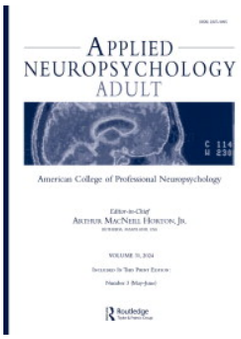

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Impaired lexical access for unique entities in individuals with subjective cognitive decline

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ABSTRACT

Subjective cognitive decline (SCD) may serve as an early indicator of Alzheimer's disease (AD). However, accurately quantifying cognitive impairment in SCD is challenging, mainly because existing assessment tools lack sensitivity. This study examined how tasks specifically designed to assess knowledge of famous people, could potentially aid in identifying cognitive impairment in SCD. A total of 60 adults with SCD and 60 healthy controls (HCs) aged 50 to 82 years performed a famous people verbal fluency task and a famous people naming task. In the famous people fluency task, the results showed that the individuals with SCD produced significantly fewer famous names in the total time allowed than the HCs, and this difference was also found in the first and the second time interval. In the famous people naming task, the performance of the SCD group was significantly lower than that of the HC group only in the more recent period of fame. Overall, these results suggest that retrieving the names of famous people was more difficult for people with SCD than for people without cognitive complaints. They also suggest that famous people verbal fluency and naming tasks could be useful in detecting cognitive decline at the preclinical stage of AD.

KEYWORDS

Alzheimer's disease; assessment; cognition; famous people knowledge; language; naming; subjective cognitive decline; verbal fluency

Introduction

The DSM-5 criteria have undergone an update (American Psychiatric Association, 2013), leading to a revision in the definition of dementia. The term "dementia" has been replaced with "Major Neurocognitive Disorder" (MNCD). MNCD is a pressing global health problem. It affected about 55 million people in 2019, a number that is expected to rise to 139 million by 2050 (Gauthier et al., 2022). MNCD has profound consequences for affected individuals, their families, caregivers, and society at large (Tahami Monfared et al., 2022). Among older adults, dementia is the leading cause of disability and is among the leading causes of mortality (Alzheimer Association, 2023; Avan & Hachinski, 2021). Moreover, as the aging population continues to grow, the prevalence of MNCD is expected to persistently rise (Alzheimer Association, 2023).

The primary cause of MNCD is Alzheimer's disease (AD). The standard progression of MNCD caused by AD consists of three primary stages: (1) a pre-clinical phase where individuals may exhibit a range of symptoms from no noticeable decline to subtle changes referred to as subjective cognitive decline (SCD) or subjective cognitive impairment; (2) mild cognitive impairment (MCI), a phase preceding MNCD characterized by memory impairment or other cognitive deficits, and (3) MNCD (Dubois et al., 2021).

AD and other significant forms of MNCD can have a pre-symptomatic phase that can extend for several decades (Villemagne et al., 2013). In the continuum of AD, SCD refers to a decline in cognitive function that is personally perceived without obvious signs of objective cognitive impairment (Jessen et al., 2020; Rabin et al., 2017).

Most people over the age of 65 have occasional concerns about their memory or language. Based on population-based studies, approximately 50% to 80% of individuals aged 70 and above, who achieve normal scores on cognitive assessments, report experiencing some degree of self-perceived decline in cognitive functioning when questioned (van Harten et al., 2018). For example, in a recent meta-analysis of longitudinal studies on the risk of developing dementia or mild cognitive impairment in people with SCD, Pike et al. (2022) reported a mean prevalence of 44% (range 5-84%) SCD in their sample of 46 studies including more than 74,000 participants. The presence of self-reported subtle cognitive issues in individuals has been linked to a higher risk of developing MNCD (Hallam et al., 2022; Slot et al., 2019). However, despite the existing evidence for the usefulness of the concept of SCD, the literature is still inconclusive regarding its reliability in accurately identifying the early stages of neurocognitive disorders (NCD), especially in the presence of psychiatric symptoms or disorders such as depression or anxiety (Liew, 2019, 2020).

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Detecting neurodegenerative diseases at an early stage is a significant concern within public health and clinical research efforts aimed at MNCD prevention. However, when it comes to SCD, the limited sensitivity of assessment tools poses a challenge in detecting cognitive impairment, as individuals may compensate for deficits and demonstrate apparently normal performance (Jessen et al., 2014; Rabin et al., 2017). Systematic neuropsychological assessment of people with SCD is not recommended in standard clinical practice. However, early implementation of counseling and care optimization resources is vital to improve support for people who are concerned about their cognitive abilities.

A large proportion of studies on SCD have examined the predictive value of cognitive complaints for future decline and dementia. For example, in a recent study involving 873 community-dwelling older adults without dementia and 843 informants, Numbers et al. (2020) showed that the rate of global cognitive decline was related to both participants' (p = .027) and informants' (p < .001) complaints specifically related to memory. Similarly, in a multicenter study on SCD in community-based settings and memory clinics involving 2978 participants with SCD and 1391 controls, Slot et al. (2019) reported a higher incidence of dementia in SCD (17.7/1000 person-years) compared with controls (14.2/1000 person-years), more pronounced in memory clinics than in community-based settings.

Cross-sectional studies on SCD have also objectified cognitive impairment in various cognitive domains. With respect to memory, studies have shown that participants with SCD perform worse compared with paired controls on tasks examining long-term visual recognition memory (Bainbridge et al., 2019), autobiographical memory (Bruus et al., 2021), memory binding (Koppara et al., 2015), prospective memory (Hsu et al., 2015), and learning new information (Polcher et al., 2017). Other studies on SCD found significant weaknesses in executive functioning (for a review, see Webster-Cordero & Giménez-Llort, 2022). Finally, studies used tests of verbal fluency to examine lexical access and executive functions in SCD. Overall, the authors found lower performance of participants with SCD compared to participants without cognitive complaints (Açikgöz et al., 2014; López-Higes et al., 2017; Macoir et al., 2019, 2022; Nikolai et al., 2018; Nutter-Upham et al., 2008).

The main objective of this study was to investigate the potential contribution of tasks involving the retrieval of famous people to objectively identify cognitive impairment in SCD. According to some authors, tests that assess access to semantic and lexical representations of unique concepts such as famous people or famous buildings are good predictors of conversion of MCI to AD (Ahmed et al., 2008; Estévez-González et al., 2004; Thompson et al., 2002). Unique entities are characterized by their distinctness and correspond to single concepts and specific names. Concrete concepts, on the other hand, comprise a collection of properties shared by various entities associated with the same concept. These concepts are represented by common names that can be replaced by synonyms without changing the meaning or specificity of the message. Unique concepts have semantic attributes that are less frequently shared with other concepts, making them more vulnerable to neurological conditions (Ross & Olson, 2012; Thompson et al., 2002). Given the predictive value of cognitive complaints for future decline and dementia, we hypothesized that individuals with SCD should have difficulty in tasks requiring the retrieval of information about unique entities. Therefore, the main objective of this study was to determine whether a famous people fluency task and a famous people naming task could objectify deficits in individuals with DCS.

Method

Participants

For the current study, a total of 60 adults with SCD and 60 HCs (healthy controls) were sampled. Participants ranged in age from 50 to 82 years. Their mother tongue and current language was French. They were recruited through advertising in the community. All individuals with SCD expressed concerns about their cognitive abilities and met the criteria for SCD as defined by Jessen et al. (2014). To ensure the physical and mental well-being of all HCs, a self-report questionnaire on health status was completed.

Individuals with certain previous or current medical conditions were excluded from the study. This included those with a history of moderate or severe traumatic brain injury, cerebrovascular disease, delirium within the past 6 months, intracranial surgery, neurological disorders of cerebral origin, encephalitis or bacterial meningitis, recent oncological treatments within the past 12 months, and general anesthesia within the past six months. Additionally, participants with unstable metabolic or medical conditions (e.g. untreated hypothyroidism or diabetes), a current or previous psychiatric disorder as per DSM-V (Axis I) criteria (American Psychiatric Association, 2013), alcoholism or substance abuse within the past 12 months, uncorrected vision or hearing problems, usage of experimental medication, or the inability to provide informed consent were also excluded. The information regarding these exclusion criteria was obtained through self-reports provided by the participants.

All participants in the study provided written informed consent in accordance with the Declaration of Helsinki. The study received approval from the local research ethics board, specifically the Ethics Committee on Sectoral Research in Neurosciences and Mental Health of the CIUSSS de la Capitale-Nationale (project number 2019-1529).

Clinical assessment and group characterization

In order to verify the inclusion and exclusion criteria and categorize individuals into the SCD and HC groups, all participants underwent an extensive range of clinical tests. This battery of tests encompassed evaluations of cognitive complaints, depressive and anxiety symptoms, and overall cognitive functioning. The Questionnaire de Dépistage de la Plainte Cognitive (Screening Questionnaire of Cognitive Complaints; QDPC), (Dion et al., unpublished), is a user-friendly and straightforward questionnaire designed to

assess cognitive complaints. This standardized questionnaire is directly aligned with the research criteria for SCD established by Jessen et al. (2014). The QDPC uses the following questions and sub-questions to address an individual's cognitive decline in comparison to his/her former level of functioning as well as his/her cognitive function as compared to other people of the same age group:

1. Are you worried about how your memory is working?
2. Do you think your memory has changed in the last 10 years?
   If yes, how long have you observed a decline in memory functioning?
3. Do you feel that your memory is worse than that of other people your age?
   3.1. If yes, and it is worse, do you feel that you have always had a poorer memory than other people your age?
   3.2. If no, and it is the same, would you say that, in the past, your memory was at the same level as or better than most other people your age?

Based on the criteria of Jessen et al. (2014), participants were categorized as having SCD if they answered yes to questions 2, 3 and 3.1. They were also categorized as having SCD if they answered yes to question 2 and no to question 3 and stated in question 3.2 that their memory was better than that of most other people their age. Participants who had normal cognitive function and believed that their memory was either better or similar to that of their peers (only if it did not represent a decline) were assigned to the control group. In addition, individuals who reported poorer memory performance but had not seen any decline over the past 10 years were also assigned to the control group.

To account for the frequent occurrence of depressive and anxiety symptoms in individuals with SCD (Hill et al., 2016; John et al., 2019), all participants were assessed with the 30-item Geriatric Depression Scale (GDS −30) and the Geriatric Anxiety Inventory (GAI). These assessment tools consist of a series of yes–no questions and were specifically designed to detect symptoms of depression and anxiety, respectively.

In addition, general cognitive impairment was assessed with the Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005), a widely used screening test specifically designed to detect cognitive impairment associated with MCI. The MoCA has demonstrated sensitivity in detecting mild cognitive deficits and has shown the ability to predict future cognitive decline in several cognitive impairments, including AD and other forms of MNCD. However, as found in various studies (e.g. Davis et al., 2015; Malek-Ahmadi et al., 2015), the use of a cutoff score of 26, as recommended by Nasreddine et al. (2005), particularly increases the risk of false positive results in individuals with higher age and/or lower education, the socio-demographic characteristics of the participants in this study. In addition, Carson et al. (2018) concluded in their meta-analysis of 304 studies that a MoCA cutoff score of 23 instead of the originally recommended score of 26 reduces the false-positive rate and has better overall diagnostic accuracy. Considering these recommendations, we used the regression-based norms that we developed for the MoCA test in the middle-aged and elderly French-Quebec people (Larouche et al., 2016). As pointed out by Carson et al. (2018), these norms, adjusted for age, education and sex, maximizes specificity and sensitivity and thus enable a better diagnosis.

Experimental tasks

Retrieval of semantic and lexical information about unique entities was assessed with a famous people fluency task followed by a famous people naming task.

The famous people fluency task involves executive functions, activation of unique semantic representations, namely famous people, and lexical access. The participants were given the following instructions in French: "I want you to name as many famous people as possible, e.g., the names of singers, athletes, politicians, actors. It must be a person who already existed, not a fictional character. You must tell me the first and last name of the famous person, not just the first or last name. Can you give me an example of the name of a famous person?" If the answer is inappropriate, the examiner asks for another example of a famous person. If the answer is acceptable, the examiner says, "Great. Before you begin, do you have any questions? To avoid distraction, you must now close your eyes and tell me as many names of famous people as possible in 1 minute 30 minutes." At the end of the task, if the participant has given names unknown to the examiner, the examiner says: "You said "FIRST NAME + LAST NAME". I don't know this person. Can you tell me why she is famous?"

The scoring method was based on the number of different names of famous people names produced in 90 seconds and within each time interval (1: 1–29 seconds; 2: 30–59 seconds; 3: 60-90 seconds). Responses that referred to famous people whose last names were not commonly used, were mostly unknown (e.g. Queen Elizabeth, Napoleon), or did not exist (e.g. "French singer" known only by her nickname "Zaz") were also scored one point.

The famous people naming task involved activating semantic representations of famous people and lexically accessing their names. The stimuli, which consisted of 32 free-use black-and-white photographs of famous people, were obtained by searching their names in Google Images. They were chosen from four domains: actors, singers, politicians, and athletes. Stimuli were also controlled for the following four fame periods (i.e. the period in which the individual's fame occurred and was maximal): before 1960, 1960–1980, 1980–2000, and 2000 and over). It is worth mentioning that many of the selected famous people were still active in their domains after these notoriety periods. However, all photographs depicted the famous people in their most renowned period. They are all part of Quebec's cultural, political, and sporting landscape and are widely known among the population. This was ensured with a pilot naming task including 128 stimuli of famous people, which

Table 1. Distribution of the stimuli in the famous people naming task by fame domain and fame period.

	Actors	Singers	Politicians	Athletes
Before 1960	Charlie Chaplin	Félix Leclerc	Maurice Duplessis	Maurice Richard
	Marylin Monroe	Édith Piaf	John F. Kennedy	Babe Ruth
1960–1980	Catherine Deneuve	John Lennon	Robert Bourassa	Mohamed Ali
	Clint Eastwood	Gilles Vigneault	Fidel Castro	Nadia Comaneci
1980–2000	Michel Côté	Michael Jackson	Brian Mulroney	Wayne Gretzky
	Gérard Depardieu	Martine St-Clair	Margaret Thatcher	Patrick Roy
2000 and over	Brad Pitt	Isabelle Boulay	Stephen Harper	Roger Federer
	Guylaine Tremblay	Martin Deschamps	Nicolas Sarkozy	Michael Schumacher

Table 2. The demographic and cognitive characteristics of groups.

	HC ($n=60$)		SCD ($n=60$)				
	M (SD)	min–max	*M (SD)*	min–max	*t/U*	*p*	*Effect size*
Age	64.5 (7.89)	50–82	66.8 (5.46)	56–75	1.87	.06	$d=0.342$
Education	15.6 (2.88)	9–23	17.6 (3.00)	11–23	1151	<.001***	$rbc=0.361$
Males/females	22/38		30/30		2.172[t]	.14	
MoCA (30)	27.1 (1.83)	23–30	27.0 (1.74)	24–30	1698	.59	$rbc=0.057$
GDS (30)	5.45 (4.75)	0–16	7.47 (4.47)	0–20	1364	<.05*	$rbc=0.242$
GAI (20)	2.77 (3.47)	0–16	4.47 (4.71)	0–16	1405	<.05*	$rbc=0.219$

Note: *d* = Cohen's *d*; GAI = Geriatric Anxiety Inventory; GDS = Geriatric Depression Scale; HC = Healthy controls; *M* = Mean; min-max = minimal-maximal test score value; MoCA = Montreal cognitive assessment; *rbc* = rank-biserial correlation; SCD = Subjective cognitive decline; *SD* = Standard deviation.
***$p<.001$; *$p<.05$; *t* = Pearson's Chi-squared test.

was presented to 10 healthy participants aged 50 years and older. The 32 stimuli for which performance in the different categories was better were selected for the experimental task. The distribution of stimuli by fame domain and fame period is shown in Table 1.

The participants were given the following instructions in French: "In this task, photos of famous people will be presented one after the other on the computer screen. These famous people are actors, singers, politicians, and athletes. I would like you to name each of these people by their first and last names. You can say the last name if you don't know the person's first name. We'll start with two examples (photos of Jean Charest, the former premier of Quebec, and the singer Elvis Presley). Are you ready?"

Correct answers that consisted of giving the last name of the famous person were awarded one point, while complete answers (i.e. first and last name) were awarded two points.

Participants were assessed in two 40-min sessions in which each of the clinical and cognitive profile characterization tests and the two experimental tasks were administered in the same order.

Statistical analyses

All statistical analyses were carried out using the freely accessible statistical package Jamovi (The Jamovi project, 2023). Independent samples *t*-tests (age) or Mann-Whitney *U* test (educational level, GDS, GAI) were used to compare the groups based on demographic data, except for sex, which was examined with the chi-square test. The relation between the sociodemographic variables and the main dependent variables of the experimental tasks was examined using Spearman tests for the two groups and the total sample. First, the data distributions of the two groups were checked for skewness using the Shapiro-Wilk test and histograms. In addition, the normality and homoscedasticity of the residuals were checked using suitable visualizations, namely quantile-quantile (Q–Q) plots and plots of the residuals versus the fitted values.

The distributions of the data for all variables of interest in the famous people fluency task (total score and scores in each time interval) and in the famous people naming task (total score and scores in each fame period) were skewed and the residual plots indicated violations of homoscedasticity. Therefore, robust independent t-tests (i.e. Yuen's *t*-test with bootstrapping) were used to analyze the data (Yuen, 1974). This robust statistical method performs well in terms of type I error control and statistical power, even when the assumptions of normality and homoscedasticity are violated (Wilcox, 2017). Effect sizes (ξ) were calculated for all significant comparisons, and 0.1 was considered small, 0.3 moderate and 0.5 large (Rand & Tian, 2011).

Finally, we used logistic regression to assess the additive contribution of the two experimental tasks in the classification of SCD and HC. Results were presented as odds ratios with 95% confidence intervals (CIs). We reported the accuracy, sensitivity, and specificity as well as the positive and negative predictive values. The area under the ROC curve (AUROC) was also calculated.

Results

Table 2 shows the demographic information and clinical test results. As shown in this table, the groups were found to be comparable in terms of age and sex distribution. However, participants with SCD were found to have higher educational attainment compared with HCs. All participants were within the normal range on the MoCA test, and no significant differences were found between the SCD and HC groups. The GDS −30 scores for the HCs and participants with SCD ranged from 0 to 16 and 0 to 20, respectively. None of the participants met the clinical criteria for depression as defined

Table 3. Correlations between sociodemographic variables and the main results on experimental tasks.

	Education			GDS			GAI			Famous people fluency		
	Total sample	HC	SCD	Total sample	HC	SCD	Total sample	HC	SCD	Total sample	HC	SCD
Education	1.00											
GDS	0.01	−0.20	0.04									
GAI	0.05	−0.20	0.17	**0.35*****	**0.28***	**0.42*****						
Famous people fluency	0.05	**0.31***	0.03	0.002	0.09	0.03	0.11	0.1	0.23			
Famous people naming	0.11	**0.36****	0.008	0.12	0.08	0.22	0.06	−0.03	0.21	**0.57*****	**0.72*****	**0.37****

Relevant correlations are highlighted in bold.
*$p < .05$; **$p < .01$; ***$p < .001$.

Table 4. The results on the famous people fluency task according to group, performance and time interval.

	HC ($n = 60$)			SCD ($n = 60$)						
Performance	*Mean*	*SD*	*Range*	*Mean*	*SD*	*Range*	*t (Bt)*	*df*	*p*	ξ (95% ξ CI)
Total response	16.5	5.22	8–37	13.8	4.47	7–29	3.06 (−3.08)	68.2	<.01**	0.42 (0.17–0.59)
Interval 1 (1–29 sec.)	7.5	2.16	4–13	6.55	2.24	3–13	3.09 (−3.11)	70.0	<01**	0.35 (0.13–0.61)
Interval 2 (30–59 sec.)	5.02	2.14	1–14	3.58	1.94	0–10	3.98 (−3.92)	70.1	<.001***	0.515 (0.28–0.71)
Interval 3 (60–90 sec.)	4.00	2.66	0–11	3.72	2.23	0–11	0.61 (−0.62)	64.0	.54	0.10 (0–0.36)

Note: HC: healthy controls; SCD: subjective cognitive decline; SD: standard deviation; t = Yuen's *t*-test; Bt = Yuen's bootstrapped; ξ = Effect size.
**$p < .01$; ***$p < .001$.

Table 5. The results on the famous people naming task according to group, performance and fame period.

	HC ($n = 60$)			SCD ($n = 60$)						
Performance	*Mean*	*SD*	*Range*	*Mean*	*SD*	*Range*	*t (Bt)*	*df*	*p*	ξ (95% ξ CI)
Total response	40.2	10.9	20–60	36.5	11.0	7–60	1.11 (1.12)	67.8	.27	0.16 (0–0.40)
Before 1960	11.1	3.24	2–16	10.8	2.84	2–16	0.77 (−0.77)	46.1	.45	0.10 (0–0.36)
1960-1980	10.7	3.42	2–16	10.5	3.70	2–16	0.11 (0.11)	70.0	.91	0.02 (0 − 0.32)
1980-2000	11.0	3.69	4–16	9.68	3.77	0–16	1.38 (−1.39)	69.5	.17	0.18 (0–0.47)
2000 and over	7.42	3.56	1–14	5.55	3.44	0–16	2.86 (−2.88)	67.1	<.01**	0.43 (0.14–0.63)

Note: HC: healthy controls; SCD: subjective cognitive decline; SD: standard deviation; t = Yuen's *t*-test; Bt = Yuen's bootstrapped; ξ = Effect size.
**$p < .01$.

by the DSM-V (American Psychiatric Association, 2013). However, a significant difference was found in the GDS-30 scores between the two groups, indicating a different level of depressive symptoms, which is more pronounced in SCD than in HCs. GAI scores ranged from 0 to 16 for HCs and participants with SCD, and none of the participants met clinical criteria for anxiety according to the DSM-V. However, a significant difference in GAI scores was found between the two groups, indicating different levels of anxiety symptoms, which are more pronounced in SCD than in HCs.

As shown in Table 3, the level of education correlated with performance on the two experimental tasks only in the HC group, while no correlation was found between the GDS and GAI scores and performance on the two experimental tasks either in the individual groups or in the total sample. Therefore, the level of education as well as the GDS and GAI scores were not included as covariates in the analyses.

Famous people fluency task

Table 4 shows the mean, SD and range of results for the famous people fluency task by group and time interval. As shown in Table 4, there were significant differences between the two groups' performance on the famous people fluency task. The robust independent t-test showed that the performance of the SCD group was significantly lower than that of the HC group for both the total score and the number of famous names produced in the first- and second-time intervals. In the third-time interval, however, there was no statistical difference between the two groups.

Famous people naming task

Table 5 shows the mean, SD and range of results for the famous people naming task by group and fame period. The robust independent *t*-test showed that the performance of the SCD group was significantly lower than that of the HC group only in the more recent period of fame.

Prediction of groups HC vs SCD

When comparing the models with each score using AIC and BIC (see Table 6), it was found that the two variables that best identified SCD were the total score of famous people fluency task and the naming of famous people from the year 2000 and above. The total score of the fluency task correctly identified 68% of the SCD cases (AUC = 0.664; sensitivity = 0.50; specificity = 0.68), while the naming score for the more recent period of fame correctly identified 65% of the

Table 6. Logistic regression models for prediction of groups HC vs SCD using the results of experimental tasks in separate model.

HC vs SCD	95% CI for Odds Ratio						
Variables	Estimate (SE)	Lower	OR	Upper	*p*	AIC	BIC
Total response fluency £	0.123	0.039	1.13	0.207	<.01**	161	166
Total response naming ≠	0.031	−0.003	1.03	0.065	.073	167	173
Naming 2000 and over ¥	0.15	0.044	1.17	0.263	<.01**	162	168

Note: AIC: Akaike information criterion; BIC: Bayesian information criterion; CI = confidence interval; HC: healthy controls; OR = odds ratio; SCD: subjective cognitive decline; SE = standard error.
£: Model $\chi^2 = 9.50$, $p < .01$, Deviance = 157, $R^2 = 0.057$ (McFadden), 0.08 (Cox & Snell), 0.10 (Nagelkerke).
≠: Model $\chi^2 = 3.33$, $p = .068$, Deviance = 163, $R^2 = 0.020$ (McFadden), 0.027 (Cox & Snell), 0.0365 (Nagelkerke).
¥: Model $\chi^2 = 8.35$, $p < .01$, Deviance = 158, $R^2 = 0.050$ (McFadden), 0.067 (Cox & Snell), 0.090 (Nagelkerke).

SCD cases (AUC = 0.65, sensitivity = 0.60, specificity = 0.65).

Discussion

This study aimed to explore how tasks focused on retrieving information about famous people can effectively detect cognitive impairment in individuals with SCD. In the famous people fluency task, the results showed that the individuals with SCD produced significantly fewer famous names in the total given time than the HCs and this difference was also found in the first and the second time interval. In the famous people naming task, the participants with SCD were able to name fewer famous people correctly than the HC participants. Moreover, when the accuracy of naming was analyzed according to the period of fame, the performance of the SCD group was significantly lower than that of the HC group only in the more recent period of fame. Overall, these results suggest that retrieving the names of famous people was more difficult for people with SCD than for people without cognitive complaints.

In SCD, lexical access and executive functions were examined in studies using different types of verbal fluency tasks. Mixed results have been reported in studies using semantic fluency. Some reported impairments in SCD compared to healthy controls (Açikgöz et al., 2014; Elkana et al., 2016; Kielb et al., 2017; Koppara et al., 2015; López-Higes et al., 2017; Minett et al., 2008; Nikolai et al., 2018), while others (Caramelli & Beato, 2008; De Simone et al., 2023) found no difference between the groups. There is a similar discrepancy in studies of phonemic fluency tasks in SC, with studies reporting differences between SCD and HC groups (Koppara et al., 2015; López-Higes et al., 2017) and others not (De Simone et al., 2023; Nutter-Upham et al., 2008; Park et al., 2019). The heterogeneity of performance on in verbal fluency tasks within SCD individuals might be due to sample characteristics, such as differences in educational level, presence of depressive or anxiety symptoms, and cognitive reserve (e.g. Montemurro, Mondini & Arcara, 2021; Thomas et al, 2022). Finally, SCD participants were recently found to be impaired compared to healthy participants on alternating and constraint verbal fluency, two verbal fluency tasks with high executive processing load (Macoir et al., 2022). As far as we know, the famous people fluency task has never been used in people with SCD. It has been used rarely in healthy elderly people (Özdemir & Tunçer, 2021) or in people with pathological conditions such as multiple sclerosis (Beatty et al., 1988) or MCI (Clague et al., 2011). In the latter study, participants (14 healthy controls and 13 MCI) were presented with a classic semantic fluency task and a famous people fluency task, in which they were asked to name as many famous people as possible in each of four given professional categories (actors and TV presenters, politicians and statesmen, singers and musicians, and athletes) over a period of one minute. Compared to the healthy participants, the MCI group was impaired to the same extent in the famous people fluency and the semantic fluency tasks. In the present study, we showed that the difficulties in retrieving the names of famous people can also be observed in SCD.

The generation of words as a function of time interval is a compelling variable that provides insight into how processing load affects performance on the verbal fluency task. During the initial phase of the task, there is a readily available pool of words. As time progresses, this pool becomes depleted, leading to increasing difficulty in word generation and requiring additional executive resources to complete the task successfully (Raboutet et al., 2010). A few studies focusing on verbal fluency in MCI and examining within-task performance have produced inconsistent findings. Demetriou and Holtzer (2017), for example, showed a correlation between MCI status and reduced word generation within the first 20-second time interval in both semantic and phonemic fluency tasks, while Jacobs et al. (2021) found this correlation across all time intervals in semantic fluency and only in the last time interval in phonemic fluency. In the present study, the participants with SCD produced fewer names of famous people than the healthy participants in the given time as a whole and in the first- and second-time interval. This pattern of performance indicates difficulty of SCD participants to access the pool of names that is immediately available at the beginning of the fluency task and that they have difficulty to adopt strategies to pursue the semantic-lexical search.

In SCD, the ability to name pictures has only been investigated in a few studies. Park et al. (2019) found no differences between healthy participants and participants with SCD in the Korean Boston Naming Test (Kim & Na, 1997). However, in the longitudinal study by Kielb et al. (2017), the results of object naming on the Boston Naming Test were significantly worse in the group of participants with SCD at the beginning of the study than in the group of participants without cognitive complaints. In this study, the annual rate of change in object naming scores over the follow-up period was significantly higher in the SCD group than in the healthy group. Finally, participants with SCD

performed similarly to HCs when naming objects, while a HCs-SCD-MCI performance pattern was found in video action naming, where only HCs differed significantly from participants with MCI and participants with SCD were midway between HCs and participants with MCI (Macoir et al., 2019). As far as we know, there is no study that dealt specifically with the naming of famous people in SCD. In MCI, deficits in object naming are not always objectified (Balthazar et al., 2008; Choi et al., 2013; Clague et al., 2011). However, there seems to be a more consistent impairment in naming pictures of famous people (Ahmed et al., 2008; Clague et al., 2011; Estévez-González et al., 2004; Gardini et al., 2013; Joubert et al., 2010). Moreover, performance on tests requiring activation of semantic and lexical representations of unique concepts (e.g. people, famous monuments) appears to be a good predictor of conversion from MCI to AD (Ahmed et al., 2008; Estévez-González et al., 2004; Thompson et al., 2002).

The presence of a temporal gradient, as observed in the SCD participants in the present study, has also been investigated in studies on MCI. The temporal gradient effect refers to the literature on episodic memory, in which studies have reported that memory loss is more pronounced in the current phase of life than in more distant periods of life (Scoville & Milner, 1957; Squire & Alvarez, 1995). A temporal gradient effect in episodic memory has been observed in neurodegenerative diseases such as AD (e.g. De Simone et al., 2016; Greene & Hodges, 1996), MCI (e.g. Bizzozero et al., 2008; Serra et al., 2022), and Parkinson's disease (e.g. Sagar et al., 1988; Smith et al., 2010). In studies on semantic knowledge about unique entities in MCI, a temporal gradient was also found, with better recall performance for remote information than for current information on famous people (Benoit et al., 2017; Seidenberg et al., 2013). However, such a temporal gradient has not been systematically observed in MCI. Studies have shown similar performance patterns when naming faces of famous people (Barbeau et al., 2012; Thompson et al., 2002) or when recalling famous historical events (Langlois et al., 2016; Leyhe et al., 2010) over different periods of fame.

The temporal gradient observed in the SCD participants in the present study is consistent with the theoretical model of memory consolidation (Squire & Alvarez, 1995). In this model, the hippocampal complex and medial temporal lobes are hypothesized to play a role in the temporary storage and retrieval of semantic and episodic memories. These memories are later consolidated into long-term storage through the formation of memory traces in neocortical and extrahippocampal structures. Therefore, the impairment of these brain structures in MCI (Chen et al., 2016; Yushkevich et al., 2015) could lead to specific difficulties in retrieving recent information in long-term memory compared to remote information.

The current study has limitations, primarily due to its cross-sectional design, which precluded the ability to track the gradual development of cognitive decline in SCD. Consequently, it was not possible to assess the predictive capacity of the famous people fluency and naming tasks concerning progression from SCD to MCI and MNCD. Furthermore, while individuals with SCD exhibited performance within the normal range on the MoCA, indicating typical cognitive functioning, a more comprehensive evaluation of their neuropsychological and neurolinguistic abilities would have yielded a more thorough understanding of the cognitive processes influencing their performance in the famous people experimental tasks. A further limitation arises from the chosen sampling method, a recognized factor that contributes to inconsistencies in the results (Abdelnour et al., 2017; Rodríguez-Gómez et al., 2015). For example, research suggests that people with SCD recruited from memory clinics are more likely to progress to MCI compared to people from the general population, who are more representative of the wider population struggling with cognitive problems (Kuhn et al., 2019; Snitz et al., 2018). Finally, in studies to objectify cognitive impairment in SCD, particular attention should be paid to the presence of affective symptoms. Indeed, many studies have shown an increased risk of MCI or MNCD in individuals with affective symptoms (e.g. An et al. 2024; Li et al., 2023), and especially with anxiety (Desai et al., 2021). Therefore, although no correlation was found in the present study between depression (measured with the GDS), anxiety (measured with the GAI) and performance on the two experimental tasks, these two factors should always be considered in future studies.

In contrast to object nouns or verbs, unique entities like famous people or events are processed at the most precise conceptual level and each of them belongs to a class without other members (Grabowski et al., 2001). There is often a great deal of information available about famous people, and the specific details about their characteristics, achievements and social status are often very individualized (Ross & Olson, 2012). In contrast to objects too, unique entities such as famous people are labeled with proper names, specific to a unique "exemplar." Unique and non-unique entities also differ at the neuroanatomical level. Studies have shown that the processing of famous entities is more strongly associated with a distributed network of brain regions compared to non-famous ones (e.g. Fairhall & Caramazza, 2013; Wang et al., 2016). These distinctive features make unique entities more vulnerable to the cognitive decline associated with AD (Montembeault et al., 2017; Thompson et al., 2002) and MCI (Clague et al., 2011; Estévez-González et al., 2004). The results of the present study show that knowledge about famous people could also be vulnerable in people with SCD. They also suggest that famous people verbal fluency and naming tasks could be useful in detecting cognitive decline at the preclinical stage of AD. More generally, these findings contribute to the clinical characterization of SCD, a condition in which the cognitive domains known to be impaired in MCI, such as processing unique entities, could decline more than what would be expected in the general population.

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Informed consent statement

Informed consent was obtained from all subjects involved in the study.

Disclosure statement

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