instructions." This seems to be contrary to the PD personality hypothesis, if we assume this to be reflective of the traits flexibility and extroversion. Upon closer investigation, we found that among the occupations scoring highly on this characteristic were teachers, nurses, and medical professionals. This confirms observations from previous studies that reported associations between PD and teaching and occupations in health care services,[39–41] which was interpreted by 1 author as being consistent with a prior hypothesis that frequent exposure to common viral (or other) respiratory infections in these occupations might be a risk factor for developing PD.[39,42] Thus, although our observation does not fit the Parkinsonian personality hypothesis, it raises the possibility of another (possibly viral) pathogenic mechanism resulting in PD.

In conclusion, we used a unique approach to examine the hypothesis that distinct personality characteristics and abilities required in jobs may be related to a PD personality. We provide very limited support for the notion that PD cases may tend to choose and remain in certain occupations that do not require workers to have abstract and creative preferences and the

ability to make generalizations. Most importantly, our study suggests that some PD patients either prefer or do not work in jobs requiring high levels of motor abilities, which may be either indicative of early motor dysfunction or lack of continuous training of the motor system.

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APPENDIX

APPENDIX 1

Mean Scores for Occupational Characteristics for Census Occupational Categories

	Mean ± SD Score						
Characteristic	**Managerial**	**Professional Specialty**	**Technical, Sales, and Administrative**	**Service**	**Farming, Forestry, and Fishing**	**Precision Production, Craft, and Repair**	**Operators, Fabricators, and Laborers**
Ability to perform a variety of duties often changing from one task to another of a different nature without loss of efficiency or composure	51.1 ± 24.8	36.5 ± 33.3	41.9 ± 30.7	52.2 ± 33.4	16.9 ± 0.6	56.8 ± 28.7	15.8 ± 20.1
Ability to deal with people beyond giving and receiving instructions	73.0 ± 25.8	81.2 ± 27.0	65.0 ± 32.1	60.4 ± 39.1	5.9 ± 11.4	21.6 ± 30.5	30.2 ± 26.8
Adaptability to situations involving feelings, ideas, or facts in terms of a personal viewpoint	3.6 ± 6.5	17.3 ± 25.7	0.5 ± 0.9	1.3 ± 3.2	0.2 ± 0.2	0.2 ± 0.4	0.3 ± 0.5
Ability to make generalizations, judgments, or decisions based on measurable or verifiable criteria	52.2 ± 18.0	35.3 ± 38.6	23.7 ± 26.8	12.7 ± 15.5	46.0 ± 19.1	71.3 ± 23.0	24.8 ± 28.6
Ability to perform under stress when confronted with emergency, critical, unusual, or dangerous situations	0.8 ± 1.3	10.3 ± 23.5	8.2 ± 21.7	21.7 ± 35.4	1.5 ± 4.0	1.9 ± 2.7	0.6 ± 1.8
Ability to perform repetitive work or to continuously perform the same work according to set procedures, sequence, or pace	6.0 ± 5.2	1.1 ± 1.4	16.3 ± 22.5	28.5 ± 28.7	30.2 ± 15.0	17.0 ± 22.1	48.8 ± 20.4
Preference for activities of an abstract and creative nature	1.1 ± 0.8	21.4 ± 27.7	1.0 ± 1.6	7.56 ± 24.3	0.2 ± 0.3	0.6 ± 0.9	0.4 ± 0.8
Preference for activities of a concrete, routine, or organized nature	15.3 ± 11.6	2.4 ± 3.0	38.7 ± 33.0	49.6 ± 36.3	62.9 ± 28.0	22.0 ± 25.0	70.0 ± 27.4

	Mean ± SD Score						
Characteristic	Managerial	Professional Specialty	Technical, Sales, and Administrative	Service	Farming, Forestry, and Fishing	Precision Production, Craft, and Repair	Operators, Fabricators, and Laborers
Motor skill							
Finger dexterity	2.1 ± 0.1	2.7 ± 0.6	2.8 ± 0.5	2.3 ± 0.4	2.3 ± 0.1	2.7 ± 0.3	2.3 ± 0.3
Manual dexterity	2.1 ± 0.1	2.6 ± 0.6	2.6 ± 0.3	2.9 ± 0.3	2.8 ± 0.3	3.1 ± 0.4	2.7 ± 0.4
Motor coordination	2.1 ± 0.1	2.6 ± 0.5	2.8 ± 0.5	2.5 ± 0.5	2.4 ± 0.2	2.7 ± 0.2	2.7 ± 0.2

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TABLE 1

Characteristics of Parkinson's Environment and Gene Study Population*

Characteristic	Cases (n = 355)	Controls (n = 335)
Age (y)	69.4 ± 10.3	67.6 ± 11.5
Female sex	150 (42.3%)	160 (47.8%)
White race	305 (85.9%)	287 (85.7%)
Education		
< 12 y	63 (17.8%)	37 (11.0%)
12 y	98 (27.6%)	63 (18.8%)
> 12 y	194 (54.7%)	235 (70.2%)
Smoking status		
Current	21 (5.9%)	33 (9.9%)
Former	148 (41.7%)	158 (47.2%)
Never	186 (52.4%)	144 (43.0%)
Longest held job duration (y)	20.3 ± 11.1	18.5 ± 11.2
Years resided in Central Valley†	23.0 (81.1%)	24.0 (79.3%)

*Mean ± standard deviation or number (percentage).

†1974-present/study entry.

TABLE 2

Distribution of Study Participants' Longest Held Jobs by Census Occupational Categories

	No. (Percentage)	
Occupational Category (Census Code)	**Cases**	**Controls**
Managerial (1–37)	34 (9.6)	28 (8.4)
Professional specialty (43–199)	70 (19.7)	82 (24.5)
Technical, Sales, and Administrative (203–389)	110 (31.0)	105 (31.3)
Service (403–469)	32 (9.0)	36 (10.8)
Farming, Forestry, and Fishing (473–499)	56 (15.8)	36 (10.8)
Precision Production, Craft, and Repair (503–699)	32 (9.0)	31 (9.3)
Operators, Fabricators, and Laborers (703–889)	21 (5.9)	17 (5.1)

TABLE 3

ORs and 95% CIs of Parkinson Disease Associated With Different Occupational Characteristics and Aptitudes Among Rural Californian Cases and Controls From Adjusted* Multiple Logistic Regression Models

Characteristic	Trait or Factor Assessed†	Expected Association With Parkinson Disease	Cases/Controls	OR (95% CI)*
Ability to perform a variety of duties often changing from one task to another of a different nature without loss of efficiency or composure	Flexibility, task shifting	Negative		1.04 (0.89, 1.21)‡
First quartile			96/89	1.00 (ref)
Second quartile			70/83	0.92 (0.59, 1.45)
Third quartile			105/89	1.07 (0.70, 1.65)
Fourth quartile			97/80	1.08 (0.69, 1.67)
Ability to deal with people beyond giving and receiving instructions	Extroversion, leadership	Negative		1.15 (0.97, 1.36)‡
First quartile			116/90	1.00 (ref)
Second quartile			79/84	0.95 (0.61, 1.48)
Third quartile			81/83	1.12 (0.71, 1.78)
Fourth quartile			92/84	1.24 (0.79, 1.95)
Adaptability to situations involving feelings, ideas, or facts in terms of a personal viewpoint	Flexibility, openness	Negative		0.84 (0.70, 1.02)‡
First quartile			116/88	1.00 (ref)
Second quartile			92/83	0.85 (0.55, 1.32)
Third quartile			92/87	0.85 (0.56, 1.30)
Fourth quartile			68/83	0.71 (0.45, 1.11)
Ability to make generalizations, judgments, or decisions based on measurable or verifiable criteria	Abstract thinking	Negative		0.85 (0.72, 1.00)‡
First quartile			117/89	1.00 (ref)
Second quartile			79/84	0.81 (0.53, 1.25)
Third quartile			109/86	0.93 (0.60, 1.42)
Fourth quartile			63/82	0.57 (0.36, 0.91)
Ability to perform under stress when confronted with emergency, critical, unusual, or dangerous situations	Risk taking, stress resistance	Negative		1.05 (0.90, 1.23)‡
First quartile			101/94	1.00 (ref)
Second quartile			94/83	1.07 (0.70, 1.65)
Third quartile			93/80	1.03 (0.66, 1.60)
Fourth quartile			80/84	1.08 (0.70, 1.67)
Ability to perform repetitive work or to continuously perform the same work according to set procedures, sequence or pace	Rigidity, conservativeness	Positive		1.03 (0.88, 1.21)‡
First quartile			108/109	1.00 (ref)
Second quartile			53/64	0.76 (0.47, 1.23)
Third quartile			108/86	1.12 (0.74, 1.71)
Fourth quartile			99/82	1.05 (0.67, 1.65)

Characteristic	Trait or Factor Assessed[†]	Expected Association With Parkinson Disease	Cases/Controls	OR (95% CI)[*]
Preference for activities of an abstract and creative nature	Abstract thinking, creativity	Negative		0.90 (0.76, 1.06)[‡]
First quartile			126/83	1.00 (ref)
Second quartile			102/91	0.73 (0.48, 1.12)
Third quartile			73/84	0.66 (0.42, 1.02)
Fourth quartile			67/83	0.61 (0.38, 0.95)
Preference for activities of a concrete, routine, or organized nature	Inflexibility, conservativeness	Positive		1.03 (0.88, 1.21)[‡]
First quartile			77/88	1.00 (ref)
Second quartile			102/84	1.33 (0.84, 2.10)
Third quartile			91/85	1.26 (0.80, 2.00)
Fourth quartile			98/84	1.24 (0.77, 2.02)

[*] Adjusted for age, sex, race/ethnicity, education, smoking.

[†] Hypothesized personality trait assessed by the occupational characteristic.

[‡] Expressed as the difference in standard deviation units.

TABLE 4

ORs of PD and 95% CIs for Motor Skills With Stratifications by Age of Onset and Education

	OR (95% CI)*†				
		Age Onset/Interview (y)		Education	
Motor Skill	**All Participants**	**≤ 60**	**> 60**	**High School or Less**	**More Than High School**
Finger dexterity	0.86 (0.75, 0.99)	0.98 (0.72, 1.33)	0.83 (0.70, 0.97)	0.71 (0.53, 0.93)	0.94 (0.80, 1.11)
Manual dexterity	0.91 (0.78, 1.07)	1.24 (0.88, 1.75)	0.84 (0.70, 1.00)	0.89 (0.67, 1.19)	0.93 (0.78, 1.12)
Motor coordination	0.84 (0.73, 0.97)	0.93 (0.69, 1.27)	0.84 (0.71, 0.99)	0.75 (0.58, 0.98)	0.89 (0.74, 1.06)

*Adjusted for age, gender, race/ethnicity, education, smoking.

†OR are expressed as the difference in standard deviation units.

CI indicates confidence interval; OR, odds ratio; PD, Parkinson disease.