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Development of a short version of the German subjective cognitive decline questionnaire (SCD-Q17): a principal component analysis approach to item reduction

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Abstract

Since it was shown that Alzheimer's disease (AD) begins many years before the onset of symptoms with subjective cognitive decline (SCD), there has been increasing interest in the early clinical stages where disease-modifying drugs are expected to have the greatest benefit. However, at this early stage cognitive testing may yield unremarkable results, it is necessary to find a tool that can provide a simple and reliable indication of SCD as a part of a screening tool for AD in the general population. The German version of the 24-item Subjective Cognitive Decline Questionnaire (SCD-Q) with a dichotomous answer scale was tested, which then revealed some challenges. For this reason, an adaptation of the questionnaire was necessary. 360 participants completed the SCD-Q, all of whom were outpatients at a memory clinic. The most relevant subitems were identified by principal component analysis. This analysis focused on the self-perceived perspective of the decline. Results of the principal component analysis, consultations with experts and feedback from respondents were integrated into a short version of the SCD-Q with 17 items and a Likert scale – the SCD-Q17. The SCD-Q17 was sent to 100 participants of the original questionnaire for re-completion and, a new cut-off value was calculated by receiver operator characteristic (ROC) curves. The SCD-Q17 is a useful tool for the reliable detection of subjective symptoms, and thus may prompt more in-depth assessments of the underlying etiology. CogScreen has been retrospectively registered at clinical trials (NCT06191952).

Keywords Dementia · Alzheimer's disease · Subjective cognitive decline · Principal component analysis · Methodology

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Introduction

Facing the increasing prevalence of Alzheimer's disease (AD) and the advent of novel disease-modifying drugs most likely to benefit individuals in the earliest stages of the disease, there is an urgent need to reliably detect subjective cognitive decline (SCD), which is known to be associated with an increased risk of clinical progression (Ismail et al., 2021). These stages are considered the most effective in terms of disease-modifying therapies (Assunção et al., 2022). However, healthcare systems worldwide are ill-equipped to detect neurodegenerative diseases such as AD at an early stage, and easy-to-use methods for routine clinical care are needed to support early detection.

SCD is defined as a self-perceived progressive decline in cognitive abilities such as memory, executive function, or language. This condition is associated with subtle cognitive decline that may not be detectable by standardized tests, but only by self-report (Jessen et al., 2014). This term is also included in the most recent version of the National Institute on Aging-Alzheimer's Association (NIA-AA) diagnostic framework and in the revised criteria for diagnosis and staging of AD by the Alzheimer's Association Workgroup (in press), where it is referred to as "Stage 2 Transitional decline", characterized by a decline from a previously higher cognitive level but normal performance on objective cognitive tests, including individuals who do not (yet) meet criteria for mild cognitive impairment (MCI) (Albert et al., 2011; Petersen, 2004).

Due to the limited agreement on standardized methods, the assessment of SCD varies widely between studies. A systematic review examined 17 different self-report instruments, some of which have not been psychometrically evaluated, designed to measure SCD, either for screening or diagnosis (Ibnidirs et al., 2022). For example, for screening purposes, the SCD Questionnaire (Gifford et al., 2015), the Memory Functioning Questionnaire (MFQ) (Gilewski et al., 1990), or the Cognitive Change Index (CCI) (Rattanabannakit et al., 2016) were included. For diagnosis, the Cognitive Function Instrument (Chipi et al., 2018) or the Subjective Cognitive Decline Questionnaire (SCD-Q) (Rami et al., 2014) were used.

For the present study, the SCD-Q by Rami et al. (2014) was used because the original version had been sufficiently validated on an appropriate sample and demonstrated good scores for convergent validity and internal consistency reliability scores. After validation, the original version of the SCD-Q was described as "a useful tool for measuring self-perceived cognitive decline that incorporates the decliner and informant perspectives" (Rami et al., 2014). In the present study, only the self-perceived perspective of the decline (MyCog) was used (see Appendix A) in order to optimize it as a screening tool for unaccompanied persons. In the first three pre-questions, the SCD-Q asks about the presence of forgetfulness, whether one would consult a doctor about these difficulties, and whether memory has deteriorated in the last two years. The SCD-Q then consists of another 24 statements about activities, for which the respondent is asked whether he or she is less able to perform the respective activity than approximately two years ago. The SCD-Q indicates subjective cognitive decline when seven items are answered 'yes'.

We aimed to develop a short but still valid German version of the SCD-Q in order to create a tool for use in settings characterized by time constraints and to respond to feedback from participants. For this reason, the present study examined the questionnaire based on test-statistical properties to see whether meaningful over-categories can be formed and, if necessary, the number of items can be reduced. In addition, a more precise response scale should be added. This is of particular practical importance because a time-saving short version with an improved response scale is needed to create a useful tool for the reliable detection of subjective symptoms of AD, which may lead to more in-depth assessments of the underlying etiology. The SCD-Q is an easy-to-use instrument for the rapid and practical detection of subjective cognitive complaints. It can be used as a screening tool to guide further diagnostic testing (e.g. blood biomarkers). However, the SCD-Q also has some limitations. For example, it cannot distinguish SCD from MCI or AD. There are also some methodological difficulties in the development of the original SCD-Q by Rami (no testing of concurrent validity with similar questionnaires, use of cross-sectional data), that require further psychometric work-up. In the future, the SCD-Q17 should also be widely used, with a digitized version to be completed by the subjects themselves.

Materials and methods

Study design SCD-Q

Most of the data were collected as part of the Community geriatric diagnosis-based cognitive screening to identify early decline in seniors in Germany (COGSCREEN) study (see Fig. 1). The aim of this project is to find out which measures, using questionnaires, digital cognitive tests and blood-based biomarkers, are best suited to prepare the health care system for the identification and treatment of patients with AD in its earliest stages. In the present analysis, only the SCD-Q is considered to assess its psychometric quality.

As a first step, 360 subjects were recruited to complete the German version of the SCD-Q (see Appendix A),

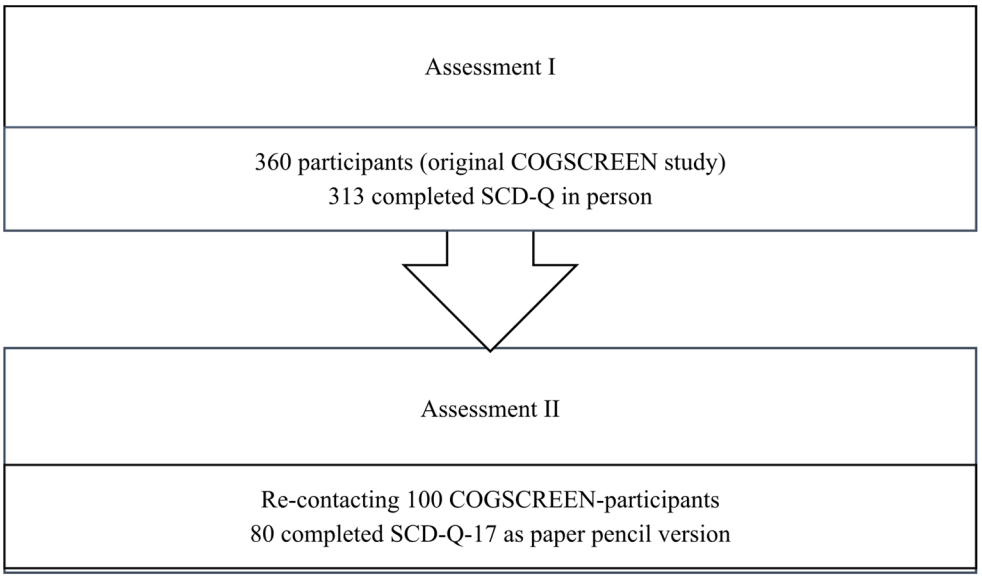

Fig. 1 Overview of the data collection

following the recommendation to recruit 10–15 subjects per variable (Pett et al., 2003). As there are 24 variables in the SCD-Q, this corresponds to between 240 and 360 subjects. Participants were recruited from various social and cultural centers and groups for seniors in Munich as well as through advertisements in local newspapers. Inclusion criteria were an age over 60 years and no obvious signs of significant cognitive impairment or a known diagnosis of dementia. Participants were only included if they gave written informed consent after being fully informed of the study procedures, and if they agreed that their assessment results could be shared with their general practitioner (GP). The study was approved by the Ethics Committee of LMU Munich (project numbers 22–0786 and 22-1117).

In a quiet environment, participants were given a paper-and-pencil questionnaire, and those who agreed to participate were asked to answer 'yes'/'no' to questions on the SCD-Q about whether they had noticed a decline in their cognitive abilities in the past two years. As part of the study design for the overall project, the results were then sent to their general practitioner after scoring. In addition, sociodemographic information such as age, sex and years of education was requested. A contact address and details of a GP for re-contact were also requested.

Data storage and SCD-Q software

The data from the paper-pencil questionnaires were first entered into Castor EDC, which is an eClinical data management platform. Only members of the working group entered the data. In addition, access was restricted and regular backups were carried out. From there, the data could be exported to an Excel spreadsheet or as an SPSS file and processed for further calculations. All data were pseudonymized. The SCD-Q comes with a dichotomous response scale. Factor analysis using a Pearson correlation cannot be applied because it would violate the following assumptions: (1) the observed variables do not have continuous, multivariate normal distributions, and (2) their relationships are not linear (Lorenzo-Seva & Ferrando, 2012). Instead, it is necessary to use a factor analysis that calculates with tetrachoric correlations. This possibility is offered by the free software FACTOR with PCA, developed at the University Rovira i Virgili. For this program, the data were again saved from an Excel spreadsheet in Windows Editor format. The Windows Editor files were then read with the FACTOR program, the missing values had to be named and then the analysis could be performed.

Transparency and openness

We describe our sampling plan, all data exclusions, all manipulations, and all measures in the study. Data were analysed using IBM SPSS Statistics, version 29.0.0.0 (241), and FACTOR, version 12.04.01 by Ferrando et al. (2017). The data can be made available upon request after verification.

Data analysis SCD-Q & development of SCD-Q17

After computing a robust factor analysis and PCA, several data reduction options were considered. Items that loaded on more than one factor were removed (items 1, 10, 22). Similarly, items with very low total factor loadings were removed (items 7, 3, 5, 2). After consultation with neurologists and psychiatrists from the Alzheimer Research Unit of the LMU Hospital, who were also concerned about practical administration, an abbreviated version of 17 items was agreed upon (SCD-Q17). In a subsequent qualitative

survey ($N = 30$, publication in preparation), the subjects of the COGSCREEN study were asked for structured feedback on the different parts of the test. It turned out that the questionnaire was perceived as too long, or that the items of the SCD-Q in German were not understood correctly, did not cover the problem sufficiently, or that the dichotomous 'yes'/'no' response scale was perceived as too imprecise to capture the actual answer. Therefore, the response scale was also changed to a Likert scale from 'strongly disagree' to 'strongly agree' (see Appendix B). This short version was then mailed as a paper-pencil test to 100 participants who had agreed to participate again, following the recommendation of Kass and Tinsley (1979). 80 questionnaires were completed and returned. Once the data were collected, they were entered into an Excel spreadsheet. This Excel spreadsheet was then imported into SPSS statistical software, as the interval scaling made it possible to calculate a factor analysis using a PCA based on a Pearson correlation. Once the data were prepared, the assumptions were verified. A PCA was then calculated.

A new cut-off had to be defined for the SCD-Q17 because it consists of fewer items and does not have a 'yes'/'no' response scale. Therefore, both the 17 items of the shortened SCD-Q and the three pre-questions of the original SCD-Q were used to calculate the cut-off. A new variable 'cognitive deficits' was created for this purpose. If any of the three pre-questions were answered in the affirmative, the variable was adjusted. An individual´s total score on all variables was then calculated and defined as the second new variable. These two new variables were then used to calculate the receiver operator characteristic (ROC) curve.

Table 1 Sociodemographic characteristics of participants of SCD-Q

Parameters	*N*	Mean (M)	Standard Deviation (SD)
Gender	339		
Female	226		
Male	113		
Age	311	73.15	7.73
Years of education	232	14.87	3.86
Parameters	N	%	
Gender	339		
Female	226	66.1	
Male	113	33	
Cut-off for Subjective Decline	313		
Reached	184	53.8	
Not reached	129	37.7	

Due to a group of participants with decreasing cognitive abilities, there were distorted age data (e.g., indication of year of birth instead of age)

Results

Demographic characteristics

Outpatients of a memory clinic were interviewed. The participants´ demographic characteristics of the first assessment are shown in Table 1. The mean age was $M = 71.15$ ($SD = 7.73$). The gender distribution was uneven, with 66% of participants being female and 33% male. The second assessment covered the same topics as the first.

Principal component analysis SCD-Q

Factor analysis was first performed on the SCD-Q data. 360 subjects participated in the study. However, only data from 313 subjects were used for the PCA, as some test subjects had to be excluded, e.g., due to incomplete responses. The measure of the sample adequacy provided by the Kaiser-Meyer-Olkin test (KMO = 0.87) confirmed that the items were appropriate for PCA. The Kaiser-Guttmann criterion was used to identify 5 factors with an eigenvalue < 1. Items were assigned to specific factors according to their factor loadings, and after the 5 factors were labeled as follows: Memory for personally relevant items (Component 1), Ability to organize daily life (Component 2), Ability to cope with unfamiliar situations (Component 3), Ability to learn with attention (Component 4), and Retention of social interactions (Component 5) (see Table 2 & Appendix A). A PCA was then performed, resulting in a rotated load matrix (see Table 2). Three items showed high loading on different factors (items 1, 10, 22, Table 2). Other items, especially items 7, 3, 5, and 2, showed low loadings below $r = .4$. After careful analysis and consultations with experts, we decided to exclude the above seven items, which provides further evidence for the validity of the questionnaire.

Principal component analysis SCD-Q17

The structure of the Subjective Cognitive Decline short form instrument was subjected to exploratory factor analysis. The results of both Bartlett's test chi-square $(136) = 981.891$, $p < .001$ and the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO = 0.916) indicated the viability of the variables for factor analysis. A PCA with varimax rotation was performed, and a two-factor solution, accounting for

Table 2 Rotated loading matrix SCD-Q

Variable	Component 1	Component 2	Component 3	Component 4	Component 5
scdq_1		0.347	0.311	0.466	
scdq_2	0.374				
scdq_3					0.414
scdq_4		0.577			
scdq_5			0.475		
scdq_6			−0.0.406		0.906
scdq_7					0.447
scdq_8		0.762			
scdq_9					0.684
scdq_10	0.304		0.338	0.541	
scdq_11	0.352				0.628
scdq_12	0.734				
scdq_13	0.437				
scdq_14		0.514			
scdq_15	0.919				
scdq_16			0.674		
scdq_17		0.829			
scdq_18				-0.569	
scdq_19			0.668		
scdq_20			0.733		
scdq_21			0.657		
scdq_22		0.480	0.576		
scdq_23	-0.359	0.759			
scdq_24			0.845		

The values of the rotated loading matrix for the five extracted components for each item of the SCD-Q are shown

Table 3 Rotated loading matrix SCD-Q17

Variable	Component 1	Component 2
scdq_8	0.838	0.310
scdq_2	0.823	0.281
scdq_3	0.783	0.303
scdq_4	0.756	0.365
scdq_7	0.740	0.315
scdq_1	0.737	0.345
scdq_16	0.721	0.287
scdq_5	0.699	0.445
Scdq_11	0.636	0.457
scdq_6	0.611	0.452
scdq_9	0.225	0.811
scdq_15	0.320	0.806
scdq_17	0.397	0.771
scdq_10	0.341	0.728
scdq_14	0.294	0.713
scdq_12	0.476	0.630
scdq_13	0.512	0.618

The values of the rotated loading matrix for the two extracted components for each item of the SCD-Q17 are shown

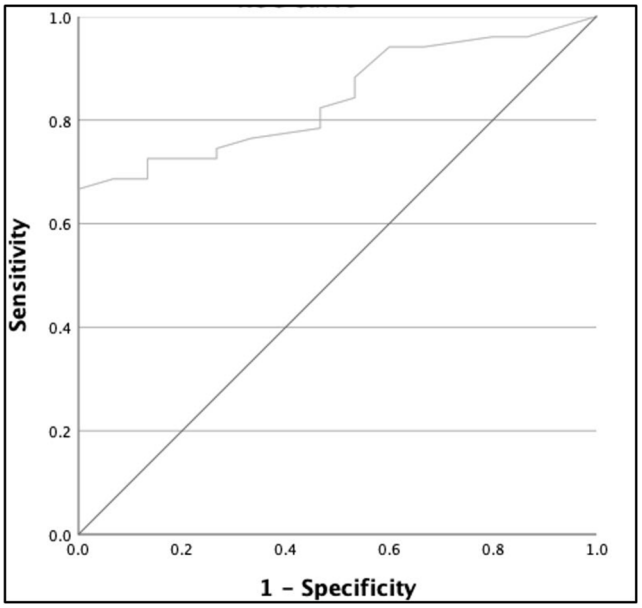

Fig. 2 ROC Curve. *Note*. Determining the cut-off threshold. Diagonal segments are produced by ties.

67.503% of the variance, was selected. Two factors were identified. The first factor encompasses items 8, 2, 3, 4, 7, 1, 16 and 5 as these items load higher on the first factor ($r \geq .69$). Items 9, 15, 17, 10 and 14 load higher on the second factor than on the first factor ($r \geq .7$) and therefore are assigned to this factor. The first factor was ultimately named "Difficulties in performing tasks related to daily activities" (Component 1) because the items that load high on the first factor address problems with everyday activities (e.g. item 8: recalling amounts of money, item 2: finding personal items). The second factor was named "Challenges in adapting to new situations" (Component 2) because these items describe topics that have to be learned anew (e.g. item 17: remembering names of places recently visited, item 14: recalling street and place names) (see Table 3 & Appendix B). Items 11, 6, 12 and 13 show cross-loadings on both factors. This is indicated by the fact that the differences between the loadings on the first and second factors are less than $r = .2$. In terms of content, this means that these items have similarities with Factor 1 and Factor 2. For example, the cross-loading of item 11 ("I find it more difficult to remember the details of the latest news") could be explained by the fact that it addresses topics from the first and the second factor. For example, the item combines an everyday situation (watching the news) with new elements (details of the latest news). However, based on prior knowledge of the subject

matter, we can assume that this represents an appropriate solution.

According to Hemmerich (2018), the ROC curve was used to identify the optimal point between an appropriate ratio of sensitivity and specificity in order to find the cut-off value for the SCD-Q17. Sensitivity measures the proportion of true positives that are correctly recognized as such, while specificity measures the proportion of true negatives that are correctly classified as such. The ROC curve shows graphically where this point is located (Fig. 2). It is about 0.7 on the sensitivity axis and about 0.1 on the 1-specificity axis. A reasonable cut-off value can then be read from Table 4 using the coordinates of the curve. In this case it is between 21.5 and 22.5 and can be reported as 22. It can be concluded that participants with a cumulative SCD-Q score above 22 on the SCD-Q are more likely to experience subjective cognitive decline than those with a score below 22. The mean score (*M*) was 25.49 and the standard deviation (*SD*) was 15.01. Approximately 50% of the participants met the cut-off threshold. On the SCD-Q17 version, 50 individuals scored above the cut-off threshold of 22. Based on the original SCD-Q, approximately 53.8% of participants scored abnormal with a cut-off of 7 positive items. In terms of clinical implications and diagnostic relevance, the comparison of the number of subjects who are abnormal at the new and the old cutoffs indicates that the new cutoff of the SCD-Q17 identifies abnormal subjects as reliably as the cut-off of the SCD-Q24.

Discussion

Considering AD begins many years before symptom onset with subjective cognitive decline (SCD) and various treatments are expected to be most beneficial at this early stage, an instrument is needed that can easily and reliably indicate the preclinical stage. The aim of this study was to assess and improve an instrument for measuring subjective cognitive decline in German-speaking countries. Its primary function is to detect early signs of subjective cognitive decline that may progress to the AD spectrum. Data from 313 individuals, who were outpatients from a memory clinic, were used to perform a PCA for item reduction and adaptation to common feedback from study participants about problems with understanding the instructions, the length of the original questionnaire (Rami et al., 2014), and the binary 'yes'/'no' response scale of the questionnaire.

After a robust factor analysis and PCA, items that loaded on more than one factor (items 1, 10, 22) and items with very low total factor loadings (items 7, 3, 5, 2) were removed. In addition, the response scale was also changed to a Likert scale from 'strongly disagree' to 'strongly agree'. All changes to the original SCD-Q were discussed with various experts in Alzheimer's research and adapted taking into account the comments from a qualitative survey. This short version with an adapted response scale was then mailed as a paper-pencil test to 100 participants. After 80 people returned the questionnaire, a PCA was then computed. Furthermore, a rotated loading matrix showed favorable factor loadings. Finally, a cut-off value of 22 was calculated for the SCD-Q17. When comparing the cut-off values for the SCD-Q and the SCD-Q17, it can be seen that the SCD-Q17 is capable of identifying abnormalities with a similar level of precision with less effort. This is due to the reduced number of items and the modified response scale of the SCD-Q17, which was developed in response to the critisism from study participants and from experts and boasts favorable psychometric test values.

From a test psychological perspective, there are several advantages to using Likert scales: For example, the Likert scale allows a more precise and sensitive gradation of responses (Grassi et al., 2007; Greenwald et al., 1970), socially desirable responses are made more difficult and many statistical test procedures require a Likert scale as a prerequisite for conducting certain tests. It is also important to keep the response burden as low as possible. Meta-analyses have found a general correlation between response rate and questionnaire length (Rolstadt et al., 2011). This empirical evidence was also reported back qualitatively by participants who found the questionnaire too long or incomprehensible or the response scale not precise enough. This feedback was one reason for developing the SCD-Q17 as a useful tool for a reliable measurement of subjective symptoms of the AD. This is particularly relevant for typical amnestic

Table 4 Coordinates of the curve

Positive if Greater Than or Equal to	Sensitivity	1-Specificity
14.5000	0.824	0.467
15.5000	0.804	0.467
16.5000	0.784	0.467
18.0000	0.765	0.333
19.5000	0.745	0.267
20.5000	0.725	0.267
21.5000	0.725	0.133
22.5000	0.686	0.133
24.0000	0.686	0.067

Only the coordinates relevant for specificity and sensitivity were presented in the table

AD, which is also the most common form of the disease (Dubois et al., 2014) while AD variants (e.g. with a behavioral-dysexecutive presentation) may not be captured by this questionnaire (Graff-Radford et al., 2021; Ossenkoppele et al., 2015).

Despite the comprehensive analysis conducted in this study, it is important to acknowledge certain criticisms. One important issue is the general shortcomings of factor analysis, which can be highly subjective. Even after a thorough evaluation of all statistical values, factor analysis often involves subjective decisions such as determining the number of items and assigning factor names. The SCD-Q has been criticized for failing to collect data on the timing of onset and the extent of subjective cognitive decline. In addition, it selectively focuses on memory while excluding domains (such as executive function or language), even though self-perceived decline affects cognitive domains other than memory (Ibnidiris et al., 2022). In addition, participants in the COGSCREEN study and in the testing of the SCD-Q17 reported that the selected items did not fully cover their cognitive problems. The German SCD-Q lacks important statistical parameters (e.g., content validation). Nevertheless, the original version of Rami et al. (2014) was sufficiently validated. The representativeness of the sample is limited because only participants from the Munich area were recruited. It is important to note that the SCD-Q may only be valid in Western cultures and that cultural differences may lead to different responses. It is well known that cultural factors also play an important role in problem-solving approaches. For example, belonging to an individualistic vs. collectivistic culture may lead to different cognitive processes in problem solving (rule-based vs. context-based) (Arieli et al., 2018). It should also be noted that the sex distribution of the sample was uneven. Significantly more women participated, which is a bias typically observed in similar studies due to women´s greater willingness to participate in research. Another reason may be that most subjects were recruited through personal contact, which may also have influenced motivation to participate. However, one reason for the sample distribution could also be the increased incidence of dementia in women. The reasons for this are being discussed. One reason could be, for example, that women live longer than men and older age is the greatest risk factor for AD (Chêne et al., 2015; Herbert et al., 2001; Seshadri et al., 1997). In addition, several studies and meta-analyses are still discussing whether there is an influence of the sex hormone estrogen on the difference in the AD rates between men and women (Kang et al., 2012; Yaffe et al., 2000). Due to the limited representativeness of the sample, it is not possible to draw any generalized conclusions. The applicability of the findings is limited to the selected participant group of seniors from German-speaking countries, which is also the target group of the SCD-Q17.

Further research should consider testing additional items that more accurately reflect the range of problems experienced by the subjects. In addition, it is imperative that the TheirCog is no longer disregarded. However, the TheirCog version, which includes relatives, was not used in this study because the aim was to develop a simple self-report measure for early diagnosis. The statistical validation of the German translation of the SCD-Q should also be improved. For example, convergent and knowngroup validity, test-retest and split-half reliability should be examined. In addition, cross-cultural validation should be a topic for further researchers. Finally, more objective criteria should have been used in the factor analysis of the study.

Conclusion

However, there has been a search for an useful tool to measure subjective symptoms in Alzheimer's disease, which can be found in the SCD-Q17. Feedback from participants in the COGSCREEN study indicated that the length of the original SCD-Q was too long and the response scale too imprecise. As a result, a revision was undertaken using PCA for item reduction. The binary option to answer was changed to Likert scale. The revised version of the SCD-Q, the SCD-Q17, was administered to additional participants and was found to identify cognitive complaints as reliably as the original SCD-Q.

The SCD-Q17 is of practical importance as an improved response scale and a shortened questionnaire were needed to create a useful tool for the detection of preclinical AD cases, which cannot be identified other than by self-report. The SCD-Q17 may therefore lead to a more thorough clinical assessment. In the future, the SCD-Q17 should also be widely used with low-threshold access. A digitized version of the questionnaire should be available for self-administration by the subjects.

Appendix A: German SCDQ

Fragebogen zur subjektiven kognitiven Beeinträchtigung (SCD-Q)
Bewertung des kognitiven Abbaus (MyCog)

a) Sind Sie vergesslich oder haben andere geistige Schwierigkeiten bemerkt?	JA	NEIN
b) Würden Sie sich wegen dieser Schwierigkeiten an einen Arzt wenden?	JA	NEIN
c) Haben sich ihr Gedächtnis oder Ihre geistige Leistung in den vergangenen 2 Jahren verschlechtert?	JA	NEIN

Nachstehend finden Sie eine Liste an Aktivitäten. Bitte antworten Sie mit JA, wenn Sie glauben, dass Sie diese Tätigkeiten SCHLECHTER als noch vor etwa zwei Jahren ausführen

1.	Ich finde es schwieriger, neue Telefonnummern zu lernen.	JA	NEIN
2.	Es fällt mir schwerer, persönliche Gegenstände zu finden (Schlüssel, Telefon, Utensilien usw.).	JA	NEIN
3.	Es fällt mir schwerer, die Handlung von Filmen zu beschreiben.	JA	NEIN
4.	Es fällt mir schwerer, mir Arzttermine zu merken.	JA	NEIN
5.	Ich finde es schwieriger, der Handlung eines Buches zu folgen.	JA	NEIN
6.	Ich kann mich schlechter an die Details eines kürzlich stattgefundenen Familienereignisses erinnern.	JA	NEIN
7.	Es fällt mir schwerer, mich an das Ergebnis eines kürzlich stattgefundenen Sportereignisses zu erinnern.	JA	NEIN
8.	Es fällt mir schwerer, mir Geldbeträge zu merken (Zahlungen oder Schulden).	JA	NEIN
9.	Es fällt mir schwerer, mich an die Einzelheiten eines Gesprächs zu erinnern.	JA	NEIN
10.	Es fällt mir schwerer, mir Dinge zu merken, ohne dafür bestimmte Strategien anzuwenden (Listen, Tagebuch, usw.).	JA	NEIN
11.	Es fällt mir schwerer, mich an die Einzelheiten der jüngsten Nachrichten zu erinnern.	JA	NEIN
12.	Es fällt mir schwerer, mir die Namen berühmter Leute zu merken.	JA	NEIN
13.	Es fällt mir schwerer, mir die Namen von Leuten zu merken, die ich kürzlich getroffen habe.	JA	NEIN
14.	Es fällt mir schwerer, mir Straßen- und Ortsnamen zu merken.	JA	NEIN
15.	Es fällt mir schwerer, das Wort zu finden, das ich in einem Gespräch verwenden möchte.	JA	NEIN
16.	Ich finde es schwieriger, Dinge zu verstehen, wenn jemand sie zum ersten Mal sagt.	JA	NEIN
17.	Es fällt mir schwerer, mir die Namen von Orten zu merken, die ich kürzlich besucht habe	JA	NEIN
18.	Es fällt mir schwerer, mich auf das zu konzentrieren, was ich gerade tue.	JA	NEIN
19.	Ich bin schlechter darin, Dinge zu planen, die nicht zu meiner täglichen Routine gehören (Reisen, Ausflüge, usw.).	JA	NEIN
20.	Es fällt mir schwerer, elektronische Geräte zu benutzen.	JA	NEIN
21.	Ich finde es schwieriger, neue oder mir fremde Dinge zu beginnen.	JA	NEIN
22.	Ich finde es schwieriger, Gespräche zu beginnen.	JA	NEIN
23.	Ich finde es schwieriger, im Kopf zu rechnen.	JA	NEIN
24.	Ich finde es schwieriger, mehr als eine Sache auf einmal zu tun, ohne unruhig zu werden.	JA	NEIN

Appendix B: German SCDQ 17

Kurzversion des Fragebogens zur kognitiven Leistungsfähigkeit

a) Sind Sie vergesslich oder haben andere geistige Schwierigkeiten bemerkt? JA NEIN

b) Würden Sie sich wegen dieser Schwierigkeiten an einen Arzt wenden? JA NEIN

c) Haben sich ihr Gedächtnis oder Ihre geistige Leistung in den vergangenen 2 Jahren verschlechtert? JA NEIN

Nachstehend finden Sie eine Liste an Aktivitäten. Bitte kreuzen Sie an, inwiefern Sie zustimmen, dass Sie diese Tätigkeiten SCHLECHTER als noch vor etwa zwei Jahren ausführen.

Aktivitäten	0 Stimme überhaupt nicht zu	1 Stimme nicht zu	2 Stimme weder zu noch lehne ich ab	3 Stimme zu	4 Stimme voll und ganz zu
1. Es fällt mir schwerer, mir Arzttermine zu merken.					
2. Ich kann mich schlechter an die Details eines kürzlich stattgefundenen Familienereignisses erinnern.					
3. Es fällt mir schwerer, mir Geldbeträge zu merken (Zahlungen oder Schulden).					
4. Es fällt mir schwerer, mich an die Einzelheiten eines Gesprächs zu erinnern.					
5. Es fällt mir schwerer, mich an die Einzelheiten der jüngsten Nachrichten zu erinnern.					
6. Es fällt mir schwerer, mir die Namen berühmter Leute zu merken.					
7. Es fällt mir schwerer, mir die Namen von Leuten zu merken, die ich kürzlich getroffen habe.					
8. Es fällt mir schwerer, mir Straßen- und Ortsnamen zu merken.					
9. Es fällt mir schwerer, das Wort zu finden, das ich in einem Gespräch verwenden möchte.					
10. Ich finde es schwieriger, Dinge zu verstehen, wenn jemand sie zum ersten Mal sagt.					
11. Es fällt mir schwerer, mir die Namen von Orten zu merken, die ich kürzlich besucht habe.					
12. Es fällt mir schwerer, mich auf das zu konzentrieren, was ich gerade tue.					
13. Ich bin schlechter darin, Dinge zu planen, die nicht zu meiner täglichen Routine gehören (Reisen, Ausflüge, usw.).					
14. Es fällt mir schwerer, elektronische Geräte zu benutzen.					
15. Ich finde es schwieriger, neue oder mir fremde Dinge zu beginnen.					
16. Ich finde es schwieriger, im Kopf zu rechnen.					
17. Ich finde es schwieriger, mehr als eine Sache auf einmal zu tun ohne unruhig zu werden.					

Appendix C: English SCDQ 17

Short version of the questionnaire on cognitive performance

a) Are you forgetful or have you noticed any other mental difficulties? YES NO

b) Would you consult a doctor about these difficulties? YES NO

c) Have your memory or mental performance deteriorated in the past 2 years? YES NO

Nachstehend finden Sie eine Liste an Aktivitäten. Bitte kreuzen Sie an, inwiefern Sie zustimmen, dass Sie diese Tätigkeiten SCHLECHTER als noch vor etwa zwei Jahren ausführen.

Activities	0 Do not agree at all	1 Do not agree	2 I neither agree nor disagree	3 Agree	4 Fully agree
1. It is more difficult for me to remember doctor's appointments.					
2. I have a more difficult time remembering the details of a recent family event.					
3. It is more difficult for me to remember amounts of money (payments or debts).					
4. I find it more difficult to remember the details of a conversation.					
5. I find it more difficult to remember the details of the latest news.					
6. It's more difficult for me to remember the names of famous peopl					
7. It's more difficult for me to remember the names of people I've met recently.					
8. It is more difficult for me to remember street and place names.					
9. I find it more difficult to find the word I want to use in a conversation.					
10. I find it more difficult to understand things when someone says them for the first time.					
11. I find it more difficult to remember the names of places I have recently visited.					
12. It's more difficult for me to concentrate on what I'm doing.					
13. I am worse at planning things that are not part of my daily routine (travelling, trips, etc.)					
14. I find it more difficult to use electronic devices.					
15. I find it more difficult to start new or unfamiliar things.					
16. I find it more difficult to do the maths in my head.					
17. I find it more difficult to do more than one thing at a time without getting restless.					

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Robert Perneczky: Study conception/design, Data acquisition, Manuscript writing and/or critical review, Approval of final version for submission.
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Declarations

Ethics approval Participants were recruited from the CogScreen study (project number 22–0786), a cohort study investigating the feasibility of screening for Alzheimer's disease (AD) in the general population, which started in 02/23. A comparison group was recruited from the SCD-Q study (project number 22-1117) at the Memory Clinic of the Department of Psychiatry and Psychotherapy, University Hospital Munich, LMU Munich, which started in 04/23. Both studies were approved by the local ethics committee of the Ludwig-Maximilians-University Munich (project numbers 22–0786 and 22-1117). Permission to reproduce material from other sources is not required as proprietary data is used for this manuscript. CogScreen has been retrospectively registered at clinical trials (NCT06191952).

Consent to participate All authors ensure that informed consent was appropriately obtained, that the research met ethical guidelines, including compliance with the legal requirements of the country of the study. Written informed consent was obtained from all participants in accordance with the 1964 Declaration of Helsinki.

Competing interests The authors report no conflicts of interest for the studies presented. R.P. competing interests are described in the acknowledgements. R.P. has received honoraria for advisory boards and speaker engagements from Roche, EISAI, Eli Lilly, Biogen, Janssen-Cilag, Astra Zeneca, Schwabe, Grifols, Novo Nordisk and Tabuk.

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