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Occupational differences in a Dutch sample of patients with primary progressive aphasia, behavioral variant frontotemporal dementia, and Alzheimer's dementia

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ABSTRACT

Background: Cognitive reserve is a potential mechanism to cope with brain damage as a result of dementia, which can be defined by indirect proxies, including education level, leisure time activities, and occupational attainment. In this study we explored the association between dementia diagnosis and type of occupation in a retrospective Dutch outpatient memory clinic sample of patients with primary progressive aphasia (PPA), behavioral variant frontotemporal dementia (bvFTD), and Alzheimer's Dementia (AD).

Methods: We included data from 427 patients (bvFTD $n=87$, PPA $n=148$, AD $n=192$) and compared the frequency of occupations (11 categories) between patients and data from the Dutch census using Pearson X^2 tests and we calculated odds ratios (OR) by means of multinomial logistic regression analyses. We also investigated patient group differences in age, sex, education, disease duration, and global cognition.

Results: The frequency of teachers in patients with PPA was significantly higher than the frequency of teachers in patients with bvFTD [OR = 4.79, $p=.007$] and AD [OR = 2.04, $p=.041$]. The frequency of teachers in patients with PPA (16%) was also significantly higher than the frequency of teachers in the Dutch census [5.3%; OR = 3.27, $p<.001$]. The frequency of teachers in both bvFTD and AD groups were not significantly different from the frequency of teachers in the Dutch census ($p=.078$ and $p=.513$, respectively).

Conclusions: A potential explanation for our results is the so called "wear and tear" hypothesis, suggesting that teachers have a communication-wise demanding occupation – and therefore are at higher risk to develop PPA. Alternatively, teaching requires continuous communication, hence teachers are more sensitive to subtle changes in their speech and language abilities. Our findings broaden our understanding of the relationship between occupational activity and cognitive reserve in the development of dementia.

KEYWORDS
Cognitive reserve; dementia; occupation; education; primary progressive aphasia

Introduction

Dementia is one of the leading causes of cognitive decline worldwide, and it is estimated that the number of cases will increase from 57.4 million cases in 2019 to 152.8 million cases in 2050 (GBD 2019 Dementia Forecasting Collaborators, 2022). Alzheimer's dementia (AD) and frontotemporal dementia (FTD) are the most prevalent types of early-onset dementia (<65 years) (Bang et al., 2015). As there currently is no curing treatments for dementia available, research is increasingly focusing on factors that may delay the onset of cognitive decline and/or impact cognitive outcomes. One of these factors is the concept of cognitive reserve (Pettigrew & Soldan, 2019). Cognitive reserve is defined as the brain's preexisting ability for cognitive processing or compensatory approaches, a latent concept that provides an explanation for the discrepancy between observed brain damage and clinical pathology in dementia (Stern, 2012; Stern et al., 2019). It can be quantified through indirect proxies, including education level, leisure time activities, and occupational attainment (Mondini et al., 2016). Interestingly, a study by Josephs et al. (2013) demonstrated a significant association between progressive speech and language disorders and the occupation of teaching. In the sample of patients with primary progressive aphasia (PPA) and primary progressive apraxia of speech (PPAoS), the study showed that twenty-two percent of patients were teachers, which was significantly higher than in patients with AD (8%) or in the US census (4%). The researchers interpreted this finding as teaching being a communication-wise

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demanding occupation, therefore teachers are more sensitive to develop PPA than other occupations that require less constant or less accurate verbal and written communication. If true, this would go against the concept of cognitive reserve and "use it or lose it" and be more in line with a "wear and tear" (the more you use it, the more likely you lose it) hypothesis. Alternatively, it was hypothesized that teaching requires continuous communication, hence teachers have more opportunity to observe changes in their speech and language skills, and/or that teachers are more sensitive to subtle changes in their speech and language abilities as they observe themselves and their students continuously. This could broaden our understanding of the relationship between occupational activity and cognitive reserve in the development of dementia.

In the outpatient memory clinic of the Department of Neurology and Alzheimer Center of the Erasmus MC University Medical Center (Rotterdam, the Netherlands) we observed a similar trend as in the paper by Josephs et al. (2013), in that we have noticed that a large percentage of patients with PPA was, or has been previously, a teacher. The aim of our study was to replicate the study by Josephs et al. (2013) by investigating the association between dementia diagnosis and occupation in a Dutch outpatient memory clinic sample of patients with PPA, behavioral variant FTD (bvFTD), and AD, and occupation data from the 2022 Dutch census. To additionally explore the latent concept of cognitive reserve, we also investigated group differences in age, sex, education, disease duration, and global cognition.

Methods

Participants

In this retrospective study, we included data from 501 patients with a clinical diagnosis of dementia visiting the outpatient memory clinic of the Alzheimer Center Erasmus MC University Medical Center, Rotterdam, the Netherlands, between January 2011 and February 2023. We excluded 74 patients, as their former occupation was not recorded in the electronic patient file or never had paid occupations. Finally, we included data from 427 patients with a clinical diagnosis of dementia, of which 87 patients with bvFTD, 148 patients with PPA (svPPA $n=43$, nfvPPA $n=44$, lvPPA $n=41$, PPA not otherwise specified – PPA-NOS $n=20$), and 192 patients with AD. Dementia diagnoses were made in multidisciplinary consensus meetings, using established clinical diagnostic criteria for bvFTD (Rascovsky et al., 2011), PPA (Gorno-Tempini et al., 2011), and AD (McKhann et al., 2011), using all available clinical information (e.g., patient- and informant-based information, neuropsychological tests, MR brain imaging, fluid biomarkers). See Figure 1 for the patient inclusion and exclusion flowchart.

Procedure

As part of the local biobank study of the Alzheimer Center Erasmus MC, the following demographic and clinical data were recorded: date of birth, age at the time of the visit to the outpatient memory clinic, sex, education level, professional

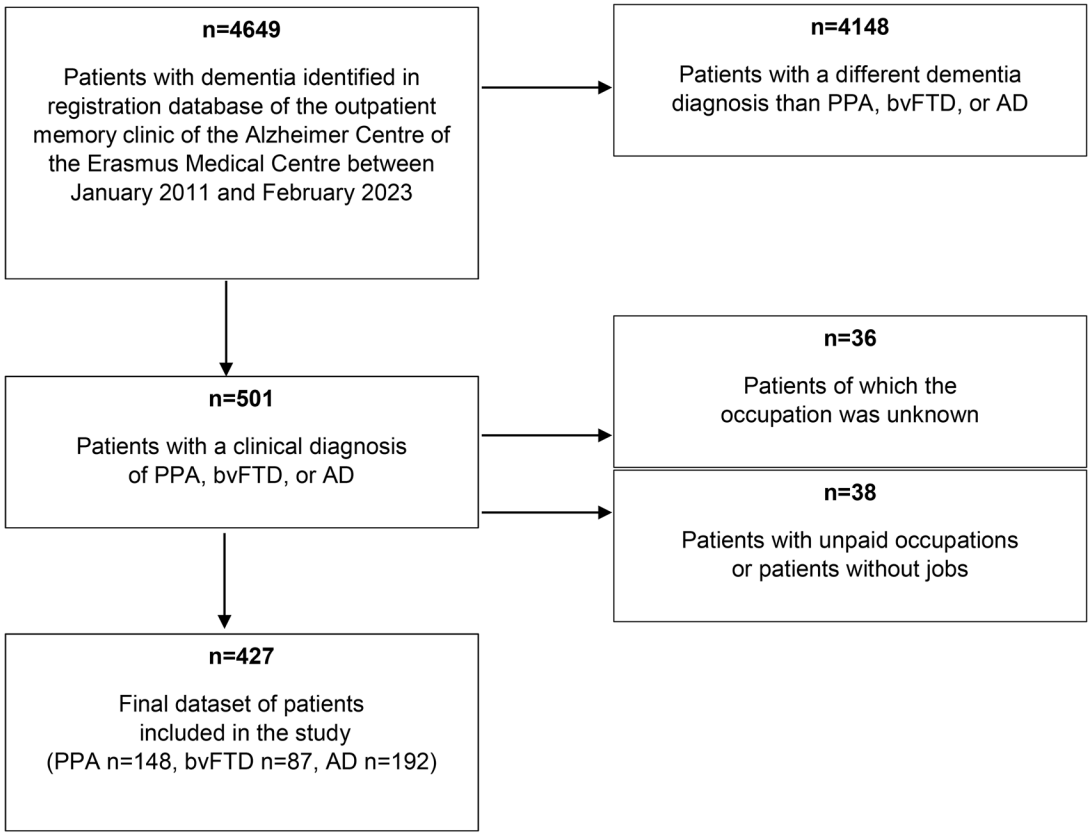

Figure 1. Flowchart of patient in- and exclusion. PPA: primary progressive aphasia; bvFTD: behavioral variant frontotemporal dementia; AD: Alzheimer's Dementia.

Table 1. Occupation categories (based on StatLine and ISCO-08) with examples.

No	Occupation category	Examples
1	Armed forces occupations	Commissioned and noncommissioned armed forces officers, armed forces occupations (other ranks)
2	Managers	Legislators and senior officials, managing directors and chief executives, business services and administration managers, sales, marketing and development managers, professional services managers, hotel and restaurant managers, retail and wholesale trade managers
3	Professionals – teachers	Primary school and early childhood teachers, secondary education teachers, university and higher education teachers, vocational education teachers, other teaching professionals
4	Professionals – nonteachers	Physical and earth science professionals, mathematicians, actuaries and statisticians, life science professionals, architects, planners, surveyors and designers, medical doctors, nursing and midwife professionals, paramedical practitioners, veterinarians, finance professionals, administration professionals, sales, marketing and public relations professionals, software and applications developers and analysts, database and network professionals, librarians, archivists and curators, authors, journalists and linguists, social and religious professionals, creative and performing artists
5	Technicians and associate professionals	Physical and engineering science technicians, ship and aircraft controllers and technicians, nursing and midwifery associate professionals, sales and purchasing agents and brokers, sports and fitness workers, business services agents, administrative and specialized secretaries, telecommunications and broadcasting technicians
6	Clerical support workers	General office clerks, secretaries (general), keyboard operators, tellers, money collectors and related clerks, client information workers, numerical clerks, material-recording and transport clerks, other clerical support workers
7	Service and sales workers	Travel attendants, conductors and guides, cooks, waiters and bartenders, hairdressers, beauticians and related workers, building and housekeeping supervisors, street and market salespersons, shop salespersons, cashiers and ticket clerks, childcare workers and teachers' aides, personal care workers in health services, protective services workers
8	Skilled agricultural, forestry and fishery workers	Market gardeners and crop growers, animal producers, mixed crop and animal producers, fishery workers, hunters and trappers, subsistence crop and/or livestock farmers
9	Craft and related trades workers	Building frame and related trades workers, painters, building structure cleaners and related trades workers, blacksmiths, toolmakers and related trades workers, handicraft workers, printing trades workers, electrical equipment installers and repairers, food processing and related trades workers, wood treaters, cabinet-makers and related trades workers
10	Plant and machine operators, and assemblers	Mining and mineral processing plant operators, chemical and photographic products plant and machine operators, food and related products machine operators, assemblers, locomotive engine drivers and related workers, car, van and motorcycle drivers, heavy truck and bus drivers, mobile plant operators, ships' deck crews and related workers
11	Elementary occupations	Domestic, hotel and office cleaners and helpers, vehicle, window, laundry and other hand cleaning workers, agricultural, forestry and fishery laborers, mining and construction laborers, manufacturing laborers, transport and storage laborers, food preparation assistants, street and related service workers, street vendors (excluding food)

occupation, clinical diagnosis, and date of disease onset. We calculated disease duration in months by subtracting the date of symptom onset from the outpatient memory clinic visit date. We compared the occupation data of the patients with dementia to the Dutch census occupation data of the last quarter of 2022 via StatLine, the electronic database of Statistics Netherlands (https://opendata.cbs.nl/statline). All occupations were grouped into 11 categories according to the ISCO-08 coding system; the original ISCO-08 list consists of 10 categories, and for the purpose of this study the group of professionals was divided into two new categories, namely teachers and non-teachers (Table 1).

Standard protocol approvals, registrations, and patient consents

All patients were part of a local biobank study, for which they provided written informed consent for the use of their anonymized medical and clinical data for research purposes. The Erasmus University Medical Center ethics committee gave approval for the study (MEC-2016-069).

Statistical analysis

We performed statistical analyses using SPSS Statistics 28.0.1.0 (IBM Corp., Armonk, NY). Alpha was set at 0.05 across all comparisons (two-tailed). We compared continuous demographic and clinical data (age, education level, age at onset, and disease duration) between patients with PPA, bvFTD and AD using one-way ANOVA with Bonferroni post hoc tests. We analyzed between-group differences in sex distribution with Pearson X^2 tests. We compared the frequency of occupations between patients with PPA, bvFTD and AD, and the NL census using Pearson X^2 tests, and calculated odds ratios (OR) by means of multinomial logistic regression analyses. Age, sex and education level were added as covariates. All models were corrected for multiple comparisons (Bonferroni).

Results

Demographic and clinical data

Of the 427 included patients, 206 participants were female (48.2%). The majority of patients was white (94.4%). Most patients finished secondary vocational education (28.7%), followed by higher professional education (25.4%). Most participants worked as managers (16.6%), clerical support workers (15.7%), or professionals (non-teachers; 14.8%). Patients had an age of disease onset between 32 and 85 years (M = 64.6, SD = 8.6). See Table 2 for demographic and clinical data of the individual patient groups and Appendix Table A1 for demographic and clinical data for each ISCO category. Patients with bvFTD were significantly younger

Table 2. Demographic and clinical data.

	PPA	bvFTD	AD
n	148	87	192
Age	65.7 (7.7)	61.9 (10.1)	65.0 (8.3)
Sex (F, %)	78 (52.3)	29 (33.7)	99 (51.6)
Education level*	5.2 (1.7)	5.1 (1.9)	5.1 (1.7)
Age at onset (years)	63.1 (8.1)	58.5 (9.8)	62.5 (11.8)
Disease duration (months)	36.7 (25.2)	50.4 (34.4)	55.2 (35.5)

Values indicate means (standard deviation) or count (percentage). PPA: primary progressive aphasia; bvFTD: behavioral variant frontotemporal dementia; AD: Alzheimer's Dementia.

than patients with PPA and AD [H(2) = 7.15, $p = .028$]. There were no differences in ISCO categories with respect to age [F(10,416) = 0.479, $p = .904$]. Patients with bvFTD had a lower age at disease onset than patients with PPA and AD [F(2,424) = 6.13, $p = .002$]. There were more males in the bvFTD group than in the PPA and AD groups [X(2)=9.12, $p = .010$]. The distribution of sex was different amongst the ISCO categories [X(10) = 96.264, $p < .001$]. More male patients were working in armed forces occupations, skilled agricultural, forestry and fishery, and craft and related trades, while there were more female patients working as technicians and associate professionals, and as clerical support workers. There were no differences between patients with bvFTD, PPA or AD with respect to education level. Both managers and teachers had relatively high levels of education (i.e., on average Verhage level 6 = higher vocational education), followed by patients in armed forces occupations and elementary occupations. Teachers with a diagnosis of PPA were not higher educated than teachers with a diagnosis of bvFTD or AD [F(2,37) = 0.807, $p = .454$ – data not shown]. Disease duration was not significantly different between patient groups, nor between ISCO categories (both $p > .05$).

Occupation frequency in patients with PPA, bvFTD, and AD

The number and percentage per occupation category in each patient group is displayed in Table 3. In patients with PPA, the most common occupation was clerical support worker, followed by the armed forces, and teaching. Most patients with bvFTD were within the armed forces, were teachers, or craft and related trades workers. In patients with AD, the most common occupation was the armed forces, clerical support work, teaching, and technical and associate professions. The frequency of teachers in patients with PPA was significantly higher than the frequency of teachers in patients with bvFTD [OR = 4.79, $p = .007$] and AD [OR = 2.04, $p = .041$]. The frequency of teachers in patients with PPA (16%) was also significantly higher than the frequency of teachers in the NL census [5.3%; OR = 3.27, $p < .001$; Figure 2]. The frequency of teachers in both bvFTD and AD groups were not significantly different from the frequency of teachers in the NL census ($p = .078$ and $p = .513$, respectively). Amongst patients with PPA, the frequencies of teachers in patients with svPPA [18.6%; OR = 3.70, $p < .001$] and patients with nfvPPA [18.2%; OR = 3.62, $p < .001$] were significantly higher than the frequency of teachers in the NL census. The frequency of teachers in patients with lvPPA was not significantly different ($p = .503$) compared to the NL census. The frequency of elementary occupations in patients with PPA was significantly lower than in patients with bvFTD [OR = 0.30, $p = .027$] and AD [OR = 0.32, $p = .019$]. The frequency of plant and machine operators, and assemblers was also significantly lower in patients with PPA [OR = 0.35, $p = .023$], and AD [OR = 0.30, $p = .007$] than in patients with bvFTD. In comparison to the NL census, patients with PPA, AD, and bvFTD were more often managers, and less often (associate) professionals (all p-values <.05).

Table 3. Occupation frequency per patient group.

Occupation category	PPA	bvFTD	AD
Armed forces occupations	25 (17)	14 (16)	32 (17)
Managers	22 (15)	3 (3)	15 (8)
Professionals – teachers	24 (16)	13 (15)	26 (13)
Professionals – nonteachers	11 (7)	6 (7)	13 (7)
Technicians and associate professionals	15 (10)	8 (9)	26 (13)
Clerical support workers	28 (19)	9 (10)	31 (16)
Service and sales workers	1 (1)	1 (1)	3 (2)
Skilled agricultural, forestry and fishery workers	10 (7)	8 (9)	16 (8)
Craft and related trades workers	8 (5)	12 (14)	9 (5)
Plant and machine operators, and assemblers	5 (3)	9 (10)	19 (10)
Elementary occupations	0 (0)	3 (3)	2 (1)

Values indicate frequency (percentage). PPA: primary progressive aphasia; bvFTD: behavioral variant frontotemporal dementia; AD: Alzheimer's Dementia.

Discussion

In this retrospective study, we have investigated the association between dementia diagnosis and type of occupation in an outpatient memory clinic sample of patients with PPA, bvFTD, and AD. More specifically, we were interested if there was a relationship between the occupation of teachers and PPA diagnosis, as a previous study by Josephs et al. (2013) showed that the frequency of teachers was higher in patients with speech and language disorders than in patients with AD and in the US census. We also investigated differences between patient groups in age, sex, education, disease duration, and global cognition.

In line with the results from the study by Josephs et al. (2013), we found the frequency of teachers in patients with PPA to be significantly higher than the frequency of teachers in patients with bvFTD and AD, and the NL census. From a biological perspective, this could provide evidence for the "wear and tear" hypothesis, suggesting that teachers have a communication-wise demanding occupation – more than other occupations that require less constant or less accurate verbal and written communication – and therefore are at higher risk do develop progressive language disorders. The opposite, the theoretical concept of cognitive reserve or the "use it or lose it" hypothesis, is still understudied in FTD spectrum disorders (Maiovis et al., 2018). Some studies have suggested that patients with bvFTD who are either

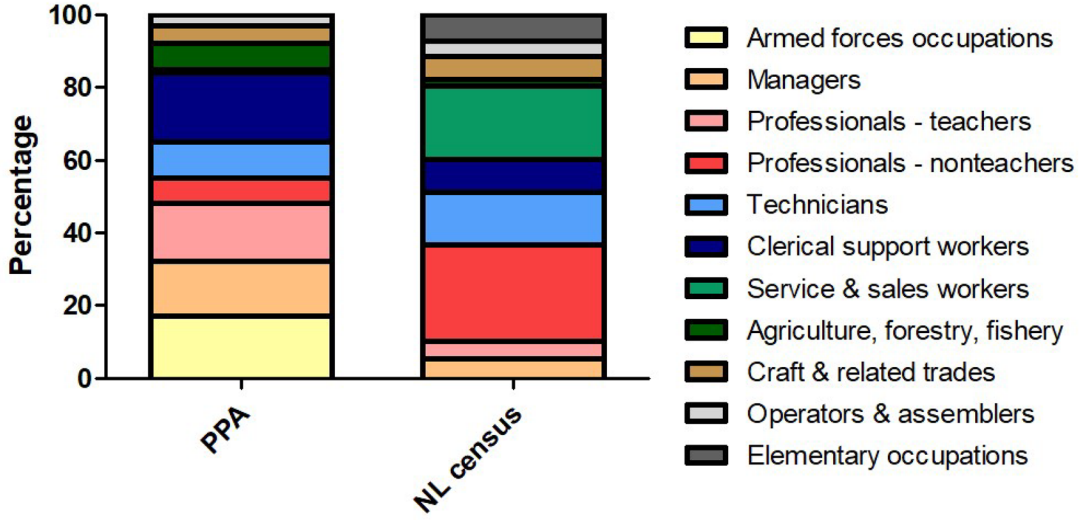

Figure 2. Occupation frequencies for patients with primary progressive aphasia (PPA) and the 2022 NL census cohorts.

higher educated (Perneczky et al., 2007; Premi et al., 2013) or work at a higher occupational level (Spreng et al., 2011) have a higher cognitive reserve than patients with lower levels. There have only been two studies performed in patients with PPA, that suggested that the presence of cognitive reserve mechanisms is also present in nfvPPA (Perneczky et al., 2007; Premi et al., 2012) and svPPA (Premi et al., 2012). More specifically, these studies found an inverse relationship between educational level and brain metabolism, which was more outspoken in the (language-) dominant hemisphere, i.e., at the same disease stage, patients with higher education levels had greater brain damage in the areas affected by the disease pathology. We do not find evidence of this latter mechanism in our sample, as there were no differences between patients with PPA, bvFTD, and AD with respect to education level, and also teachers with PPA were not higher educated than teachers with a diagnosis of bvFTD or AD. However, there might be an effect of occupational attainment, as the frequency of elementary occupations and plant and machine operators, and assemblers was significantly lower in patients with PPA than in patients with bvFTD and AD. Potentially occupational attainment therefore has a larger influence on cognitive reserve than educational level in our sample. It is of note that amongst patients with PPA, the frequencies of teachers in patients with svPPA and nfvPPA were significantly higher than the frequency of teachers in the NL census, while the frequency of patients with lvPPA was not significantly different between groups. This finding coincides with previous studies (Perneczky et al., 2007; Premi et al., 2012), and suggests that cognitive reserve mechanisms most strongly apply to the PPA subtypes with underlying FTD pathology (i.c. nfvPPA and svPPA) and not with lvPPA, that in most cases has underlying AD pathology (Bergeron et al., 2018).

An alternative explanation of the findings suggested by Josephs et al. (2013) is that teaching requires continuous communication, hence teachers have more opportunity to observe changes in their speech and language skills, and/or teachers are more sensitive to subtle changes in their speech and language abilities as they observe themselves and their students continuously. Even though disease duration – calculated by subtracting the date of disease onset (first symptoms) from the outpatient memory visit date – was not statistically different between patient groups, the disease duration in patients with PPA was lower (~37 months) than in patients with bvFTD (~50 months) and patients with AD (~55 months), suggesting that patients with PPA potentially are more sensitive to more subtle changes in their speech and language abilities. The large spread of data around the mean disease duration (i.e., higher SDs) is most likely the reason groups differences did not become significant. A more statistical rather than a biological explanation for our findings is the fact that the category teachers in the ISCO-08 coding system is more homogenous than the other categories, i.e., category 3 "teachers" only contains teachers, while the other categories – for instance category 4 "professionals – nonteachers" – contain a wide range of occupations. Therefore, it was more likely that we would detect group differences in the teachers category. Alternatively, it cannot be ruled out that a recruitment bias is present in our data, in that patients visiting an academic hospital have other clinical and demographic characteristics than patients visiting a general outpatient memory clinic. Thus, it is possible that patients evaluated at the Erasmus MC University Medical Center were more likely to be professionals (including teachers) compared to the general population.

Next to a different frequency of teachers in patients with PPA, bvFTD, and AD, we also found differences in other work field between patients and the NL census. Notably, the frequency of plant and machine operators, and assemblers was significantly lower in patients with PPA and AD than in patients with bvFTD. Potentially this is related to the frequency of females being higher in patients with PPA and AD than in patients with bvFTD, as males are overrepresented in this line of work (Eurostat, 2016). In a previous observational study into occupational classes amongst patients with diverse types of dementia (vascular dementia, AD, FTD, Lewy body dementia, corticobasal syndrome)

differences in sex distribution also seemed to explain why the number of patients with AD was relatively low in the transportation/logistics sector and relatively high in the healthcare/welfare sector (van Loenhoud et al., 2019). We do not know the exact reason as to why elementary occupations were less frequently carried out by patients with PPA than by patients with bvFTD and AD. The most likely explanation is that the number of patients working in elementary occupations in our sample is so low (i.e., zero patients with PPA, three patients with bvFTD, and two patients with AD) that analyses in this ISCO category are less reliable. Another finding was that patients with PPA, AD, and bvFTD were more often managers and less often (associate) professionals than was found in the NL census. This is partly in contrast with the study by Helmer et al. (2001) that showed the lowest incidence of dementia amongst managers and professionals in comparison to the other occupational categories (e.g., farmers, craftsmen/shopkeepers, blue collar workers). The authors relate the lower incidence of dementia in managers and professionals to selective survival, referring to the fact that in developed countries, survival is longer in some occupations (professionals and managers) than others (farmers). It should be noted that this was an epidemiological study on normal and pathological aging, allowing the calculation of risk ratios, while our study was a retrospective, cross-sectional study using absolute data – making comparison between the two studies and their implications difficult.

The key strength of our study is the large retrospective cohort of patients with PPA, bvFTD, and AD. Our study can be regarded as a replication as well as an extension of the original study by McKhann et al. (2011), as we included a sample of patients with bvFTD in addition to the samples of PPA and AD patients that were already present in the previous study. Moreover, our group of PPA patients is more homogenous than the original sample by Josephs et al. (McKhann et al., 2011), which included patients with progressive speech and language disorders, meaning both patients with PPA and patients with PPAoS. Though to be regarded as preliminary, as sample sizes were small, we found differences between the clinical subtypes of PPA, which has broadened our knowledge of cognitive reserve mechanisms in PPA. A limitation of the present study is that, based on the retrospective data used in the present study, it is not possible to investigate causal relations, which is important in light of dementia prevention and intervention, and the identification of possible mediating or confounding factors that are at play. Prospective cohort studies are therefore needed to disentangle the complex relationship between proxies of cognitive reserve (such as education and occupation) and the risk of developing dementia, and PPA in particular. Other factors influencing cognitive reserve, including lifestyle and social and leisure activities, can then also be taken into account. Lastly, the ethnic diversity in the current sample was low, as the vast majority had a white background. This is remarkable given that in the Netherlands 27% of the general population has a migration background (CBS, 2022). Especially PPA tends to be underdiagnosed in diverse populations, amongst others due to the lack of clinical assessment tools adapted or adaptable to differing social and linguistic contexts. Moreover, the level of education that people attained in their country of origin does not necessarily coincide with the occupational level in the country people migrated into. This makes it harder to generalize the results to the general population. As such, future research should include a wider range of ethnic diversity, for example by larger collaborations covering multiple countries and cultural, social, and linguistic backgrounds.

Conclusion

Our retrospective cohort study demonstrated the frequency of teachers in patients with PPA to be significantly higher than the frequency of teachers in patients with bvFTD and AD, and the NL census. Our findings corroborate and extend the original study by Josephs et al. (McKhann et al., 2011) in an American sample of patients with progressive speech and language disorders, as we additionally included patients with bvFTD. Potential explanations for our results is the "wear and tear" hypothesis, suggesting that teachers have a communication-wise demanding occupation – and therefore are at higher risk to develop progressive language disorders. Alternatively, teaching requires continuous communication, hence teachers have more opportunity to observe changes in their speech and language skills, and/or teachers are more sensitive to subtle changes in their speech and language abilities. Our findings broaden our understanding of the relationship between occupational activity and cognitive reserve in the development of dementia.

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Appendix

Table A1. Demographic and clinical data per occupation category.

Occupation category	Age	Sex, f (%)	Education level	Disease duration, m
Armed forces occupations	65.6 (8.6)	51 (71.8)	5.4 (1.4)	17.9 (163.5)
Managers	65.2 (7.3)	15 (37.5)	5.9 (0.7)	44.7 (36.5)
Professionals – teachers	65.2 (7.6)	36 (58.1)	6.0 (1.2)	39.4 (39.5)
Professionals – nonteachers	63.2 (10.6)	19 (63.3)	5.0 (1.4)	37.3 (27.8)
Technicians and associate professionals	65.5 (7.7)	9 (18.4)	4.8 (1.5)	46.6 (37.3)
Clerical support workers	64.3 (8.7)	15 (22.1)	4.4 (1.7)	41.8 (25.2)
Service and sales workers	64.6 (7.6)	3 (60.0)	4.4 (0.9)	59.9 (43.2)
Skilled agricultural, forestry and fishery workers	64.2 (9.5)	30 (83.3)	4.4 (2.3)	41.8 (29.2)
Craft and related trades workers	64.3 (8.5)	25 (89.3)	3.9 (1.2)	36.1 (20.9)
Plant and machine operators, and assemblers	62.8 (9.9)	14 (42.4)	4.4 (2.2)	48.9 (50.5)
Elementary occupations	62.0 (9.2)	4 (80.0)	5.4 (0.5)	55.3 (74.3)