Dementia Recognition and Cognitive Performance in Relation to Elderly Patients' Social Integration

Demenzerkennung und kognitive Leistung in Abhängigkeit von der sozialen Integration älterer Patienten/innen

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Background: A German study on dementia (Ageing, Cognition and Dementia in Primary Care Patients, Age-CoDe) found that family practitioners (FPs) identify mild dementia less frequently in patients without a partner. The reasons for this are unknown. This article deals with two questions: 1) Does FPs' recognition of dementia relate to a patient's partner status in particular or to the overall social integration (partner, family/friends, social activities)? 2) Is the cognitive performance of a patient dependent on partner status and level of social integration (as a possible reason for differences in dementia recognition)?

Methods: Data from a subsample of the prospective cohort study AgeCoDe were explored. FP patients between 75 and 89 years of age were interviewed at home by researchers. The interview included cognitive testing and the application of the social integration index (SII) in questions about the patients' partner status, level of contact with friends and family members, and social activities. Diagnostic reference was constituted by the clinical dementia diagnosis based on interview results and consensus meetings with interviewers and experts. Independent of these clinical interviews, the participating patients' FPs completed a questionnaire about each patient, which included ratings on the patient's cognitive status and dementia (Global Deterioration Scale). Concordance between FP ratings and the reference diagnosis revealed sensitivity and specificity of the FP judgement for dementia recognition. To answer question 1), two multi-level analyses were carried out with the target variable of missed or overestimated dementia and the predictors of social integration/partner status, gender, education, and global cognitive performance. To answer question 2),

Hintergrund: Eine deutsche Demenzstudie (Ageing, Cognition and Dementia in Primary Care Patients, AgeCoDe) weist darauf hin, dass eine leichte Demenz bei Patienten/innen ohne Partner/in seltener von Hausärzten/innen erkannt wird. Woran das liegt, ist nicht bekannt. Im vorliegenden Artikel werden zwei Fragen bearbeitet: 1) Ist es wirklich speziell der Partnerstatus oder ist es eher die gesamte soziale Einbettung eines/r Patienten/in (Partner/in + Familie/Freunde + soziale Aktivitäten), die mit der hausärztlichen Demenzerkennung zusammenhängt? 2) Zeigen Patienten/innen je nach Partnerstatus und sozialer Einbettung Unterschiede in ihrer kognitiven Leistung (als möglicher Grund für die unterschiedliche Demenzerkennung)?

Methoden: Die Daten einer Teilstichprobe der prospektiven Kohortenstudie AgeCoDe wurden querschnittlich exploriert. Hausarztpatienten/innen zwischen 75 und 89 Jahren wurden mittels strukturierten Interviews inkl. kognitiver Testung in häuslicher Umgebung von Wissenschaftlern/innen untersucht und mit dem Social Integration Index (SII) zu Partnerstatus, Kontakt zu Freunden/Angehörigen und sozialen Aktivitäten befragt (soziale Einbettung). Diagnostische Referenz bildete die klinische Demenzdiagnose auf Basis der Interviewergebnisse und der Konsensussitzungen mit Interviewern/innen und Experten/innen. Unabhängig von den Interviews füllten die Hausärzte/innen der teilnehmenden Patienten/innen je einen Fragebogen pro Patient/in aus, in dem u.a. nach der Einschätzung des kognitiven Status und einer Demenz gefragt wurde (Global Deterioration Scale). Die Übereinstimmung zwischen Demenzdiagnose und hausärztlicher Einschätzung ergab die Werte für Sensitivität und Spezifität des Hausarzturteils hinsichtlich der Demenzerken-

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groups of patients with varied levels of social integration were compared with regard to several cognitive abilities, using bivariate group comparisons.

Results: A sample of 91 patients with incident dementia and a sample of 743 patients without dementia were analysed. 1) Partner status, but not overall social integration, is an independent predictor of FPs' dementia recognition. 2) Dementia patients without partner but with high level of social integration display inferior performance in tasks of verbal intellectual ability. In the non-dementia sample, those with high level of social integration and with partner show least depressiveness; patients with a partner display a lower level of everyday functionality.

Conclusions: It is specifically the partner status of a patient, rather than the overall social integration, that impacts FPs' ability to identify dementia. There is no indication that poor recognition can be explained by patients without partner being cognitively more intact. A resulting hypothesis is that the lack of diagnostic information from a partner can impede FPs' recognition of dementia. Consideration of partner status as a factor in FP dementia recognition and of verbal intellectual ability as a relevant cognitive domain may be helpful in any future research on FPs' diagnostic judgement and cognitive testing.

Keywords: cognition; family practice; diagnosis; spouses; social environment

nung. Zu Frage 1) wurden zwei Mehrebenenanalysen mit dem Kriterium übersehener bzw. überschätzter Demenz und den Prädiktoren sozialer Einbettung/Partnerstatus, Geschlecht, Bildung, globale kognitive Leistung durchgeführt. Zu Frage 2) wurden Patientengruppen in unterschiedlicher sozialer Einbettung mit bivariaten Gruppenvergleichen hinsichtlich mehrerer kognitiver Teilleistungen miteinander verglichen.

Ergebnisse: Eine Stichprobe von 91 Patienten/innen mit inzidenter Demenz und eine Stichprobe von 743 Patienten/innen ohne Demenz wurden analysiert. 1) Der Partnerstatus, nicht aber die generelle soziale Einbettung, ist unabhängiger Prädiktor der hausärztlichen Demenzerkennung. 2) Patienten/innen mit Demenz in hoher sozialer Einbettung, aber ohne Partner/in zeigen schlechtere Leistungen in sprachlich-intellektuellen Fähigkeiten. In der Stichprobe ohne Demenz zeigen diejenigen in guter sozialer Einbettung und mit Partner/in die geringste Depressivität, Patienten/innen mit Partner/in geringere Alltagsfunktionalität.

Schlussfolgerungen: Es ist speziell der Partnerstatus, nicht die gesamte soziale Einbettung, der die Demenzerkennung beeinflusst. Des Weiteren sprechen die Ergebnisse gegen ein kognitiv „intakteres" Bild von Patienten/innen ohne Partner/in als Erklärung für die geringere hausärztliche Demenzerkennung. Aus diesen beiden Ergebnissen lässt sich die Hypothese ableiten, dass dem Hausarzt/der Hausärztin bei Patienten/innen ohne Partner/in eventuell diagnostisch relevante fremdanamnestische Angaben vom Partner/von der Partnerin fehlen, wodurch die Demenzerkennung erschwert wird. Die Berücksichtigung des Partnerstatus als Einflussfaktor hausärztlicher Demenzerkennung sowie sprachlich-intellektueller Fähigkeiten als relevanter kognitiver Domäne könnten helfen, in zukünftiger Forschung sowohl das hausärztliche Urteil als auch diagnostische Instrumente zu verbessern.

Schlüsselwörter: Kognition; Allgemeinmedizin; Diagnose; Partnerschaft; soziale Integration

Background

Despite the benefits for physicians, patients and relatives [1] of early recognizing dementia, mild dementia is frequently overlooked in family medicine [2]. Current research priorities propose a more effective role played by family practitioners (FPs) in the diagnostic process [3]. Still, dementia recognition can be difficult due to disease characteristics (e.g. insidious onset), patients' intentions (e.g. denial, masking symptoms), or FPs' attitudinal barriers (e.g. nihilism regarding therapy and support) [4]. Furthermore, certain patient characteristics have been associated with a lower level of dementia recognition by FPs: in a previous analysis of the German Study on Ageing, Cognition and Dementia in Primary Care Patients (AgeCoDe), we found that having no partner was the only independent risk factor for missing incident dementia [5]. The reasons remain unclear, but primarily two assumptions arise: is it the lack of diagnostic information from a partner that makes it difficult for FPs to recognize dementia in patients without partner? Or do these dementia patients have a unique clinical presentation which could explain why FPs have difficulties identifying their dementia? The first assumption is supported by qualitative findings from FP interview studies [6]. The second assumption relates to reported associations between cognitive performance and social integration [7]. Considering both, we address the following research questions in this article: 1) Is it the patient's partner status in particular that impedes dementia recognition, or does partner status merely act as *pars pro toto* of the overall social integration construct [8]? 2) Does the cognitive performance of elderly FP patients vary in relation to their level of social integration?

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Construct	Instrument/Measure	Score/Categories	Role in analysis 1	Role in analysis 2
Assessments in structured patient interviews conducted by researchers				
Dementia diagnosis (diagnostic reference)	SIDAM: structured Interview for Diagnosis of Dementia of Alzheimer type, Multi-infarct Dementia, and Dementia of other Etiology according to the Diagnostic and Statistical Manual of Mental Disorders, 3rd Edition, Revised (DSM-III-R), Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV), and International Classification of Diseases, 10th Revision (ICD-10) [11]	Dementia vs. no dementia	Used to divide whole sample in 'dementia sample' and 'non-dementia sample'	
			Used for concordance measures (see below)	
Social integration	Social integration index [10]: three domains: partner status, contacts with friends and family, participation in social activities. For the presented analyses, partner status was omitted and analyzed as a separate variable.	Dichotomized: low vs. high social integration	Predictor	Independent variables (group definition)
Partner status	Direct question on having a partner or not	With partner vs. without partner	Predictor	
Sex	–	Male vs. female	Predictor	-
Education	CASMIN classification (Comparative Analysis of Social Mobility in Industrial Nations) [12]	Low vs. mediate vs. high level	Predictor	-
Global cognition	Mini Mental State Examination (MMSE) [13]	Score 0–30	Predictor	Dependent variable
Memory	CERAD (test battery of the Consortium to Establish a Registry for Alzheimer's Disease): composite score on immediate and delayed word list recall and recognition [14]	Score 0–50	–	Dependent variable
Verbal fluency	CERAD task 1-minute animal naming [14]	Number of named animals	–	Dependent variable
Orientation	SIDAM subscale [11]	Score 0–10	–	Dependent variable
Verbal intellectual abilities	SIDAM subscale (explaining, judging) [11]	Score 0–5	–	Dependent variable
Depressiveness	Geriatric depression scale [15]	Score 0–15	–	Dependent variable
Subjective memory impairment	Five questions on patient's subjectively perceived memory problems [16]	Score 0–10	–	Dependent variable
Everyday functionality	Lawton's Instrumental Activities of Daily Living (IADL) scale [17]	Score 0–8	–	Dependent variable
Pre-dementia change	Differences in 8 scores listed above between time of incident dementia and assessment prior to incident dementia	Differences in scores, negative = decline, positive = increase	–	Dependent variable in dementia sample
Family practitioners' ratings, assessed in FP questionnaires about each participating patient (independent from research interviews)				
Dementia rating of FP (index test)	Global Deterioration Scale (GDS) [18]: FP's clinical judgement on a patient's cognitive status	Categories 0–7 with increasing level of cognitive deterioration; categories 0–3 indicating an FP rating of no dementia vs. 4–7 indicating an FP rating of dementia	Used for concordance measures (see below)	–
Measures of concordance				
Sensitivity of FPs in dementia case-finding	Proportion FP 'dementia' ratings of all dementia cases	Percentage of dementia patients recognized by FPs	Criterion in dementia sample	–
Specificity of FPs in ruling out dementia	Proportion FP 'no dementia' ratings of all non-dementia cases	Percentage of non-dementia patients correctly ruled out by FPs	Criterion in non-dementia sample	–

Table 1 Assessment procedures

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Characteristic	Incident dementia sample (patients from 36 FP practices)					Non-dementia sample (patients from 65 FP practices)				
	total	low SII, no partner	low SII, with partner	high SII, no partner	high SII, with partner	total	low SII, no partner	low SII, with partner	high SII, no partner	high SII, with partner
n	91	28	17	27	19	743	152	143	272	176
Age* (mean, SD)	84.14 (4.47)	85.64 (4.42)	83.24 (4.02)	84.81 (5.10)	81.79 (2.82)	82.41 (3.45)	83.53 (3.84)	81.85 (3.07)	82.84 (3.58)	81.23 (2.70)
Gender (% women)	67.0	85.7	47.1	85.2	31.6	67.4	84.9	44.8	88.2	38.6
Education (% low level)	65.9	75.0	47.1	77.8	52.6	62.0	70.4	58.7	64.3	54.0
*For incident dementia sample: age at time of incident dementia; for non-dementia sample: age at time of FU2 assessment										

Table 2 Characteristics of dementia and non-dementia samples according to social integration (SII) and partner status

Methods

This paper presents a cross-sectional explorative analysis of elderly German family medicine patients, performed in a subsample of the prospective AgeCoDe cohort study (which has been described in various reports, e.g. [9]).

Sample

Participants were recruited from FP practices in two German study centers. Inclusion criteria were age 75 to 89 and at least one contact with an FP within the past 12 months. Individuals were excluded in case of dementia at baseline, home visit-only consultations, residence in a nursing home, any potentially fatal illness, insufficient German language proficiency, deafness or blindness, inability to provide consent, and not being a regular patient of the participating practice.

Assessments

Structured interviews were conducted by psychologists and trained physicians during visits to participants' homes at all assessments. Follow-up assessments (FU) were scheduled at 18-month intervals; data from four assessments were included in the presented analyses (baseline, FU1, FU2, FU3). Interviews included psychometric testing, clinical anamnesis, and sociodemographic data. All assessments and their function in analyses are detailed in table 1. The social integration index SII [10] was assessed

at baseline in all patients of the Leipzig and Düsseldorf study centers. Clinical dementia diagnosis was based on the SIDAM (Structured Interview for Diagnosis of Dementia of Alzheimer type) [11]: international criteria for dementia are comprised in a diagnostic algorithm by assessing cognitive performance and activities of daily living, including an informant interview in suspected dementia cases. All diagnoses were discussed in consensus conferences with the interviewers and experienced geriatric psychiatrists or geriatricians. Independent from patient interviews by the researchers, FPs filled in questionnaires about each of their participating patients regarding a variety of clinical judgements and information.

	df	Risk estimates[1] for incident dementia being missed by FPs (n = 58) (false negative)		Risk estimates[2] for dementia being overestimated by FPs in non-dementia cases (n = 709) (false positive)	
		Odds ratio (95 % CI)	p	Odds ratio (95 % CI)	p
Being without partner (vs. with partner)	1	4.52 (1.06; 19.21)	.041	1.38 (0.42; 4.60)	.598
SII low (vs. high)	1	0.97 (0.15; 6.32)	.971	1.31 (0.35; 4.94)	.695
Partner x SII (interaction term)	1	0.85 (0.08; 9.04)	.889	0.67 (0.11; 4.01)	.662
Female gender (vs. male)	1	2.86 (0.65; 12.54)	.164	1.12 (0.47; 2.62)	.804
Educational level mediate/high (vs. low)	1	2.70 (0.81; 9.09)	.105	1.54 (0.81; 2.94)	.188
Global cognition (higher MMSE score)	1	0.95 (0.80; 1.12)	.530	0.69 (0.54; 0.88)	.003

[1] reference category: dementia correctly recognized by FP (GDS > 3), odds = risk for missed dementia
[2] reference category: dementia correctly ruled out by FP (GDS < 4), odds = risk for dementia being overestimated
SII, social integration index
MMSE, mini mental state examination

Table 3 Factors of FPs' sensitivity and specificity for incident dementia recognition and rule-out (generalized estimating equation models, adjusted for cluster effect of FP practice)
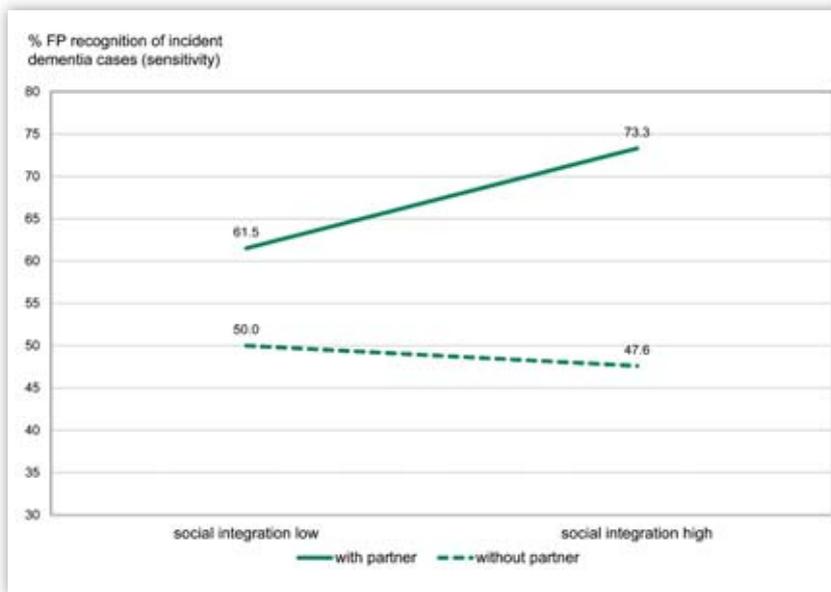
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Figure 1 Percentage of FPs' correct positive judgements among incident dementia cases

Statistics

An 'incident dementia sample' (dementia first diagnosed in FU1 or FU2 or FU3) and a 'non-dementia sample' (results from FU2 of patients with no dementia up to FU3) were analyzed separately.

1. Dementia recognition: Partner status was analyzed as a separate predictor and as part of social integration (interaction term SII x partner status). Independent predictors of FPs' sensitivity and specificity (see table 1) were analyzed by multivariate generalized estimating equation models (binary logistic, logit link), adjusting for a cluster effect of FP practices. The number of predictors was restricted to six [19].

2. Cognitive performance: In the dementia sample, cognitive performance at the onset of incident dementia and cognitive decline were analyzed. The latter was operationalized as difference between test scores at dementia onset and test scores at the assessment prior to dementia (18 months before dementia diagnosis). In the non-dementia sample, cognitive performance in FU2 was analyzed. Using non-parametric bivariate Kruskal-Wallis tests, we compared four groups of 'social integration x partner' combinations with regard to the independent variables listed in table 1. The groups

were: A) 'low social integration, no partner'; B) 'low social integration, with partner'; C) 'high social integration, no partner'; D) 'high social integration, with partner'. The sample-size independent effect size measure Cohen's d was derived from Kruskal-Wallis H (for overall effects) and Mann-Whitney U (for pairwise effects) according to published procedures [20]. We focused on robust effect sizes with $d \geq 0.50$ [21].

Results

Sample

The dementia sample consisted of 91 patients with incident dementia (29 FU1, 27 FU2, 35 FU3), the non-dementia sample consisted of 743 patients from follow-up 2. Participating physicians were 65 FPs from Leipzig and Düsseldorf, working in separate practices (38 male, 27 female; mean age 48.75 (SD 6.90); mean years in practice 12.52 (SD 6.36)).

Table 2 shows that patient groups with partner were characterized by younger age, more men and higher education level.

Multivariate analyses in the two samples were performed with 58 and 709 patients with complete data (see eTable 1). The required number of clusters [22] was achieved in both samples.

Dementia recognition

Figure 1 shows FPs' sensitivity for incident dementia, with an obvious main effect of partner status.

Analysis 1 (table 3) reveals partner status (as a separate variable, not as part of social integration) as the only significant independent predictor of FP dementia recognition (worse sensitivity in patients without partner). Global cognition was the only significant independent predictor of FPs correctly ruling out dementia (better specificity with higher test scores).

Including additional predictors (not shown) did not modify these patterns of results.

Cognitive performance patterns

Within the dementia sample, the only significant and most robust overall effect was a clear difference in the SIDAM subscale 'verbal intellectual abilities' at the time of dementia onset (Cohen's d = 0.61; p = .041): dementia patients with high social integration but without partner showed considerably worse verbal intellectual performance than the other three groups (strong post-hoc effects with $d \geq 0.80$). This and some other moderate effects (incl. worse orientation and steeper pre-dementia cognitive decline) identified this patient group as being unique in its kind of cognitive presentation. No relevant overall effect sizes (d < 0.50) existed for global cognition, memory, depressiveness, and subjective memory impairment.

The profiles in the non-dementia sample showed two clear differences regarding depressiveness and IADL (Instrumental Activities of Daily Living) (d = 0.53 and d = 1.10, respectively, both p < .001): least depressiveness in patients with high social integration with partner, and less IADL functioning in both patient groups with partner compared to both patient groups without partner. None of the cognitive parameters differed substantially between groups (d < 0.50).

Details on group comparisons are shown in the eTables 2 and 3 (see www.online-zfa.de/).

Discussion

Taken together, our results support the hypothesis that a partner living with the

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patient is a major case-finding resource for FPs and that living alone is a risk factor for missed dementia. This corresponds to the relevance FPs assign to relatives in the diagnostic process [6].

Incident dementia was less likely to be recognized by FPs in patients without a partner, irrespective of their overall social integration. FPs' ability to rule out dementia was not related to a patient's level of social integration and partner status.

We did not find that cognitive performance was better in dementia patients without partner. Therefore, a well-preserved appearance of cognitive competence becomes less plausible as a reason for poor sensitivity. Quite the contrary, dementia patients who are socially integrated but live without a partner showed a unique cognitive profile with poorer verbal intellectual abilities and a steeper pre-dementia cognitive decline.

We found no differences in the awareness of deficits (subjective memory impairment, SMI) between patients with a partner and those without. It is possible, however, that the deficits in dementia patients who lived without a partner were less likely to be reported to the FP, thus making recognition more difficult. We did not collect data on this. Levels of depressiveness did not vary between groups.

In accordance with previous research, patients who had a high level of social integration in our non-dementia sample showed the lowest level of depressiveness [23]. Superior everyday functioning (IADL) in patients without partner stood in contrast to earlier studies (e.g. [24]). This might be due to the higher percentage of women among patients without partner as well as the exclusively urban patient sample of the AgeCoDe study (meaning better access to social contacts and activities than in rural communities, constituting and preserving IADL in people living alone).

There are some limitations to our study: the social integration index was only assessed at baseline, and changes could not be taken into account. On the other hand, social networks in old age have been reported to be stable, though not in all aspects [25]. The social integration index is a rather rough measure of a structural social support component. More differentiated aspects of social support may also be of interest in this context [26]. Confounders of social support and its effects on cognition have not been assessed [27].

Among the strengths of the study are the focus on incident dementia cases and a valid and reliable reference of dementia diagnosis. We applied robust statistical methods that consider the cluster effects of FP practice and allow for a careful interpretation of explorative analyses. We did not reduce cognition to global mental status, but analyzed various cognitive domains.

Conclusions

Dementia recognition should be improved by focusing on patients without partner, due to their special needs and increased risks (e.g. malnutrition, social isolation) [28]. Further investigations are required to understand why poor verbal intellectual abilities and a steeper cognitive decline constitute the cognitive profile of dementia patients with high social integration without partner.

Despite their obvious diagnostic relevance, informant reports and scales [29] should be evaluated not only for validity, but also in terms of patient-centered handling. The development of valid questions concerning subjective cognitive complaints, specifically for patients living alone, may enhance the diagnostic relevance of patient reports in dementia recognition. Furthermore, current dementia tests have a strong focus on orientation and types of memory [30]. It would be interesting to see if items on verbal intellectual abilities can improve sensitivity in patients without partner.

Funding

Members of the AgeCoDe Study Group

Principal Investigators: Wolfgang Maier, Martin Scherer, (2002–2011: Hendrik van den Bussche)

Heinz-Harald Abholz, Christian Brettschneider, Cadja Bachmann, Horst Bickel, Wolfgang Blank, Hendrik van den Bussche, Sandra Eifflaender-Gorfer, Marion Eisele, Annette Ernst, Angela Fuchs, André Hajek, Kathrin Heser, Frank Jessen, Hanna Kaduszkiewicz, Teresa Kaufeler, Mirjam Köhler, Hans-Helmut König, Alexander Koppara, Diana Lubisch, Tobias Luck, Dagmar Lühmann, Melanie Luppa, Tina Mallon, Manfred Mayer, Edelgard Mösch, Michael Pentzek, Jana Prokein, Steffi G. Riedel-Heller, Susanne Röhr, Anna Schumacher, Janine Stein, Susanne Steinmann, Franziska Tebarth, Carolin van der Leeden, Michael Wagner, Klaus Weckbecker, Dagmar Weeg, Jochen Werle, Siegfried Weyerer, Birgitt Wiese, Steffen Wolfsgruber, Thomas Zimmermann.

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sample of oldest-old primary care patients (85+; AgeQualiDe)) that was also funded by the German Federal Ministry of Education and Research (grants: 01GY1322A, 01GY1322B, 01GY1322C, 01GY1322F, 01GY1322G).

Ethical approval

Ethical approval was obtained from the following study centers: Ethics Commission of the Medical Faculty of the Heinrich Heine University Düsseldorf 2079/2002, 2999/2008; Ethics Commission of the Medical Association Hamburg OB/08/02, 2817/2007; Ethics Commission of the University of Bonn 050/02, 258/07; Ethics Commission at the Medical Center of the University of Leipzig 143/2002, 309/2007. All partici-

pants gave written informed consent before taking part.

Conflicts of interest: None of the authors report relevant conflicts of interest.

Supplementary material available at: www.online-zfa.de

eTable 1 Characteristics of patients in generalized estimating equation analysis samples (with complete data on dependent and independent variables)

eTable 2 Cognitive profile by social integration/partner status in patients with incident dementia (detailed results of bivariate group comparisons)

eTable 3 Cognitive profile by social integration/partner status in patients without dementia (detailed results of bivariate group comparisons)

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