Subjective Age in the Oldest Old: What is the Association with Disability and Sensory Impairment?

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Abstract

Background and Purpose Disability and sensory impairment are particularly pronounced among the oldest old population (80 years and older). Considering these specificities, we analyzed the association of such parameters with subjective age, a strong predictor of health-related outcomes. We assumed that greater disability and sensory impairment (hearing and visual) would be linked with an older subjective age.

Research Design Prospective population-based study.

Study Sample Data were gathered from the 27th year follow-up of the PAQUID cohort, visit where the question on subjective age was collected. Our sample included 75 participants older than 93 years, with a mean age of 96 years.

Data Collection and Analysis Disability was assessed with Activities of Daily Living and sensory impairments by asking participants if they have visual or hearing difficulties. A multiple linear regression model was performed with subjective age as the dependent variable. Independent variables were functional disability and visual and hearing impairments.

Results On average, the participants felt 12 years younger than their actual age. Multiple regression analyses controlled for age, gender, education, depression, and dementia indicated that self-reported hearing loss ($p = 0.03$) was associated with an older subjective age, whereas no significant associations were observed for disability ($p = 0.42$) and self-reported visual loss ($p = 0.18$).

Conclusions Hearing impairment, in contrast to visual impairment and disability, is associated with feeling older. These results are discussed in light of health consequences and age stigma carried by hearing impairment.

Keywords
- aging
- disability
- hearing
- oldest old
- sensory impairment
- stigma

Introduction

The very old population (often called the "oldest old," i.e., people aged 80 years and older) is the fastest growing segment of the older population (National Institute on Aging, 2011[19]). As an illustration, in France, the group of 75 years old and more represented 9.3% of the global population in 2016 in comparison with 4.3% in 1960. Moreover, it is estimated that this group of 75 years is going to double in 2070, in comparison with 2013 (INSEE, 2016[13]). In this population, disabilities and sensory impairment are particularly frequent; the prevalence increasing markedly with age. Indeed, from 80 years to 100 years old, the ability to perform activities of daily living (ADL) and physical performance (as standing up from a chair, picking up a book from the floor, and turning around 360° without help) decline dramatically (Yi and Vaupel, 2002[31]). In addition to disabilities, nearly 80% of people aged 85 years and older have hearing loss (Lin et al, 2011[18]) and about 24% of people aged 80 years and older are visually impaired (The Eye Diseases Prevalence Research Group, 2004[29]).

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If disability and sensory impairments are markers of advanced physiological age, are they also linked with subjective age? Subjective age has been the focus of numerous studies these recent years. It refers to the age people feel like or view themselves and reveals insightful psychological and physical information (Diehl et al, 2015[7]). Indeed, several studies showed that it is a strong predictor of health-related outcomes: people who feel older than their real age present a worse physical and mental health. For example, an older subjective age is associated with more depressive symptoms (Stephan et al, 2016[25]), greater cognitive decline (e.g., memory and executive functions) (Stephan et al, 2014;[24] 2016[25]), slower walking speed (Stephan et al, 2015a[26]), and shorter survival (Westerhof et al, 2014[30]).

However, the impact of health on subjective age is less known (Eibach et al, 2010[8]; Stephan et al, 2015b[27]). A study highlighted the role of disabilities in subjective age: the more functional limitations in daily living activities (such as bathing, eating, cleaning, etc.) a person has, the older he/she feels (Knoll et al, 2004[16]). Another study suggested that experiencing sensory impairment contributes to a subjective feeling of being older: in a reading task where participants experienced visual difficulty, participants felt older if they did not receive any explanation of the source of this visual difficulty in comparison with participants who were told that the text was blurry because of a printing error (Eibach et al, 2010[8]).

In oldest old, health correlates of subjective age have been scarcely studied: to our knowledge, only one research has focused on this population and showed that not feeling old was related to a higher level of independence in ADL measured with the ADL and IADL scales (Infurna et al, 2010[12]). Therefore, the need to explore the physical determinants of subjective age is particularly relevant among the oldest old for whom the prevalence of sensory impairments and disability is greater than for any other age category (Yi and Vaupel, 2002;[31] The Eye Diseases Prevalence Research Group, 2004;[29] Lin et al, 2011[18]).

To this aim, we used the data from the PAQUID study, a large French community-based cohort of older adults. As this study started in 1989 with people of 65 years and older, the 27-year follow-up of the cohort allowed us to have a sample of oldest old. Building upon past research (Eibach et al, 2010;[8] Stephan et al, 2015b[27]), we hypothesized that people with sensory impairments (hearing and vision) and disability would feel older.

Method

Study Design

The sample is gathered from the PAQUID study, which is a French epidemiological cohort initiated in 1989. To obtain a representative sample of community-dwelling older adults of Gironde and Dordogne, two administrative areas of southwestern France, 75 geographic units were randomly chosen in both urban and rural areas. The participants were randomly selected from electoral rolls. To be invited to participate, they had to be aged 65 years or older and had to live at home. Following this procedure, 3,777 participants have been enrolled. Ethics committee of Bordeaux University Hospital approved the study, and all participants provided written informed consent to participate. Participants were evaluated at home at the initial visit and the 27 following years. At each follow-up visit, participants were interviewed according to a standardized questionnaire including social and medical information (such as perceived social support, dietary habits, prescription drugs, etc.). Also, tests and scales of cognitive performance, cognitive complaints, disability, and depressive symptomatology were administered to participants. Moreover, in addition to the neuropsychological evaluation, a criteria checklist for dementia diagnosis (according to the DSM-IIIR) was completed by a psychologist at each visit. Individuals who met criteria for dementia were visited by a neurologist or a geriatrician, who confirmed or rejected the diagnosis according to current standards. Finally, an independent panel of specialized neurologists reviewed the diagnosis (Dartigues et al, 1992[5]).

Subjective Age

Subjective age was assessed as follows: the psychologist told participants that many people feel older or younger than they actually are and asked them "What age do you feel at the present moment?" (Hughes et al, 2013[11]). The participants had to answer orally.

Disability

Disability was assessed by using the scale of the (ADLs, French version). It evaluates the ability to perform six basic activities (bathing, dressing, toileting, transferring, continence, and feeding) (Katz et al, 1970[14]). On this basis, we created two categories: disabled or not. Participants were considered as disabled if they could not perform at least one of the six activities at the highest level of performance (in other words, without any help needed).

Visual and Hearing Impairments

For visual impairment, participants had to report if they had "none or slight disorder," "disorder impacting usual activities," or "total blindness"; the last two modalities were grouped to create a dichotomous variable of visual impairment. Concerning hearing loss, participants had to report if they had "none or slight disorder," "trouble following the conversation with two or more people talking at the same time or in a noisy background," or "major hearing loss." As for visual impairment, the two last modalities were grouped as follows "none or slight" and "important or major."

Covariates

Age, gender, educational level (no diploma versus primary or more), depression, and the presence of dementia were considered as potential confounders and were adjusted for in the subsequent analyses. Depressive symptomatology was evaluated by the Center for Epidemiologic Studies Depression Scale (Radloff, 1977[21]). Participants were classified with a depressive symptomatology if they score 17 and greater for men and 23 and greater for women (Fuhrer and Rouillon, 1989[9]).

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Table 1 Description of the Sample (t-Test or Chi-Square)

Characteristics	Included Participants N = 75 Mean (SD) or N (%)	Excluded Participants N = 61 Mean (SD) or N (%)	*p*-Value
Age (years)	95.8 (2.6)	96.1 (2.8)	0.46
Subjective age (years)	84.2 (17.6)	82.4 (13.7)	0.78
Female gender	52 (69.3%)	49 (80.3%)	0.17
Low educational level	13 (17.3%)	18 (29.5%)	0.1
Depression	11 (14.7%)	2 (13.3%)	1
Dementia	26 (34.7%)	44 (72.1%)	<0.001
ADL-disability	42 (56.0%)	49 (83.1%)	0.001
Self-reported visual impairment	45 (60.0%)	35 (64.8%)	0.71
Self-reported hearing impairment	59 (78.7%)	37 (63.8%)	0.079

Statistical Analyses

Data analyses were performed using R statistical software and statistical significance was fixed at $p < 0.05$. Descriptive analyses were first conducted to report sample characteristics. Then, a multiple linear regression model was performed with subjective age as the dependent variable. Independent variables were functional disability and visual and hearing impairments. The model was adjusted for age (i.e., chronological age), gender, education, depression, and dementia.

Results

Participants

From the 137 participants having completed the 27-year follow-up visit, 53 had missing data regarding subjective age and one individual felt being 18 years old: this extreme value was excluded from our analyses, based on the Bonferroni outlier test ($p = 0.02$). Also, eight participants had missing data for depression and were also excluded from our analyses. Therefore, the final sample included 75 participants. In comparison with included participants, excluded participants were more likely to suffer from dementia and to be disabled (see ►**Table 1**).

In this sample, the mean age of participants was 95.8 (SD = 2.6). The mean subjective age reported was 84.2 (SD = 17.6). In other words, on average, the participants felt 12 years younger than their actual age. Among the 75 participants, 42 were classified as ADL-disabled, 45 reported visual impairment, and 59 reported hearing loss.

Association between Disability, Sensory Impairment, and Subjective Age

Multiple linear regressions analyses indicated that older adults who reported hearing loss felt older, independently of chronological age, gender, educational level, depressive symptomatology, and dementia (see ►**Table 2**). By contrast, functional disability and visual impairment were not associated with subjective age. This model explained 14% of the variance of subjective age. For greater readability, we presented analyses with raw scores for the subjective age measure, and we controlled for chronological age. However, we also performed the analyses with proportional discrepancy scores, calculated by subtracting participants' subjective age from their chronological age, then divided by chronological age (Rubin and Berntsen, 2006;[22] Stephan et al, 2015b[26]) and no differences were observed.

Discussion

The purpose of this study was to investigate the impact of disability and sensory impairment (hearing and visual) on subjective age in oldest old participants, with the 27-year follow-up of the PAQUID cohort. First of all, we observed that respondents felt about 12 years younger than their actual age (i.e., about 12% younger). This result is consistent with

Table 2 Multilinear Regression between Disability, Sensory Impairment, and Subjective Age in the 27-Year Follow-up of the PAQUID Study

	Nonstandardized Coefficient	SE	*p*-Value	95% CI
Disability[a]	−3.7	4.5	0.42	−12.7 to 5.3
Self-reported visual impairment[b]	−5.6	4.1	0.18	−13.8 to 2.7
Self-reported hearing impairment[b]	11.1	5.2	0.035	0.8 to 21.4

Notes: (N = 75). Model was adjusted for the age, gender, educational level, depression, and dementia.
[a]0 = no disability, 1 = disability.
[b]0 = none or slight loss, 1 = important or major loss.

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previous research: after 40 years old, the majority of people feel younger than their real age (on average, 20% younger) (Rubin and Berntsen, 2006[22]). A previous study conducted among oldest old participants in particular confirmed this trend, with the large majority of participants (from 84 to 90 years old) reporting not feeling old (Infurna et al, 2010[12]). These observations are similar in our sample, suggesting that even in very advanced age, people still use to feel younger than they actually are.

Second, our results suggested that disability and self-reported visual impairment were not significantly associated with subjective age in the oldest old population. Although in opposition to our initial hypothesis, this result could be interpreted in light of previous studies that have shown that objective health parameters (as disabilities) are not always significant predictors of subjective age (Spuling et al, 2013;[23] Ayalon et al, 2015[3]). For example, in a six-year follow-up study involving people older than 40 years, Spuling et al (2013) showed that even if an older subjective age had negative consequences on objective parameters of physical and mental health (number of diseases and depression), as well as on self-reported health, only self-reported health influenced subjective age. Moreover, a research suggested that not all health parameters influenced subjective age: peak expiratory flow, grip strength, and waist circumference were associated with feeling older, but there was no effect of blood pressure and telomere length on subjective age (Stephan et al, 2015b[27]). One hypothesis could be that functional limitations and negative physical sensations might contribute to an older subjective age only if they remind older people and their age-related physical decline (Stephan et al, 2015b[27]). Therefore, in the present study, it is likely that ADL-disability and visual loss did not capture the perception that the oldest old have of their physical decline. One hypothesis could be that the oldest old population view disabilities and visual loss as normal losses as they are inherent processes of aging. Therefore, they would poorly contribute to the assessment of one's own age-related abilities in oldest old individuals. Hearing loss is also very frequent in older age. Therefore, one could postulate that like disability and visual loss, it would have poor impact on subjective age. Yet, it revealed to be robustly associated with this measure.

What can explain this influence of hearing loss on subjective age, compared with visual loss or disabilities? Two elements raise from the literature review. On the one hand, stigmatization associated with hearing loss and on the other hand, negative consequences on health. More precisely, concerning stigmatization, a recent review showed that people with hearing loss may be seen as "less sociable/friendly," "less communicatively effective," "lonely," and "less confident" (David and Werner, 2016[6]). As it has been observed that perceived discrimination could conduct to feeling older (Stephan et al, 2015b[27]), we can hypothesize that such stigmas influence subjective age for people with hearing impairment. The second point to be highlighted is that hearing loss leads to many consequences on well-being and health parameters (Bainbridge and Wallhagen, 2014[4]). In particular, previous studies have shown that hearing loss has been associated with depressive symptoms (Kiely et al, 2013;[15] Li et al, 2014[17]), a lower quality of life (Hogan et al, 2009[10]), increased disabilities (Strawbridge et al, 2000;[28] Amieva et al, 2018[2]), and cognitive decline (Amieva et al, 2015[1]). Also, controlled for disability and visual impairment, difficulties of communication raised by hearing loss is a predictor of higher loneliness and social isolation (Palmer et al, 2016[20]). All these mental, physical, and social consequences, specific to hearing loss, might explain the impact of such impairment on subjective age.

One limitation of our study, even if we have to keep in mind that we were in the specific population of oldest old, is that our sample was relatively small (particularly because of missing data on the question of subjective age). Furthermore, associations between our variables were cross-sectional: we had information about subjective age of the PAQUID cohort only on the 27-year follow-up. Therefore, we could not analyze possible causal relationships. For future studies, data on the evolution of subjective age with time, in parallel with the evolution of health (dependency, mortality, etc.), should give us more information on the influence of health parameters on subjective age. Also, it would be interesting to collect information regarding perceived stigma associated with hearing loss, to analyze if such stigmas mediate the relationship between hearing impairment and subjective age. Finally, future studies should investigate whether people for whom hearing loss has been compensated with hearing aids since the beginning of the impairment feel younger. If so, physicians could have an additional reason for promoting diagnosis and treatment ofhearing loss in elderly people.

Conclusion

Adults older than 95 years still use to feel younger than their real age. Disability and visual impairment do not seem to be linked with feeling older, whereas people reporting hearing loss feel older than those not reporting hearing loss. In addition to literature results showing the negative consequences of hearing loss on well-being and a large range of health-related outcomes in older adults, our results show that hearing loss may also negatively influence how old one person perceives him/herself.

Abbreviations

ADL activities of daily living

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