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# The role of disability and depressive symptoms in the relation between objective cognitive performance and subjective cognitive decline

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**Background:** Subjective cognitive decline (SCD) and subjective memory decline (SMD) are common among older people. Evidence linking SCD and SMD with cognitive and memory impairment is inconsistent. Moreover, little is known about the associations of SCD and SMD with disability. We aimed to explore the associations of SCD and SMD with objective cognitive and memory performance, disability, and depressive symptoms.

**Materials and methods:** In a cross-sectional study we conducted face to face interviews in a randomized sample of people aged  $\geq 65$  years living in the Canton of Ticino, southern Switzerland, between May 2021 and April 2022. We measured subjective cognitive decline with the MyCog, a subsection of the Subjective Cognitive Decline Questionnaire (SCD-Q); cognitive functioning with the Community Screening Instrument for Dementia; memory with the consortium to establish a registry for alzheimer's disease (CERAD) 10-word list learning task; and disability and depressive symptoms with the world health organization disability assessment schedule 2.0 (WHO-DAS 2.0) and the Euro-Depression (EURO-D) scales, respectively.

**Results:** Of the 250 participants 93.6% reported at least one cognitive difficulty, and 40.0% SMD. Both SCD and SMD were associated with poorer objective cognitive/memory performance, and independently with greater disability, and more depressive symptoms. But in participants with high disability and depressive symptoms subjective and objective cognition were

no longer associated. Disability fully mediated the associations of poorer objective cognitive and memory performance with subjective cognitive and memory decline.

**Conclusion:** Routine clinical assessments of cognitive function should include formal enquires about SCD and SMD, and also account for disability and depressive symptoms.

#### KEYWORDS

subjective cognitive complains, functional ability, mental health, depression, cognitive functioning

## Introduction

Up to one quarter of people aged 60 and over perceive a decline in their cognitive abilities, so-called subjective cognitive decline (SCD) and subjective memory decline, the self-reported experience of memory loss (SMD) (1). SCD is associated with worse cognitive performance, and with progressive impairment in cognitive function (2–5). Similarly, SMD appears to be associated with a higher risk of developing cognitive decline and with a worse memory performance (6–9). Therefore, the elicitation of SCD and SMD in routine clinical assessments of older adults may have important implications for timely detection of cognitive decline (10).

However, evidence on the associations between SCD and objective cognitive performance, and between SMD and objective memory performance is inconsistent. This may be ascribable to the lack of shared conceptualization and operationalization of SCD (11, 12), and to variations in the cognitive domains assessed: some studies focused on mnemonic tasks (13, 14), others explored several cognitive domains (15, 16). While the latter approach may be used to investigate non-amnesic forms of mild cognitive impairment (MCI) and dementia (17–22), memory impairment may be more noticeable, and the association between SMD and objective memory impairment appears to be stronger than the association of SCD and impairment across cognitive domains (2, 11).

Depressive symptoms are associated with both SCD and SMD in cognitively healthy individuals (23–31). Depressive symptoms are prospectively associated with cognitive impairment, and may be a prodromal sign of cognitive decline (7, 29–35). However, both objective and subjective decline in cognition, including memory may cause depressive symptoms (36–40).

Disability is defined according to the International Classification of Functioning, Disability, and Health (ICF) as a negative interaction between the individual health status and the environment, which results in functional difficulties. These difficulties may also be linked to SCD and SMD and cognitive

impairment (41–44). Differently from instrumental activities of daily living (IADL), which focus on the practical consequence of one's health state and may be spared in mildly cognitive impaired older adults, disability extends to a broad variety of potential consequences of poorer health status, and may capture subtle difficulties in a variety of lived experiences (41–43). And yet, the role that disability may play in the association of SCD and/or SMD with objective cognitive performance is largely unexplored (44, 45).

We aimed to study whether objective cognitive and memory performances were associated with subjective cognitive and memory decline, and with disability and depressive symptoms. We also explored the potential mediating or moderating effects of disability and depressive symptoms in the association of objective and subjective cognitive and memory functioning.

## Materials and Methods

### Study sample, design, and procedures

We used data from the SwissDEM Study<sup>1</sup>, a one-phase, population-based, cross-sectional study. In SwissDEM we recruited a randomized sample of the 80,500 people aged  $\geq 65$  years living in the Canton of Ticino, southern Switzerland (46), without any exclusion criteria except age. We sent an informative letter to 2,000 older adults randomly selected from local registries (response rate = 15%). Two weeks later, we sent an official invitation letter with instructions on how to participate in the study, including *via* a dedicated phone line, a paper-based form, and a direct web-link. All procedures and methodology for local adaptation, translation, piloting, and testing of all data collection tools, and for the interviewers' training have been previously reported (47). Briefly, overall 24 study interviewers received standard instructions and training

<sup>1</sup> <https://www.biomed.usi.ch/en/facolta-scienze-biomediche/istituti/swissdem>

for the cognitive assessments by two neuropsychologists. The training was coordinated by the PI (EA) and followed the original 10/66 manual which was previously used in community settings (48), and was adapted to the study context and culture. The training included sessions covering the theoretical background of cognitive impairment and decline, detailed explanation of the cognitive assessment tools, practical group and individual activities on cognitive tests administration and answers coding, and all sampling, registration and data collection procedures.

We conducted all interviews face to face between May 2021 and April 2022 with participants (i.e., older adults) and informants (i.e., a close family member, friend, or who knew the participant well), in participants' home or in dedicated areas in a local older adults' association, and in our lab at Università della Svizzera italiana (in Lugano). We used RedCap (i.e., Research Electronic Data Capture) on dedicated tablets with data encryption for both online and off line data collection, which also allowed automated and regular checks, and monitoring of data collection standards and procedures throughout data collection (47).

## Ethical approval

All participants signed a paper-based informed consent to participate in the study, which was authorized by the local Ethics Committee (ID 2017-02181).

## Measures

### Sociodemographic information

Sociodemographic variables comprised age, sex, educational level, and marital status. Educational level comprised six categories: No education; Not completed primary school; Primary school; Secondary school; High school; University certificate. Marital status comprised five categories: Single; Married; Divorced/Separate; Widowed; Civil union.

### Subjective cognitive decline

To assess subjective decline in memory, language, and executive functioning in the last two years we used the MyCog, a subsection of the Subjective Cognitive Decline Questionnaire (SCD-Q) (49). The MyCog SCD-Q scale comprises 24 dichotomous items (yes = 1; no = 0); higher scores (possible range: 0–24) indicate greater SCD. Sample items are “I find it harder to learn new telephone numbers” and “I find it harder to concentrate on what I am doing.” Study authors (DP; EA) translated this measure from English to Italian following standard procedures for translation and back translation (50). We conducted brief internal cognitive interviews and resolved discrepancies and incongruities through discussion among

member of the research group (DP; EA; GF; BG). Cronbach's alpha ( $\alpha$ ) for the SCD-Q in the current study sample is 0.68 indicating acceptable scale reliability.

### Subjective memory decline

Subjective memory decline was determined with a positive answer to the bespoken question: “Do you perceive cognitive difficulties, such as memory problems?” Similar assessment tools have been used in the literature to investigate SMD (51, 52).

### Objective cognitive performance

To assess objective cognitive performance we used the Community Screening Instrument for Dementia (CSI'D') participant part (53). The CSI'D' is a widely used, culturally unbiased and education-fair instrument for dementia screening. The test covers various domains comprising orientation, memory, language expression, comprehension, and spatial constructional praxis. The total score is calculated by summing the 35 scale items. Higher total score (possible range: 0–35) means better cognitive performance.

### Objective memory performance

We used the consortium to establish a registry for alzheimer's disease (CERAD) 10-word list learning task to assess memory. The test consists of a list-learning paradigm in which participants listen 10 words and are asked to recall as many as possible; the process is repeated three times (immediate recall). Around 5 min after participants are asked again to list all the words they remember (deferred recall). The total score for both immediate (possible score: 0–30) and deferred recall (possible score: 0–10) is obtained from the sum of correctly remembered words. The total CERAD 10-word list learning task score is obtained from the sum of immediate and deferred recall scores (possible range: 0–40). Higher scores mirror better performance (54).

### Disability

The short version of the World Health Organization Disability Assessment Schedule 2.0 (WHO-DAS 2.0) was used to assess disability in the previous 30 days. Each of the 12 self-reported items is scored on a Likert scale ranging between one (none) and five (extreme) (55). Sample items are “In the last month, how much difficulty did you have in carrying out your day to day work and usual activities?” and “In the last month, how much of a problem did you have joining community activities in the same way as anyone else can?” Higher total scores (possible range: 12–60) indicate more pervasive disability.

### Depressive symptoms

We assessed depressive symptoms over the past month with the EURO-D. For each of the 12 items a score of 1 indicates that the selected symptom is present whereas a score of 0 indicates that the selected symptom is not present. A sample

item is “In the last month, have you been sad or depressed?” Higher scores (possible range: 0–12) indicate greater depressive symptoms (56). The original version of the EURO-D includes an item assessing concentration problems, which might capture SCD. For the purpose of the current study, and consistent with previous approaches (57), we computed the EURO-D total score without the item assessing concentration problems (possible score range: 0–11).

## Health conditions

We assessed participants’ health conditions through standard self-reported questions derived from the 10/66 protocol (58). Health conditions comprised stroke, ischemic heart disease, heart problems, hypertension, diabetes, episodes of loss of consciousness, chronic bad chest, arthritis, dyspnea, and gastrointestinal problems. We generated an overall score indicating the number of health conditions using a cumulative approach.

## Statistical analysis

We reported descriptive statistics for all study variables. We used chi2 tests and *t*-tests to examine differences in the scores of study variables between those included and those excluded from the current study analyses.

We used Pearson’s correlation and the point-biserial correlation in a correlation matrix to examine bivariate correlations among all study measures and covariates.

We conceived four regression models on *a priori* hypothesis. Previous evidence showed that SCD is associated with objective cognitive performance (2–5), disability (44), and depressive symptoms (23, 24); similarly, SMD is associated with objective memory performance (6, 7), disability (45), and depressive symptoms (27). However, evidence on these associations is inconsistent. Therefore, we fitted linear regression models to examine the associations of SCD (outcome) with objective cognitive performance, disability, and depressive symptoms (predictors), and of SMD (outcome) with objective memory performance, disability, and depressive symptoms (predictors). To explore within one model the relationship between the outcome and several predictors, we also fitted a multiple regression model including within the same model objective cognitive performance, disability, and depressive symptoms as predictors of SCD. Similarly, we fitted a multiple regression model including within the same model objective memory performance, disability, and depressive symptoms as predictors of SMD. For each regression we fitted both an unadjusted and an adjusted (for age, sex, and educational level) model, as previous evidence showed that SCD and SMD might be associated with age, gender, and education (59).

We used tests of interaction to examine whether levels of disability and depressive symptoms moderate the relationship between objective cognitive performance and SCD. Similarly, we used tests of interaction to examine whether levels of disability and depressive symptoms moderate the relationship between objective memory performance and SMD. When a test of interaction was statistically significant at the 5% level, we reported the unstandardized regression coefficients of the interaction terms, and the relationship between objective cognitive performance and SCD and/or between objective memory performance and SMD for three subgroups based on tertiles of the selected moderating variable. We then used the *sem* interface in STATA to fit mediation models to explore the mediating role of disability in the associations of objective cognitive and memory performance (predictors) with SCD and SMD (outcomes). We fitted both unadjusted and adjusted (for age, sex, and educational level) models.

To maximize use of available data, mean imputation and imputation of the most frequent value was used when a response for one of items of the WHO-DAS 2.0 was missing (this was done for two participants) and when a response for one of items of the EURO-D was missing (this was done for three participants).

We reported standardized regression coefficients (effects sizes) to quantify the associations; coefficients  $\leq 0.09$  were considered negligible, 0.10–0.29 small, 0.30–0.49 moderate, and  $\geq 0.50$  large (60). Analyses were conducted in STATA version 16 (61).

## Results

### Descriptive statistics

Descriptive statistics for the main study variables are reported in **Table 1**. After the exclusion of 49 participants because of missing data in the main outcome and exposure variables, the resulting analytic sample comprised 250 participants, none of which self-reported a previous diagnosis of dementia.

Participants’ mean age was 75.9 years (SD = 6.31). Slightly below half (47.2%) were women. Most participants completed at least secondary education (91.2%), and 16.4% had an academic degree. The majority were married (64.0%).

On average participants had intact cognitive functioning, as indicated by their means scores on the CSI’D’ ( $M = 31.66$ ;  $SD = 2.58$ ; Range: 21.32–35). The mean CERAD 10-word list learning task was 21.53 ( $SD = 6.14$ ). Participants reported cognitive difficulties. Almost everyone (93.6% of the study sample) reported at least one cognitive difficulty in the SCD-Q and 40% reported SMD (yes/no). The mean on the WHODAS 2.0 disability was 4.38 ( $SD = 5.98$ ). On average participants

TABLE 1 Descriptive characteristics of the study sample.

	Total study sample ( <i>n</i> = 250)
Age, M (SD; range)	75.9 (6.31; 65–92)
Women, <i>n</i> (%)	118 (47.2)
<b>Educational level, <i>n</i> (%)</b>	
No education	1 (0.4)
Not finished primary school	2 (0.8)
Primary school	18 (7.2)
Secondary school	51 (20.4)
High school	136 (54.4)
University/Professional certificate	41 (16.4)
Missing	1 (0.4)
<b>Marital status, <i>n</i> (%)</b>	
Single	19 (7.6)
Married	160 (64.0)
Divorced/separated	29 (11.6)
Widowed	39 (15.6)
Civil union	2 (0.8)
Missing	1 (0.4)
Disability, M (SD)	4.38 (5.98)
Depressive symptoms, M (SD)	2.10 (1.71)
Depressive symptoms without attention <sup>a</sup> , M (SD)	1.88 (1.59)
<b>Number of health conditions, <i>n</i> (%)</b>	
Below three	181 (72.6)
Three or more	69 (27.6)

<sup>a</sup>For the purpose of the current study, an alternative depressive symptoms score without the item assessing concentration problems was computed.

reported two depressive symptoms, and having received either one or two clinical diagnoses of health conditions (72.6%) (Supplementary Table 1). Table 2 shows the correlation matrix of study variables.

## Associations of subjective cognitive decline with objective cognitive performance, disability, and depressive symptoms

Associations of SCD with objective cognitive performance, disability, and depressive symptoms are reported in Table 3. In regression models adjusted for age, sex, and education (model 2) poorer objective cognitive performance ( $\beta = -0.13$ ; 95% CI:  $-0.25$ ;  $-0.003$ ), greater disability ( $\beta = 0.26$ ; 95% CI:  $0.14$ ;  $0.37$ ), more depressive symptoms ( $\beta = 0.21$ ; 95% CI:  $0.10$ ;  $0.32$ ) were all positively and significantly associated with higher scores of SCD. In the mutually adjusted model disability ( $\beta = 0.19$ ; 95% CI:  $0.06$ ;  $0.32$ ), and more depressive symptoms ( $\beta = 0.15$ ; 95% CI:  $0.03$ ;  $0.26$ ) remained significantly associated with SCD scores.

## Associations of subjective memory decline with objective memory performance, disability, and depressive symptoms

Associations of subjective memory decline (SMD) with objective memory performance, disability, and depressive symptoms are reported in Table 4. In regression models adjusted for age, sex, and education (model 2) better objective memory performance (OR = 0.95; 95% CI: 0.91; 1.0) predicted less likelihood of reporting SMD (yes/no). Conversely, greater disability (OR = 1.10; 95% CI = 1.04; 1.17), and more depressive symptoms (OR = 1.31; 95% CI: 1.10; 1.56) predicted higher likelihood of reporting SMD. In further mutually adjusted models, for both disability (OR = 1.08; 95% CI: 1.02; 1.14) and depressive symptoms (OR = 1.21; 95% CI: 1.01; 1.45) predicted the likelihood of reporting SMD.

## Moderating role of disability and depressive symptoms in the association of objective cognitive performance with subjective cognitive decline

The interaction term of disability and objective cognition was statistically significant in the association with SCD ( $\beta = 0.01$ ; 95% CI:  $0.01$ ;  $0.12$ ;  $p < 0.001$ ). The first third of disability comprised 106 participants who scored either 0 or 1 on the WHO-DAS 2.0. The second third comprised 66 participants who scored between 2 and 4 on the WHO-DAS 2.0. The upper third comprised 78 participants who scored between 5 and 39 on the WHO-DAS 2.0. In the stratified analysis, the association of objective cognition with SCD was not significant across disability (all  $p$ -values  $\geq 0.075$ ).

The interaction term of depressive symptoms and objective cognitive performance was a statistically significant predictor of SCD ( $\beta = 0.02$ ; 95% CI:  $0.01$ ;  $0.03$ ;  $p = 0.001$ ). The lower third of depressive symptoms severity comprised 118 participants who scored either 0 or 1 on the EURO-D. The middle third comprised 53 participants who scored 2 on the EURO-D, and the higher third comprised 78 participants who scored between 3 and 8 on the EURO-D scale. In the stratified analysis, there was a significant association between objective cognitive function and SCD in those in the lower ( $\beta = -0.31$ ; 95% CI:  $-0.47$ ;  $-0.15$ ) and middle ( $\beta = -0.27$ ; 95% CI:  $-0.51$ ;  $-0.03$ ) tertile of depressive symptoms, but not among those in the higher tertile of depressive symptoms ( $p = 0.480$ ). In the adjusted model the association between objective cognition and SCD remained significant only among those in the lower tertile of depressive symptoms ( $\beta = -0.22$ ; 95% CI:  $-0.39$ ;  $-0.05$ ).

**TABLE 2** Bivariate correlations of subjective cognitive and memory decline with objective cognitive and memory performance, depressive symptoms, disability, and participants' age, sex, and educational levels.

	1	2	3	4	5	6	7	8	9
Subjective cognitive decline	1	–	–	–	–	–	–	–	–
Subjective memory decline	0.469**	1	–	–	–	–	–	–	–
Objective cognitive performance	–0.260**	–0.129*	1	–	–	–	–	–	–
Objective memory performance	–0.194**	–0.160*	0.470**	1	–	–	–	–	–
Depressive symptoms	0.233**	0.205**	–0.148*	–0.065	1	–	–	–	–
Disability	0.341**	0.276**	–0.411**	0.257**	0.368**	1	–	–	–
Age	0.362**	0.149*	–0.410**	–0.301**	0.134*	0.373**	1	–	–
Sex <sup>a</sup>	–0.091	–0.003	–0.016	0.69	0.172**	0.111	0.003	1	–
Educational level	–0.019	0.050	0.232**	0.184**	–0.072	–0.059	–0.133*	–0.165**	1

\*0.05 level (two-tailed), \*\*0.01 level (two-tailed).

<sup>a</sup>point-biserial correlations between gender (1, male; 2, female) and other variables.

**TABLE 3** Associations of subjective cognitive decline with objective cognitive performance, disability, and depressive symptoms.

	Predictors of subjective cognitive decline		
	Objective cognitive performance (COGSCORE)	Disability (WHODAS 2.0)	Depressive symptoms (EURO-D)
	$\beta$ (95% CI); <i>P</i> -value	$\beta$ (95% CI); <i>P</i> -value	$\beta$ (95% CI); <i>P</i> -value
Model 1	–0.23 (–0.35; –0.12); <0.001	0.34 (0.24; 0.45); <0.001	0.23 (0.12; 0.35); <0.001
Model 2	–0.13 (–0.25; –0.003); 0.045	0.26 (0.14; 0.37); <0.001	0.21 (0.10; 0.32); <0.001

Model 1, linear regression models showing the associations of SCD (outcome) with objective cognitive performance, disability, and depressive symptoms (predictors). Model 2, linear regression models showing the associations of SCD (outcome) with objective cognitive performance, disability, and depressive symptoms (predictors) and adjusting for age, sex, and educational level.

**TABLE 4** Associations of subjective memory decline with objective memory performance, disability, and depressive symptoms.

	Predictors of subjective memory decline		
	Objective memory performance (CERAD 10-word list learning task)	Disability (WHODAS 2.0)	Depressive symptoms (EURO-D)
	OR (95% CI); <i>p</i> -value	OR (95% CI); <i>p</i> -value	OR (95% CI); <i>p</i> -value
Model 1	0.95 (0.91; 0.99); 0.013	1.11 (1.05; 1.17); <0.001	1.31 (1.11; 1.54); 0.002
Model 2	0.95 (0.91; 1.0); 0.043	1.10 (1.04; 1.17); <0.001	1.31 (1.10; 1.56); 0.002

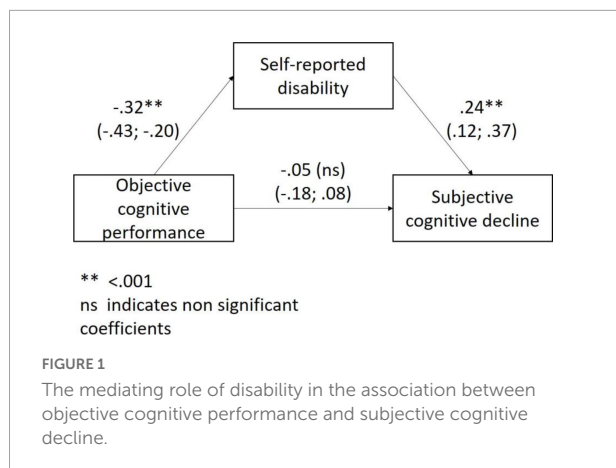
Model 1, logistic regression models showing the associations of SMD (outcome) with objective memory performance, disability, and depressive symptoms (predictors). Model 2, logistic regression models showing the associations of SMD (outcome) with objective memory performance, disability, and depressive symptoms (predictors) and adjusting for age, sex, and educational level.

### Moderating role of disability and depressive symptoms in the association of objective memory performance with subjective memory decline

Disability significantly modified the association between objective memory performance and SMD (Interaction term:  $\beta = 0.01$ ; 95% CI: 0.01; 0.02; *p*-value < 0.001). Those with higher objective memory performance were less likely to report SMD among those in the lower tertile of disability (OR = 0.91; 95%

CI = 0.83; 1.00). This association was adjusted away by age, sex, and educational level (*p* = 0.971). The associations of objective memory performance and SMD were not significant in those in the middle (*p* = 0.439) and higher (*p* = 0.514) tertiles of levels of disability scores.

Depressive symptoms significantly modified the association of objective memory performance with SMD (Interaction term:  $\beta = 0.02$ ; 95% CI: 0.004; 0.04; *p* = 0.012). Those with better objective memory performance were less likely to report SMD if they had lower depressive symptoms (OR = 0.91; 95% CI = 0.84; 0.98), but not after adjustment (*p* = 0.094). Similarly, those



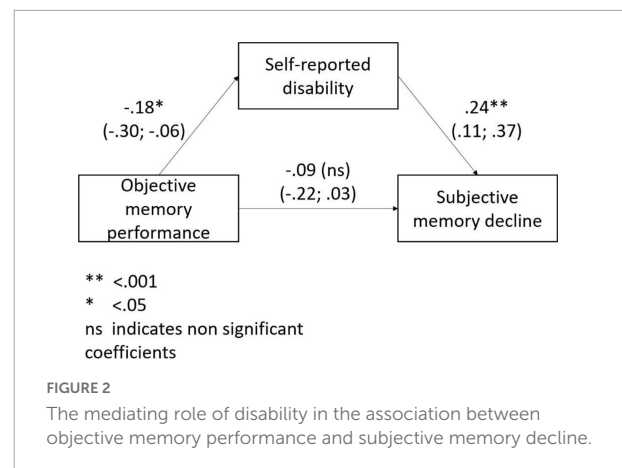
with better objective memory performance were less likely to report SMD if they had intermediate EURO-D depressive symptomatology (OR = 0.90; 95% CI: 0.81;0.99), also after adjustment for age, sex, and education (OR = 0.89; 95% CI: 0.80; 0.99). We found no significant association between objective memory performance and SMD in those with highest EURO-D scores ( $p = 0.688$ ).

### Mediating role of disability and depressive symptoms in the association of objective cognitive performance with subjective cognitive decline

In the regression models, objective cognitive performance was significantly associated with disability ( $\beta = -0.31$ ; 95% CI:  $-0.42$ ;  $-0.20$ ) but not with depressive symptoms ( $p = 0.552$ ). Hence, we only tested the mediating role of disability in the association of objective cognitive performance with SCD. Both in the unadjusted and adjusted (for age, sex, and education level) mediating model disability fully mediated the association of objective cognitive performance with SCD (Figure 1).

### Mediating role of disability and depressive symptoms in the association of objective memory performance with subjective memory decline

Objective memory performance was significantly associated with disability ( $\beta = -0.18$ ; 95% CI:  $-0.31$ ;  $-0.06$ ) but not with depressive symptoms ( $p = 0.129$ ). Both in the unadjusted and adjusted (for age, sex, and education level) mediating model disability significantly mediated the association of objective memory performance with SMD (Figure 2).



## Discussion

In a sample of older adults (65+) living in southern Switzerland (i.e., Ticino) both overall cognitive (SCD) and memory-specific subjective (SMD) complaints were common. SCD and SMD were associated with poorer objective cognitive/memory performance, and independently with disability, and depressive symptoms. Subjective and objective cognition were not associated in those with high disability and depressive symptoms. However, disability mediated the associations of objective cognitive and memory performance with subjective cognitive and memory decline. The significant associations we found between disability and SCD/SMD suggest that perceived difficulties in daily functioning may alter the subjects' perception of their cognitive capabilities (62–64).

Our findings on the positive associations between disability and subjective cognitive and memory decline are novel. Other studies found that individuals experiencing SCD have more difficulties in daily activities (44), and worse physical function (45). In our study participants with higher disability were more likely to report SMD irrespective of their cognitive impairment. Nevertheless, IADL seem fairly preserved in older adults with subjective cognitive complaints (65). This may suggest a preserved independence despite difficulties in daily functioning.

The associations of objective cognitive and memory performances with subjective cognitive and memory decline were fully mediated by disability. Cross-sectional associations between greater cognitive impairment and greater disability assessed with the WHO-DAS 2.0 tool have been previously reported (66). It is plausible that the consequences of cognitive impairment on functional ability may contribute to the self-perception of cognitive deficits, as individuals experience limitations in their daily life (44).

The associations we found between more depressive symptoms and SCD and SMD are in line with a large corpus of evidence (23–31). Issues of directionality remain unresolved but the association may be bi-directional. Prospective studies

suggest that depression is a risk factor for objective cognitive decline (7, 29–32, 66), and that cognitive impairment and neurodegenerative changes may cause depressive symptoms (21, 67, 68), and mood changes (32), respectively. Depressive symptoms and cognitive decline may also share common causal and precipitating factors such as vascular problems (69, 70).

Our findings on the lack of association between objective and subjective cognitive function in people with more marked depressive symptoms may be explained by the prominence of mood rather than cognitive concerns in these individuals. It might be that depressive symptoms entail a negative perspective on several aspects of individuals' lives, including one's cognitive capabilities (71). However, depression can be a consequence of both objective cognitive decline and SCD (24, 68, 72). Whether and the extent to which depressive symptoms moderate the associations of objective cognition with SCD in older people with cognition impairment warrants further investigations.

Some potential implications of our findings are worth noting. Because SCD and SMD may be a prodromal symptom of dementia (3) they could be elicited in routine clinical assessments to enhance timely diagnosis, and accounting for the disability level and depressive symptoms of the individual.

Our results suggest that people may not know what is expected and normative in cognitive functioning and might ascribe the perceived cognitive difficulties to dementia; this might be due to dementia worry among older people (68) or, conversely, support the erroneous belief that dementia is a normal part of aging (73). Awareness, knowledge, and understanding of dementia and cognitive decline, and their signs and symptoms must improve in the general public. Access to and use of services should be dictated by actual needs. Worry-well individuals may benefit from psychological help to address psycho-affective symptoms which might influence the perception they have of their cognitive capabilities.

This study has several strengths. First, objective cognitive performance was assessed with a comprehensive cognitive battery administered to the participant in person by trained interviewers (47). Moreover, our assessments were previously validated in the study region (Ticino) (47). Second, we assessed SCD using a comprehensive, reliable, and valid tool that covers perceived difficulties in several cognitive domains. Third, the MyCog SCD-Q returns a total score on a discrete rather than categorical scale (11), which allowed a better quantification of the severity of SCD (74). Fourth, our investigation of the moderating role of disability in the associations of objective cognitive performance with SCD, and of objective memory performance with SMD is novel. Finally, we conducted our study in community-dwelling individuals, and extended previous evidence from clinical settings. The representativeness of the target population of our study sample supports the external validity of our observations.

Some limitations are worth noting. First, the cross-sectional nature of the study leads to issues of directionality, which may diminish the interpretability also of the mediating models.

Second, despite none of the study participants self-reported a previous diagnosis of dementia, we did not have access to medical records or clinical assessments; however, the minimum achieved score in the CSI'D instrument in our sample (MIN = 21.32) suggests that cognitive impairment was not severe in any of the study participants. We acknowledge that this may introduce some undue selection bias, though potentially non-differential with respect to both objective and subjective cognitive impairment. Third, although the WHO-DAS 2.0 is a robust and extensively validated disability scale, it relies on self-reporting rather than physical or functional assessments (i.e., objective indicators of disability). Fourth, in this study we did not rely on a medical diagnosis of depression, but the EURO-D scale is commonly used in population-based samples to assess depressive symptomatology.

## Conclusion

We reported on the cross-sectional associations of objective cognitive and memory performances, disability, and depression with subjective cognitive and memory decline in a population-based sample of older adults. Subjective complaints about cognition were common, signaling a high level of concern in older adults about their cognitive abilities in late life. Health policies should aim to improve awareness, understanding, and knowledge about dementia in the general population to improve and enhance access and use of diagnostic and care services, timely and appropriately. At the same time, enquires in routine clinical assessments about SCD and SMD can contribute to timely detection of cognitive decline, and should account for the potentially modifying and mediating effects of both disability and depressive symptoms.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee of the Canton of Ticino. The patients/participants provided their written informed consent to participate in this study.

## Author contributions

DP contributed to the study design, data collection, and took the lead in writing the manuscript. SS conducted the data analysis,



contributed to the writing, and reviewing of the manuscript. MF contributed to the study design, writing, and reviewing of the manuscript. EA served as PI of the SwissDEM study, designed the SwissDEM study, and reviewed the manuscript. All authors read and approved the final manuscript.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsy.2022.963703/full#supplementary-material>

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