Psychometric evaluation of the German version of the Social Functioning in Dementia Scale (SF-DEM)

Running title: German SF-DEM

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Abstract

Background: Dementia is one of the most common and most severe disorder in old age. In addition to cognitive decline and functional impairment, changes in social functioning occur in the course of dementia. Currently, there is no valid instrument in German language to assess social functioning in individuals with dementia.

Objective: We aim to adapt and psychometrically evaluate a German version of the Social Functioning in Dementia Scale (SF-DEM).

Methods: First, a multi-step and team-based translation process based on the TRAPD model was performed. Second, we interviewed dyads of individuals with mild dementia and caregivers to test the internal consistency, test-retest reliability, interrater reliability, construct validity and acceptance of the German version of the SF-DEM.

Results: The internal consistency of the patient-rated ($\alpha = 0.72$) and the caregiver-rated ($\alpha = 0.76$) SF-DEM is at an acceptable level. The interrater reliability was excellent for both versions (patients: ICC = 0.98, CI [0.95-0.99]; caregiver: ICC = 0.95, CI [0.89-0.98]) and the test-retest reliability was moderate (patients: ICC = 0.57, CI [0.26-0.77]; caregiver: ICC = 0.58, CI [0.27-0.78]). Caregiver-rated SF-DEM correlated strong with LSNS-6 ($r_s = 0.60$, $p < .01$), QoL-AD (marriage: $r_s = 0.61$, $p < .01$; friends: $r_s = 0.51$, $p = .01$). In addition, the SF-DEM was accepted by the participants.

Conclusion: The German SF-DEM is a valid, reliable and acceptable instrument to assess social functioning in individuals with dementia. Further research should address the psychometric properties in individuals with more severe dementia.

Keywords: SF-DEM, social functioning, dementia, questionnaire, scale, measure, psychometrics, reliability, validity, acceptance

INTRODUCTION

In addition to cognitive impairment that limits the independent performance of everyday functional activities, social functioning (SF) is a characteristic feature of dementia and is defined as “how individuals associate and interact, both in society at large and their own personal environment” [1]. It causes the patient to lose interest in previously enjoyed hobbies or to experience changes in their close relationships [2], which are distressing for both the patient and their family and friends. The COVID-19 pandemic has renewed the focus on the importance of social functioning for all people, but especially those with dementia who are at a greater risk of isolation [3].

The assessment of SF in dementia is important for early detection, diagnosis, description of the course of disease, and evaluation of intervention effects. It also facilitates the development of psychosocial therapies and preventive interventions. However, this assessment requires valid and reliable instruments. Currently, measures, specifically designed to assess SF in individuals with dementia, are lacking [4].

To fill this gap, Sommerlad *et al.* developed and psychometrically evaluated the Social Functioning in Dementia Scale (SF-DEM) [2], a patient- or caregiver-reported scale to measure SF in individuals with mild dementia. Both versions of the assessment include 3 sections, derived from factor analysis, on different aspects of SF [5]. The first section, "spending time with other people" includes the frequency of contact with family members and participation in activities or events with others. The second section, "communication with other people", includes frequency of general and personal conversations with others. The third section, “sensibility to other people” includes possible difficulties in interaction with others, such as problems following conversations, arguments, and aggression, or a desire for social withdrawal. An additional and overarching section asks global questions about SF: How about your social life as a whole? How is it compared to a year ago? Is a change in your social life desired? Altogether, the questionnaire comprises 20 items for patient- and/or caregiver-report. All questions are simple and precise and are answered via pre-defined four-point Likert scale answering categories. The reference period is one month.

Currently, no comparable psychometrically tested instrument exists to assess SF in individuals with dementia in German language, and our previous systematic review found the SF-DEM to be the most promising social functioning instrument in dementia [4]. Germany has one of the oldest and fastest ageing populations in the world [6] and therefore a high number of people living with dementia as well as a projected increase of cases over the coming decades. While currently 1.6 million Germans are living with dementia, this is expected to almost double by 2050 [7]. Already, this is associated with high health care costs [8]. Instruments to assess SF are thus needed in Germany as well as other German speaking regions with similar demographic developments (i.e, Austria and Switzerland).

Therefore, the aims of this study were: (1) translation of the SF-DEM into German and (2) psychometric evaluation of the German version (“Sozialfunktionen bei Demenz–Fragebogen”/SF-DEM).

METHODS

ETHICS

This work was approved by the Ethics Committee of the Medical Faculty of the University of Leipzig (ref: 401/19-ek). Participants were informed about the aims of the study. They provided written informed consent prior to enrolment.

TRANSLATION PROCESS

We performed a multi-step and team-based translation process using the TRAPD model (Translation, Review, Adjudication, Pretesting, and Documentation) (Fig. 1) [9, 10]. Several individuals were involved over several stages for optimization of the translation process. First, the original English SF-DEM was translated into German and back into English by two independent professional translators certificated according to the norms DIN EN 15038 and ISO 1700. Second, these two versions were reviewed, discussed, and agreed upon by SR and JG. This resulted in a preliminary German version.

Figure 1 about here

As part of the pretesting, the content validity of the preliminary version was evaluated, and we considered the need for changes to the SF-DEM to make suitable for application to individuals with mild dementia. For this purpose, the research team members were interviewed. However, no adjustments were found to be necessary.

RECRUITMENT AND PARTICIPANTS

Participants were enrolled at the memory day clinic of the University Hospital, Leipzig (Germany), with the goal to reach a sample size of 30 dyads. We included individuals with mild dementia of any subtype (clinical diagnosis was made by a physician according to ICD-10 [11]), of mild severity (MMSE score ≥20), aged ≥65 years. Individuals with moderate severity of dementia were also included (MMSE score ≥18), if they are able to answer the questions. We excluded those with severe physical conditions or mental disorders, limiting their participation in the interviews, or those who were unable to give informed consent. For each individual with dementia, we included a German-speaking caregiver, aged ≥18 years, in contact with the patient at least weekly, so that they could give an accurate appraisal of the patient's current level of social functioning.

Of the 40 dyads contacted, 33 agreed to participate in the study. A total of five dyads were excluded from the analysis because of the high severity of cognitive impairment (MMSE score <18) (Fig. 2 and Supplementary Table A.1). This resulted in a final sample of 28 participating dyads. All participants, except for one dyad, consented to their interviews being audio recorded to allow assessment of scale reliability. For this purpose, the SF-DEM was completed by another interviewer, based on audio records.

The recruitment period was from October 2019 to December 2020, with face-to-face data collection from December 2019 to March 2020. Due to the COVID-19 pandemic, interviews were conducted by telephone (from April 2020; baseline: n = 11; follow-up: n = 13; Supplementary Table A.2).

Figure 2 about here

MEASURES

Structured interviews were conducted twice (baseline and after four weeks). During the interviews, the section containing the SF-DEM was audio-recorded. The baseline interviews included standardized questions on sociodemographic data, the SF-DEM, cognitive and functional tests, as well as questions related to SF, detailed below.

Sociodemographic data included age, sex, marital status, education, and living situation, among others. In order to evaluate the content validity, participants were asked Likert-scale questions about the acceptance of the SF-DEM (very acceptable, acceptable, unacceptable, and very unacceptable) and its clarity, length, and structure of the total questionnaire, and whether the length of single items was acceptable (yes/no; comments). They were also invited to make general comments about the questionnaire.

BASELINE MEASURES FOR PEOPLE WITH MILD DEMENTIA

The Mini-Mental Status Examination (MMSE) was used to gather information about the cognitive status [12, 13]. It consisted of 11 questions and tasks regarding orientation, recall, and visual construction. Higher scores indicated better overall cognitive function. The maximum score was 30.

For the patient’s everyday functions or functional independence, the Barthel index was determined by questioning individuals with mild dementia about 10 basic activities of daily living (ADL) (for example, personal hygiene, food intake, and toilet use). The maximum score of 100 reflected maximum independence [15].

Moreover, eight Instrumental Activities of Daily Living (IADL) were assessed using the Lawton & Brody IADL scale [16], which included the ability to use a telephone and transportation (car, bus, train), and the ability to manage financial matters. The score ranged from 0–8; a higher score indicated higher independence.

BASELINE MEASURES FOR PEOPLE WITH MILD DEMENTIA AND THEIR CAREGIVERS

The short version of the Lubben Social Network Scale (LSNS-6) was used to get information about the social network size [17]. It contained the number and frequency of contacts with friends and family and the support received by them. Each of the six items had scores ranging on a scale of 0–5, and the total score ranged from 0–30; higher scores indicated larger social networks.

Selected questions from the ENRICHD Social Support Inventory (ESSI) [18] were used to measure perceived emotional social support. The five questions were rated on a five-point Likert scale. The score was calculated as the sum of all items and could have values between 5 and 25. Higher values represented a stronger level of social support.

Furthermore, selected questions of the Quality of Life in Alzheimer´s Disease (QoL-AD)[19] were used to assess the patient's current social situation with family, marriage, and friends using a four-point Likert scale ("poor" to "excellent").

Impairments in social activities due to memory difficulties were rated using questions of the health status questionnaire (SF-36). Ratings were based on a five-point Likert scale ("always" to "never") [20].

ASSESSMENTS AT FOLLOW-UP

The follow-up interviews after four weeks contained the SF-DEM and a question on whether anything considered significant by the person with dementia or caregiver had occurred between baseline and follow-up. Individuals with mild dementia conducted the MMSE again.

ANALYSIS

Descriptions of sample characteristics were calculated. We assessed internal consistency using Cronbach's α. Spearman's rank coefficient was calculated to determine item-total and item-item reliability. We tested inter-rater and test-retest reliability for the total SF-DEM score based on the intraclass correlation coefficient (ICC) [21], using the (2,1) model for inter-rater reliability, the (1,1) model [22] for test-retest reliability, and inter-rater and test-retest agreement on item level using Cohen´s k [23].

In order to determine construct validity, we calculated Spearman´s rank coefficient based on the correlation of SF-DEM scores and ordinal data from SF-36, QoL-AD, LSNS-6, and ESSI. Moreover, we calculated ICC for agreement between the patient and the caregiver.

STATA 16 was used for statistical analysis [24]. All analyses employed an α-level for statistical significance of 0.05 (two-tailed).

RESULTS

SAMPLE CHARACTERISTICS

Table 1 shows sociodemographic and clinical characteristics of the 28 dyads included in the analysis. Individuals with mild dementia had a mean age of 77.54 (SD = 4.53) years, and 57.14% were women. Majority of the participants were married at the time of the interview (82.14%) and lived with their respective partner or spouse in private households (64.29%). The majority of them had completed polytechnic secondary school and half had completed an apprenticeship (78.57%; 50.00%). Functional ability was largely intact (M_{ADL} = 94.64, SD_{ADL} = 8.81; M_{IADL} = 5.28, SD_{IADL} = 2.24). The mean MMSE score was 21.21 (SD = 2.36).

Caregivers were mostly spouses of the individuals with mild dementia (75.00%) and were in daily contact with them (89.29%). Their mean age was 69.14 (SD = 11.56) years, and 57.14% were females, married (85.17%), and had completed polytechnic secondary school (64.29%) and an apprenticeship (42.86%).

Table 1 about here

SF-DEM RESULTS

Table 2 shows details of the mean and range of response scores of the participants to the SF-DEM items. Individuals with mild dementia used the full range of possible responses for eight and the caregivers for seven questions of the SF-DEM. The overall rating by individuals with mild dementia was higher than that of the caregivers' (mean difference = 2.07, 95% CI [0.28–3.86], p = .02). A significant difference was found only in the subscale “sensitivity to other people” (mean difference = 1.07, 95% CI [0.22–1.92], p = .02). The scores of the other two subscales of caregiver ratings did not differ significantly from patient ratings.

Table 2 about here

ACCEPTABILITY

Across all dyads, the SF-DEM was rated as acceptable or very acceptable. Moreover, all dyads rated the questionnaire as clearly understandable. The majority of participants stated that the overall length of the questionnaire was adequate (individuals with mild dementia: 96.43%; caregivers: 92.86%). The length of the items was judged as appropriate by all respondents. The majority approved the four response options as being adequate (individuals with mild dementia: 96.43%; caregivers: 89.29%).

The average time to complete the SF-DEM was 11.56 minutes (SD = 5.24) for the patient-report and 9.21 minutes (SD = 4.12) for the caregiver-report.

Only a few participants made additional comments. For example, it was noted that the SF-DEM might be unsuitable for individuals with more severe dementia (due to the length and language of the SF-DEM). However, the comments did not give enough reason to make adjustments to the SF-DEM.

INTERNAL CONSISTENCY

Consistency of the patient-rated (α = 0.72) and caregiver-rated (α = 0.76) instruments was acceptable (see Supplementary Table A.3 for internal consistency of subscales)

[25]. A total of five items in the patient-rated instrument (1, 3, 4, 12, 14) and five in the caregiver-rated instrument (1, 7, 12, 14, 16) had low item-total reliability (Table 3). The other items did not result in an alpha increase when they were removed.

INTER-RATER RELIABILITY

Inter-rater correlation between the two interviewers was very high for overall scores in the patient-rated (ICC = 0.98, 95%CI [0.95–0.99]) and the caregiver-rated version (ICC = 0.95, 95%CI [0.89–0.98]). Inter-rater agreement was good for item one in the patient-rated and the caregiver-rated version and for item three in the patient-rated SF-DEM. For all other items, the inter-rater agreement was very good (Table 3 and Supplementary Table A.3 for subscales).

TEST-RETEST RELIABILITY

We repeated the assessment of the SF-DEM after an average of 29.36 with patients and 29.50 days with caregivers ($SD_P = 3.11$; $range_P$ 24–39; $SD_A = 3.04$; $range_A$ 24–39).

Test-retest correlation was moderate for the patient-rated (ICC = 0.57, 59% CI [0.26–0.77]) and the caregiver-rated versions (ICC = 0.58, 95% CI [0.27–0.78]). Significant agreement ($\kappa \geq 0.4$) was found for items four and nine of both versions, as well as item two, three, and 13 of the patient-rated and item five and eight of the caregiver-rated SF-DEM (Table 3 and Supplementary Table A.3 for subscales).

Table 3 about here

VALIDITY

There is no German measure of SF against which SF-DEM can be compared in order to evaluate validity. We did not find a significant correlation between the patient ratings and LSNS-6 ($r_s = 0.20$, $p = .31$), ESSI ($r_s = 0.19$, $p = .32$), QoL-AD (family: $r_s =$

0. 09, p = .66; marriage: rs = 0.12, p = .55; friends: r_s = −0.08, p = .68), and the SF-36 items (r_s = −0.13, p = .50; r_s = 0.00, p = .99).

Strong correlations were found with respect to the caregiver-rated instrument and LSNS-6 (r_s = 0.60, p < .01) and QoL-AD (marriage: r_s = 0.61, p < .01; friends: r_s = 0.51, p = .01). Moderate correlations occurred between QoL-AD family (r_s = 0.37, p = .05) and the SF-36 items (r_s = 0.39, p = .04 and r_s = 0.33, p = .09). No significant correlation was observed between the SF-DEM and ESSI (r_s = 0.28, p = .15). See Table 4 and Supplementary Table A.4 for subscales.

Table 4 about here

No significant correlation was found between the total SF-DEM score and the 3 global social behavior questions in the patient version. In the caregiver version, the overall score correlated moderately with item 18 assessing overall social behavior (r_s = −0.45; p = 0.02). See Supplementary Table A.5 for correlations between SF-DEM subscale scores.

DISCUSSION

We aimed to provide a German version of the originally English SF-DEM scale to assess social functioning in individuals with mild dementia. The original scale was validated in individuals with mild dementia and their caregivers and has been found to have good psychometric properties [2]. Second, Budgett *et al.* showed that the caregiver-rated original English SF-DEM has satisfactory psychometric properties in all severities of dementia [5].

In our study, the first step was to translate the scale according to the TRAPD model. In the second step, we evaluated the reliability, validity, and acceptability of the German version.

The German SF-DEM was highly acceptable to the target population, i.e., individuals with mild dementia, as well as their caregivers. The internal consistency was acceptable, the inter-rater reliability was very high, and test-retest reliability was moderate for both versions.

The total score of the German SF-DEM showed higher values for the patient version than for the caregiver version. These differences were mainly found in the subscale “sensitivity to other people". The subscale included items about socially undesirable behaviors, such as aggression and arguing. It is well known that individuals with dementia may have low disease insight and often tend to underestimate or trivialize deficits [26]. Low insight, also referred to as anosognosia, increases during the course of dementia [27, 28]. Similar patterns have been identified for quality of life [29, 30].

The evaluation of construct validity was not straightforward, because there is no suitable German assessment to compare the SF-DEM; therefore, we chose instruments of constructs which we hypothesized to be correlated, such as social network size, perceived social support, and quality of life. However, we found that patient ratings of SF did not correlate with these constructs, which may further reflect the impairment of insight. However, using proxy concepts, the caregiver version showed that a higher SF-DEM score was associated with a larger social network of patients. The satisfaction of the individual with mild dementia with family, marriage, and friends, as assessed in the QoL-AD, was also positively related to the SF-DEM score. Higher SF was evident if the caregiver reported less impairments due to the patient's memory problems. The total result of the caregiver-rated SF-DEM was associated with better satisfaction of the overall social life of the patient.

Overall, our results are largely in line with those of the original English version [2]. Acceptability of the German version was consistent with the original English version. The duration of the interviews in the German version was 1 minute shorter in the patient-rated and 2 minutes shorter in the caregiver-rated version. It is most likely that these discrepancies were due to language. The internal consistency of the German SF-DEM was slightly higher than in the original English SF-DEM. The reason for this difference could be that a third subscale was added to the English version after initial psychometric evaluation, thus improving the internal consistency. Our analysis showed slightly lower values in inter-rater reliability. This may be a result of having 2 interviewers in our study, while one interviewer was involved in the evaluation of the original English version. In the study by Sommerlad *et al.* in 2017, inter-rater reliability was determined by recording the interviews on a voice recorder and then having them rated again by another person.

Notably, we found lower values regarding test-retest reliability. This may be associated with the COVID-19 pandemic, which began during our data collection period. The public health interventions to curb the spread of the virus caused significant restrictions on social life. The average SF-DEM score was lower at participant’s follow-up interviews, which largely took place during the pandemic, and this is likely due to these restrictions reducing the availability of social contacts and activities. Some of the participants were interviewed face-to-face prior to the onset of the pandemic and by telephone at follow-up after the onset of the pandemic. We cannot rule out that the change in survey mode led to a change in response behavior.

The emergence of the COVID-19 pandemic is probably also the reason why the full range of answers was not used for all questions in the SF-DEM. This was precisely because trips and visits to cafés were not possible during this period. Ceiling or floor effect for the scales were not evident.

STRENGTHS AND LIMITATIONS

Our work provides a validated instrument to assess SF in individuals with mild dementia in German language. Individuals of different educational backgrounds and of both sexes could be included. All participants were interviewed twice without dropouts.

Interviewing individuals with cognitive impairment carries the risk of cognitive fatigue. A total of 5 individuals with dementia experienced difficulties during the interview. To counteract these difficulties, the questions were rephrased and explained, if required. It cannot be ruled out that caregivers also had difficulties in answering our questions. This was not noticed by the interviewers. Bias in the answers cannot be ruled out. Caregivers were not subjected to screening. Possibly, some caregivers among the interviewees had cognitive deficits and probably could not answer questions reliably. Interviewers were trained to minimize such biases. Explanations were given in case of comprehension problems, and questions were re-formulated, if necessary.

CONCLUSION

Our results provide promising evidence that the German SF-DEM can be used as a valid and reliable patient- and caregiver-report to assess SF in individuals with mild dementia. Further studies are required to assess its applicability in moderate and severe dementia, pre-stages of dementia, and in different settings, such as in nursing homes or among community-dwelling individuals. Furthermore, the German SF-DEM should be tested in other German-speaking regions to test the generalizability of our findings. For the same reason, testing of a larger sample is also desirable with confirmatory factor analysis of the factor structure of the scale. Further research is also required to test the responsiveness of the German SF-DEM. Finally, the German SF-DEM should be used in future studies to assess changes in SF especially in individuals with dementia. Furthermore, an application in clinical and care settings is also explicitly desired to evaluate the scale's role in early detection of dementia, to facilitate conversation about distressing changes in SF, and supporting individuals with dementia and their caregivers to improve SF.

The instrument is available for free: https://www.ucl.ac.uk/psychiatry/research/mental-health-older-people/projects/social-functioning-dementia-scale-sf-dem

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FIGURES

Figure 1: Translation of the SF-DEM based on the TRAPD-model (according to Harkness [9]).

Figure 2: Flowchart - Flowchart - recruitment and analytic sample selection.

TABLES

Table 1: Characteristics of participants.

Characteristics	Patients (*n* = 28)	Caregivers (*n* = 28)
Female sex *(n (%))*	16 (57.14)	16 (57.14)
Age (*M* (*SD*))	77.54 (4.53)	69.14 (11.56)
Marital status (*n (%)*)		
Married	23 (82.14)	24 (85.71)
Single	0 (0)	2 (7.14)
Divorced	1 (3.57)	2 (7.14)
Widowed	4 (14.29)	0 (0)
Living situation of patient (*n (%)*)		
Lives alone	8 (28.57)	-
Living with spouse/partner	18 (64.29)	-
Living with other family	1 (3.57)	-
Living with others	0 (0)	-
Assisted living	0 (0)	-
Retirement homes	1 (3.57)	-
Nursing home	0 (0)	-
Level of education (*n (%)*)		
No school graduation	0 (0)	0 (0)
General elementary education	1 (3.57)	1 (3.57)
Polytechnic secondary	22 (78.57)	18 (64.29)
Advanced technical college High school graduation	5 (17.86)	9 (32.14)
Other	0 (0)	0 (0)
Level of professional education (*n (%)*)		
None	3 (10.71)	0 (0)
Completed apprenticeship	14 (50.00)	12 (42.86)
Specialists/technicians or master school	3 (10.71)	5 (17.86)
Polytechnic degree or university degree	8 (28.57)	10 (35.71)
Postgraduate degree or doctorate	0 (0)	1 (3.57)
Other	0 (0)	0 (0)
Cognitive status* (*M* (*SD*))	21.21 (2.36)	-
ADL (*M* (*SD*))	94.64 (8.81)	-
I-ADL (*M* (*SD*))	5.28 (2.24)	-
Relationship to caregiver		
Spouse	-	21 (75.00)
Child, child-in-law	-	7 (25.00)
Frequency of contact between patient and caregiver *(n (%))*		
Daily	-	25 (89.29)
More than 2-3 times/week	-	1 (3.57)
2-3 times/week	-	2 (7.14)
1 time/week	-	0 (0)

2-3 time/month	-	0 (0)
1 time/month	-	0 (0)
Rarer than 1 time/month	-	0 (0)

Abbreviations. * Mini-Mental Status Examination.
ADL, Activities of Daily Living; I-ADL, Instrumental Activities of Daily Living; M, Mean; SD, standard deviation.

Table 2: Summary of participants' responses to the German SF-DEM at baseline.

	Patient version (*n* = 28)				Caregiver version (*n* = 28)			
	n (%)				*n (%)*			
SF-DEM domain: How often in the past month have you/they…	Very often	Often	Occasionally	Never	Very often	Often	Occasionally	Never
Spending time with other people								
1. Seen friends or family in own home	20 (71.43)	8 (28.57)	0 (0)	0 (0)	19 (67.86)	7 (25.00)	1 (3.57)	1 (3.57)
2. Visited friends or family at their homes	1 (3.57)	7 (25.00)	10 (35.71)	10 (35.71)	0 (0)	11 (39.29)	8 (28.57)	9 (32.14)
3. Attended community or religious meetings*	0 (0)	0 (0)	2 (7.41)	25 (92.59)	0 (0)	26 (92.86)	1 (3.57)	1 (3.57)
4. Gone shopping with friends or family	1 (3.57)	18 (64.29)	4 (14.29)	5 (17.86)	0 (0)	18 (64.29)	3 (10.71)	7 (25.00)
5. Gone on trips or to events like the cinema or talks	0 (0)	7 (25.00)	5 (17.86)	16 (57.14)	0 (0)	6 (21.43)	8 (28.57)	14 (50.00)
6. Gone to a cafe, restaurant, pub, or social club	0 (0)	8 (28.57)	5 (17.86)	15 (53.57)	0 (0)	11 (39.29)	7 (25.00)	10 (35.71)
7. Exercised, walked, or played sport with others	7 (25.00)	13 (46.43)	2 (7.14)	6 (21.43)	5 (17.86)	15 (53.57)	4 (14.29)	4 (14.29)
Communication with other people								
8. Contacted friends or family by phone or computer	3 (10.71)	13 (46.43)	9 (32.14)	3 (10.71)	5 (17.86)	12 (42.86)	4 (14.29)	7 (25.00)
9. Started or taken part in a conversation	24 (85.71)	4 (14.29)	0 (0)	0 (0)	22 (78.57)	6 (21.43)	0 (0)	0 (0)
10. Talked to others about your/their feelings or concerns	5 (17.86)	7 (25.00)	5 (17.86)	11 (39.29)	2 (7.14)	8 (28.57)	10 (35.71)	8 (28.57)
11. Asked other people about their feelings or concerns	0 (0)	8 (28.57)	8 (28.57)	12 (43.86)	0 (0)	8 (28.57)	9 (32.14)	11 (39.29)
12. Found it difficult to think of something to say to others	0 (0)	2 (7.14)	2 (7.14)	24 (85.71)	0 (0)	7 (25.00)	6 (21.43)	15 (53.57)
13. Found other people`s conversation unclear	2 (7.14)	1 (3.57)	2 (7.14)	23 (82.14)	2 (7.14)	3 (10.71)	10 (35.71)	13 (46.43)
Sensibility to other people								
14. Been outspoken about what you/they really think	2 (7.14)	5 (17.86)	3 (10.71)	18 (64.29)	1 (3.57)	11 (39.29)	4 (14.29)	12 (42.86)
15. Found that other people are irritating	0 (0)	3 (10.71)	3 (10.71)	22 (78.75)	1 (3.57)	4 (14.29)	6 (21.43)	17 (60.71)
16. Had an argument or shouted at other people	0 (0)	1 (3.57)	4 (14.29)	23 (82.14)	0 (0)	8 (28.57)	3 (10.71)	17 (60.71)
17. Found they don`t want to do things you/they would usually	1 (3.57)	4 (14.29)	10 (35.71)	13 (46.43)	0 (0)	7 (25.00)	6 (21.43)	15 (53.57)
	M (SD)		Range		*M (SD)*		Range	
Summary scores								

Section 1 „Spending time with other people“ (1-7)	8.48 (2.68)	4 – 14	8.64 (2.67)	4 – 13
Section 2 „Communication with other people“ (8-13)	11.93 (2.26)	7 – 16	10.86 (3.22)	5 – 17
Section 3 „Sensibility to other people“ (14-17)	10.04 (2.06)	4 – 12	8.96 (1.95)	5 – 12
Total	30.43 (4.62)	20 – 40	28.36 (4.79)	19 – 36

	Patient rated (*n* = 28)					Caregiver rated (*n* = 28)				
	n (%)					*n (%)*				
	Excellent	Good	Fair	Poor		Excellent	Good	Fair	Poor	
Thinking about your/their social life as a whole, how is it now?	2 (7.14)	21 (75.00)	5 (17.86)	0 (0)		1 (3.57)	12 (42.86)	12 (42.86)	3 (10.71)	
	A lot better	A bit better	No change	A bit worse	A lot worse	A lot better	A bit better	No change	A bit worse	A lot worse
How is it now compared to 1 year ago?	4 (14.29)	2 (7.14)	14 (50.00)	6 (21.43)	2 (7.14)	0 (0)	3 (10.71)	9 (32.14)	10 (35.71)	6 (21.43)
	Rather do more	No change needed	Rather do less			Rather do more	No change needed	Rather do less		
Would you like your/their social life to change?	14 (50.00)	14 (50.00)	0 (0)			19 (67.86)	9 (32.14)	0 (0)		

Abbreviations: * missing values: n = 1.

SF-DEM, German version of SF-DEM; M, mean; SD, standard deviation;

For each question, higher score indicates better social functioning. For questions 1-11: 0 = never, 1 = occasionally, 2 = often, 3 = very often. 12-17: 0 = very often, 1 = often, 2 = occasionally, 3 = never.

Table 3: Summary of psychometric properties for items of the German SF-DEM.

Psychometric property	Item-total correlation		Interrater reliability		Test-retest reliability		Convergent validity: patient-caregiver agreement
Statistic	Spearman`s *r*		Cohen`s *k*		Cohen`s *k*		Cohen`s *k*
SF-DEM domain	Patient rated	Caregiver rated	Patient rated	Caregiver rated	Patient rated	Caregiver rated	
Spending time with other people							
1. Seen friends or family in own home	*0.19*	*0.08*	*0.74*	0.77	*0.10*	*0.22*	0.52
2. Visited friends or family at their homes	0.47	0.35	0.89	0.89	0.63	*0.26*	*0.11*
3. Attended community or religious meetings	0.33	*0.45*	0.85	0.86	0.59	0.66	*0.32*
4. Gone shopping with friends or family	*0.44*	0.62	1.00	0.88	*0.18*	0.51	*0.36*
5. Gone on trips or to events like the cinema or talks	*0.38*	0.26	1.00	0.89	*0.19*	*0.25*	*0.40*
6. Gone to a cafe, restaurant, pub, or social club	*0.51*	0.28	0.89	1.00	*0.15*	*0.30*	*0.36*
7. Exercised, walked or played sport with others	0.08	0.38	0.83	0.95	*0.11*	0.54	0.09
Communicating with other people							
8. Contacted friends or family by phone or computer	0.19	*0.25*	*0.65*	1.00	0.74	*0.31*	0.47
9. Started or taken part in a conversation	0.22	*0.10*	0.84	1.00	0.64	0.47	0.76
10. Talked to others about your/their feelings or concerns	0.50	0.63	0.95	0.90	*0.20*	*0.38*	*0.13*

Psychometric property	Item-total correlation		Interrater reliability		Test-retest reliability		Convergent validity: patient-caregiver agreement
Statistic	Spearman`s *r*		Cohen`s *k*		Cohen`s *k*		Cohen`s *k*
SF-DEM domain	Patient rated	Caregiver rated	Patient rated	Caregiver rated	Patient rated	Caregiver rated	
11. Asked other people about their feelings or concerns	0.32	0.50	0.95	0.95	*0.13*	*0.21*	*0.08*
12. Found it difficult to think of something to say to others	0.14	0.15	1.00	1.00	*0.02*	*0.21*	*0.09*
13. Found other people`s conversation unclear	0.45	*0.48*	0.89	1.00	0.42	*0.21*	*0.08*
Sensibility to other people							
14. Been outspoken about what you/they really think	*0.15*	0.15	0.87	1.00	*0.20*	*0.21*	*0.16*
15. Found that other people are irritating	0.36	0.22	1.00	1.00	*0.04*	*0.26*	*0.19*
16. Had an argument or shouted at other people	0.34	0.19	0.87	0.86	*0.15*	*0.31*	*0.25*
17. Found they don`t want to do things you/they would usually	0.32	0.38	1.00	1.00	*0.28*	*0.26*	*0.05*
Total	0.72	0.76	0.98	0.95	0.57	0.58	0.46
95% CI			.95, .99	.89, .98	.26, .78	.28, .78	.11, .71
Statistic for total score	Cronbach`s *α*		Intraclass correlation coefficient for total score				

Abbreviations: SF-DEM, German version of SF-DEM.

Psychometric property	Item-total correlation		Interrater reliability		Test-retest reliability		Convergent validity: patient-caregiver agreement
Statistic	Spearman`s *r*		Cohen`s *k*		Cohen`s *k*		Cohen`s *k*
SF-DEM domain	Patient rated	Caregiver rated	Patient rated	Caregiver rated	Patient rated	Caregiver rated	

Note. Statistics in italicized type indicate low reliability or agreement: item-total reliability: Cronbach's' α would increase if item were deleted; interrater reliability: Cohen's quadratic-weighted k ≤ 0.75; test-retest reliability: Cohen's quadratic-weighted k ≤ 0.40; and convergent validity: Cohen's quadratic-weighted k ≤ 0.40.

Table 4: Correlation analysis to test the validity of the SF-DEM.

		Patients		**Caregiver**	
		r_s	*p*	*r_s*	*p*
LSNS-6		0.20	.31	**0.60**	< .01
ESSI		0.19	.32	0.28	.15
QoL-AD					
	Family	0.09	.66	**0.37**	.05
	Marriage	0.12	.55	**0.61**	< .01
	Friends	- 0.08	.68	**0.51**	.01
SF-36					
		- 0.13	.50	**0.39**	.04
		0. 00	.99	*0.33*	.09

Abbreviations: ESSI = ENRICHD Social Support Inventory [18]; LSNS-6 = Lubben Social Network Scale [17]; r_s = Spearman's rank correlation coefficient; SF-36 = Questionnaire about health status [20], modified question about SF (6 and 9); SF-DEM = German version of the Social Functioning in Dementia Scale [2]; QoL-AD = Quality of Life in Alzheimer´s Diseases [19].

Bold print = significant on level 5%; *in italics* = significant on level 10%.