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FEATURED ARTICLE

Feasibility of a standard cognitive assessment in European academic memory clinics

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Collaborators (see Appendix in Supplementary Material)

Abstract

Introduction: Standardized cognitive assessment would enhance diagnostic reliability across memory clinics. An expert consensus adapted the Uniform Dataset (UDS)-3 for European centers, the clinician's UDS (cUDS). This study assessed its implementation acceptability and feasibility.

Methods: We developed a survey investigating barriers, facilitators, and willingness to implement the cUDS. With a mixed-methods design, we analyzed data from academic memory clinics.

Results: Seventy-eight percent of responding clinicians were experienced neuropsychologists/psychologists and 22% were medical specialists coming from 18 European countries. Sixty-five percent clinicians were willing to implement cUDS. General barriers related to implementation (43%) and clinical-methodological domains (21%). Favorable clinicians reported finances (15%) and digitalization (9%) as facilitating, but unavailability of local norms (23%) as hindering. Unfavorable clinicians reported logistical (23%) and time issues (18%).

Discussion: Despite challenges, data showed moderate clinicians' acceptability and requirements to improve feasibility. Nonetheless, these results come from academic clinicians. The next steps will require feasibility evaluation in non-academic contexts.

KEYWORDS
Alzheimer's disease, implementation feasibility, mild cognitive impairment, mixed-methods, standard cognitive assessment

1 | INTRODUCTION

The detection and timely diagnosis of Alzheimer's disease (AD) and related neurodegenerative pathologies is a global priority.[1] The first step of the diagnostic process is to ascertain cognitive deterioration in patients referring to specialty centers.[2] Currently, this assessment is not standardized across European academic memory clinics.[3,4] A wide range of diagnostic tools is available both, in digital and paper and pencil versions.[4] However, the lack of standardization leads to inconsistent diagnosis.[3,5] Exceptions are German speaking-countries which widely implemented the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) – Neuropsychological Battery (NAB) owing in large measure to the availability of local norms.[6] Recently, a consensus adapted the third version of the National Alzheimer's Coordinating Center Uniform Dataset (NACC UDS-3),[7] the most used research battery, for European memory clinics: the clinician's Uniform Dataset (cUDS).[2] The cUDS will overcome the issues of data variance by providing standard definition of the clinical disorder, tools and procedures.[2,4] The selection of the cognitive domains and tests to detect mild cognitive impairment (MCI) due to different etiologies was based on experts' opinion,[2] the Diagnostic Statistical Manual for Mental Disorders-5th version (DSM-5)'s criteria,[8] and the extensive work performed to validate UDS-3.[7] The final battery consisted of eight cognitive tests: Montreal Cognitive Assessment (MoCA), Digit Span forward-backward; Free and Cued Selective Reminding Test (FCSRT); Trail Making Test (A-B); Story-based Empathy Task (SET); Benson Figure (immediate and delayed recall); Category and Letter Fluency tests; Boston Naming Test, for an estimated administration duration of 60 to 65 min[2] (Section S1).

Standardization will improve the diagnostic reliability and allow patients to request follow-up assessments or second opinions without repeating the same baseline tests and regardless of their location, as is already the case with blood tests.[2] Aligning clinical practice with research procedures allows diagnostic biomarkers and treatments to be recommended according to their demonstrated informative or therapeutic value, and consistently across centers.[2,4,9] At the research level, it facilitates data pooling, cross-study comparisons, and the selection of more homogeneous patients, reducing variability.[2,4,10] The added-value extends also to practical and logistical advantages of increased time efficiency in clinical routine,[11–13] as well as long-term economic benefits for the health-care systems (e.g., saving unnecessary duplicated efforts).[2,14] Based on such benefits, other standardization initiatives are currently ongoing worldwide.[15,16]

The implementation of novel standardized procedures in medical settings requires changing long-established clinical routines, which is often perceived as a challenge.[13,17–19] This is due to a wide variety of factors that can hinder the translation of sound research findings into clinical practice.[20–22] The evaluation of feasibility and acceptability is a necessary step to ensure a successful implementation in medical settings.[18] Within a proposed implementation strategy (Figure 1), we aimed at assessing the feasibility and acceptability of cUDS implementation in European academic memory clinics. Specific objectives entailed (i) the identification of general barriers and facilitators related to the feasibility of cUDS implementation; (ii) the assessment of clinicians' willingness (or acceptability) to implement as well as related causal mechanisms/mediators; (iii) the identification of barriers specific to clinicians willing or unwilling to implement; and (iv) the identification of concrete next steps to overcome the identified barriers and to proceed in the analysis with the piloting-feasibility phase.

We used the methodological framework Process Evaluation (PE), typically used to evaluate processes and outcomes of complex medical interventions,[18,23] also in the dementia field,[24,25] to guide our analysis of feasibility. PE uses mixed-methods designs to capture information based on both theoretical assumptions and unbiased information from the context.[18,26]

2 | METHODS

We sent a survey to clinicians of the European Alzheimer's disease Consortium (EADC), a network of academic memory clinics of excellence established in 2001. EADC centers performing clinical diagnosis ($N = 72$) are located in 18/27 European Union countries (EU) (Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Portugal, Romania, Slovenia, Spain, and Sweden) and 4 non-EU countries (Serbia, Switzerland, United Kingdom, and Turkey).[27]

2.1 | Survey definition

We designed a survey questionnaire in collaboration with EADC and the International Society to Advance Alzheimer's Research and Treatment (ISTAART), which supports the standardization of cognitive assessment by convening the opinion of experts through the Cognition Professional Interest area (PIA) (https://tinyurl.com/yr8evcwa). We defined 33 questions (e.g., closed, multiple choice, and open answers) in collaboration with EADC and ISTAART members and then reduced the number of items to facilitate participation (Table S1). For

a detailed description of the survey development, see Supplementary Methodology Section 2.

2.2 | Data collection

We invited clinicians in charge of patients' assessment from the 72 eligible EADC memory clinics (e.g., neuropsychologists, geriatricians, neurologists, or psychiatrists) to answer the survey online over a 3-month period (September-December, 2020). We sent the questionnaire to the EADC network via email indicating the estimated time of completion (15 min). The clinicians included in the mailing list were officially registered as EADC referents for the year 2020 and invited to forward the survey to the practitioner in their center. To facilitate completion, we provided an electronic copy of the survey (pdf) in advance.

2.3 | Data analysis

According to our mixed-methods design, we initially performed quantitative and qualitative analysis separately and then interrelated the results on feasibility and acceptability (Figure S1).[28] We calculated response rates over the total eligible EADC centers ($N = 72$)[27] and computed services profiling, barriers and facilitators on the overall responses, even if independent clinicians belonged to the same center. We performed descriptive statistics using the software R Studio (RStudio Team, 2020). For the qualitative analysis, we developed a coding scheme based on a deductive approach and our research questions identifying four a priori domains for the classification of barriers and facilitators.[17] We divided the domains into: "clinical-methodological" (e.g., clinical-psychometric characteristics of the tests, such as local norms, appropriate selection of tests to include), "implementation process" (e.g., logistics/time), "external" (e.g., cultural-economic factors), and "unclear/none" (Methodology Section 3, Figure S2). We performed qualitative content-analysis on clinicians' open answers ($N = 51/51$)[29,30] with the software MAXQDA2022 (VERBI Software, 2021). For the coding of categories, we used both inductive and deductive analysis approaches to capture the unexpected meaning of responses while taking into account theoretical considerations,[26] assigning at least one code to each clinicians' answer. To assess the reliability of the coding, we calculated the intercoder reliability (ICR), which showed an agreement between raters of 54%, with $\kappa = .51$, equivalent to a moderate level of agreement. We considered the answer to the question "Would you use the 1-h cUDS as a standard battery to assess MCI patients in your center?" as a proxy of acceptability, and

RESEARCH INTO CONTEXT

1. **Systematic Review**: We reviewed the literature on previous standardization initiatives for cognitive assessment and implementation methodologies to assess its feasibility and acceptability in dementia healthcare. Previous initiatives have been conducted in the United States, leading to standardization across research centers. Nonetheless, the evaluation of feasibility and acceptability of a European standard for cognitive assessment of mild cognitive impairment has not yet been performed.
2. **Interpretation**: Evaluation of barriers and facilitators to implementation is a well-established practice in the field of dementia care, but less in the biomedical field. Only by analyzing these underlying mechanisms hindering and facilitating diagnostics we can implement clinical innovation effectively.
3. **Future Directions**: An effective implementation strategy should include the assessment of feasibility in non-academic clinics, and a pilot study assessing fidelity, namely the ability of the diagnostic intervention to reach the targeted end-users and to adapt to the contextual factors of implementation.

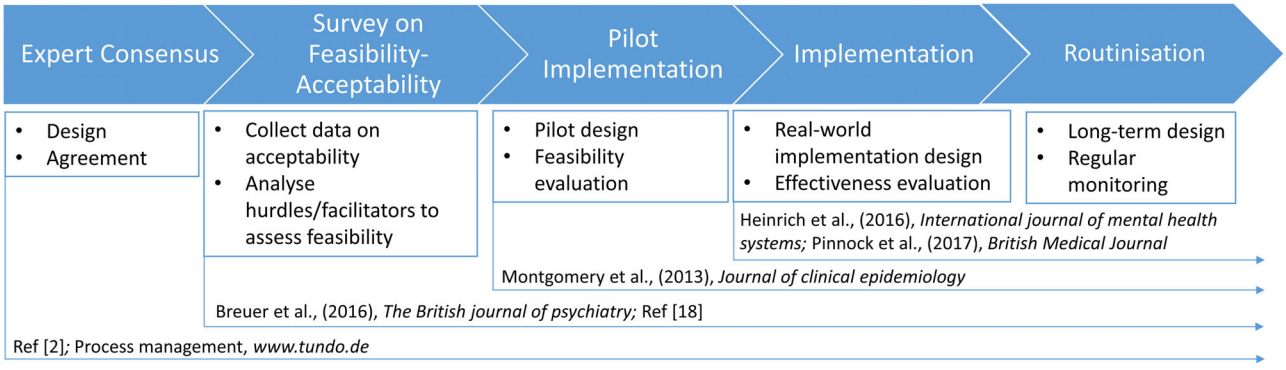

FIGURE 1 Roadmap of implementation. The figure shows the steps required for effective implementation, from the initial consensus definition of the standard battery cUDS at the Geneva workshop in 2018, the survey investigating cUDS hurdles and facilitators to the implementation in memory clinics and clinicians acceptability (current status of our work), to the piloting stage (small-scale implementation) and the evaluation of effectiveness of real-world implementation (large-scale implementation), until the intervention reaches routinization in the health-care system. For each of these steps, specific methodological frameworks can support the design of the implementation strategy.

used it to stratify the analysis of barriers and facilitators, setting a threshold of optimal acceptance at 80%.[3,31] We then applied logistic regressions to test the relation between independent variables like economic reimbursement and acceptability of cUDS.

3 | RESULTS

3.1 | Geographical distribution of EADC responding centers in Europe

Centers participating in the survey were coming from 16 out of the 18 EU countries (all except Bulgaria and Ireland) and 2 out of the 4 non-EU countries (Switzerland and United Kingdom) represented in EADC[31] (Figure S3). Although we did not detect statistical differences in the proportion of response rates between EU and non-EU regions represented in EADC, we observed higher rates in: Western European regions, 69% [(EU: Belgium, Germany, Netherlands, France; non-EU: Switzerland (22/32)]; Southern European regions, 67% [(EU: Greece, Italy, Portugal, Spain (12/18)]; followed by Eastern European regions, 55% [EU: Croatia, Czech Republic, Poland, Romania, Slovenia (5/9)], and Northern European regions, 54% [(EU: Denmark, Finland, Sweden (4/5); non-EU: United Kingdom (3/8)] (Figure S3).

3.2 | Responding EADC clinician and center profiles

Of the 72 eligible EADC centers, 46 (64%) provided a response and 26 (36%) did not provide a response to the survey (Figure S2). Responding clinicians were mainly neuropsychologists/ psychologists (78%), neurologists (10%), medical residents (6%), psychiatrists-psychotherapists (4%), and gerontologists (2%) with an average of 16 years of experience (range: 2 to 35 years, MED = 16, IQR = 11) in the clinical field. EADC centers head of departments had 25 years of experience (range: 10 to 39, MED = 25, IQR = 10). Some clinicians answered from the same centers (8 from 5 centers in Spain, 4 from 2 centers in Greece), for a total of 51 respondents. Most clinics were specialized in neurodegenerative disorders, and their patients most frequently diagnosed with MCI and dementia (Table 1). The majority of clinicians (96%) declared to use formal definitions for the diagnosis of MCI, although these were heterogeneous (Table 1). Half of the cUDS tests (4/8) were already frequently used, particularly the fluency tests (Table S2). Unavailable tests (e.g., Multilingual Naming Test used in the U.S.) had local equivalent tests examining the same function with appropriate local norms (e.g., Boston Naming Test) (Table S2). The surveyed EADC centers had also requests for foreign patients' assessment in 88% of cases.

3.3 | General barriers and facilitators to the cUDS implementation

Figure 2A and S4.A shows barriers envisioned by clinicians to implement the cUDS in their clinical context. Up to 64% of the hurdles relate to the implementation process (43%) and clinical-methodological (21%) domains, consisting mainly of logistical issues (13%) and unavailability of local norms (12%). External factors (20%) seemed to influence minimally, with 8% reporting low financial resources (for the extensive comments, please refer to Table S3.A). Figure 2B and S4.B indicates facilitating factors according to clinicians. Sixty-two percent of answers reported facilitators within the clinical-methodological (30%) and external (32%) domains. Among external facilitators, higher financial resources (10%) and evidence of cUDS clinical superiority (10%) were identified. Regarding the implementation process domain (21%), clinicians would expect to benefit mainly from digitalized assessment (7%) and greater availability of neuropsychologists training-expertise (6%) (Table S3.C).

3.4 | Willingness to implement the cUDS and economic reimbursement in EADC memory clinics

A moderate proportion of clinicians (65%) reported acceptability toward cUDS implementation. Clinicians in Northern European regions showed acceptability rates at 86%, Eastern European regions at 80%, Western European regions at 60%, and Southern European regions at 56%. According to EADC clinicians, time for cognitive assessment is highly covered by the insurance or health-care system in their centers. Indeed, 71% of respondents reported to receiving medium (61% to 95%) to high (96% to 100%) levels of reimbursement (Figure S5). Only 29% of clinicians reported receiving a low-medium (0% to 60%) level of reimbursement for assessment. Logistic regression showed no significant influence of the levels of economic reimbursement on clinicians' willingness to use the cUDS ($p = 0.72$).

3.4.1 | Clinicians willing to implement

Barriers for clinicians willing to implement the cUDS ($N = 33$) were identified as primarily related to clinical-methodological issues, such as the unavailability of local norms (23%). Concerning implementation, we identified logistical (18%) and time-management obstacles (18%), as well as limited compatibility with existing datasets (15%) (Figures 3A, S6.A). The analysis of factors facilitating site implementation confirmed the importance of local norms (21%), tests/material availability (6%), as well as financial resources (15%) (Figures 3B, S6.B). We report an example below:

> "*Importance to specify the version and instruction of the free and cued recall task and immediate and delayed recall of the Rey figure; development of parallel versions; use of alternative version when appropriate norms are not available […]*" (ID:49, Table S3.D).

Interestingly, clinicians in countries with no previous local standard (e.g., Portugal) identified mainly clinical-methodological barriers, such as the unavailability of tests material, while clinicians in countries

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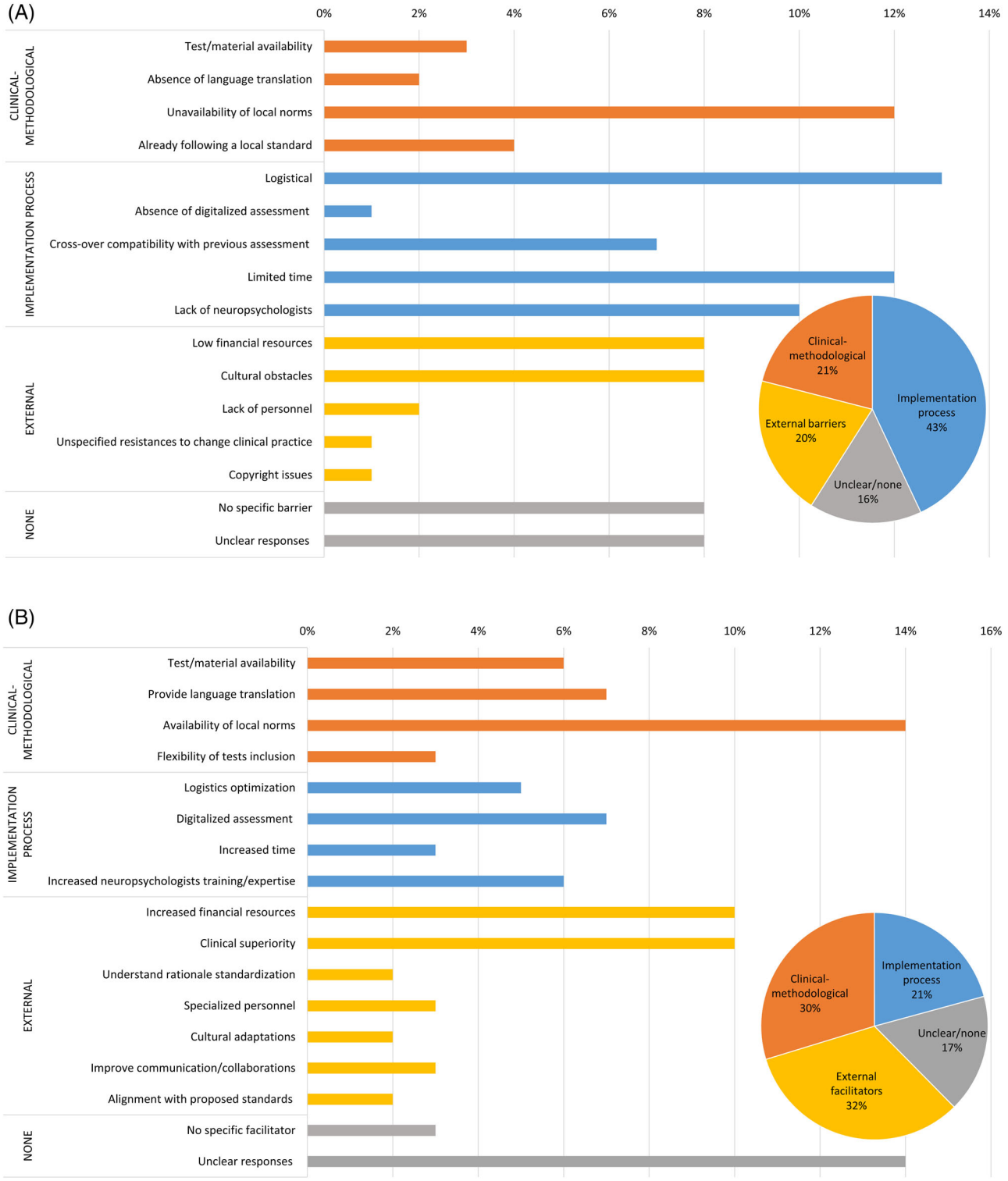

FIGURE 2 Barriers and facilitators to implement the cUDS in academic settings. Based on content-analysis, barriers (A) and facilitators (B) were grouped into four main domains: clinical-methodological, implementation process, external, and unclear/none. Open responses were provided by 51 of the 51 survey responders for both barriers and facilitators. Numbers in the bars represent the responses' frequency percentage calculated for each coded category. For space and illustrative purposes, the displayed range is between 0% and 16%. For the display of the full range percentage (0% to 100%), please refer to Figure S4 of the Supplementary Material.

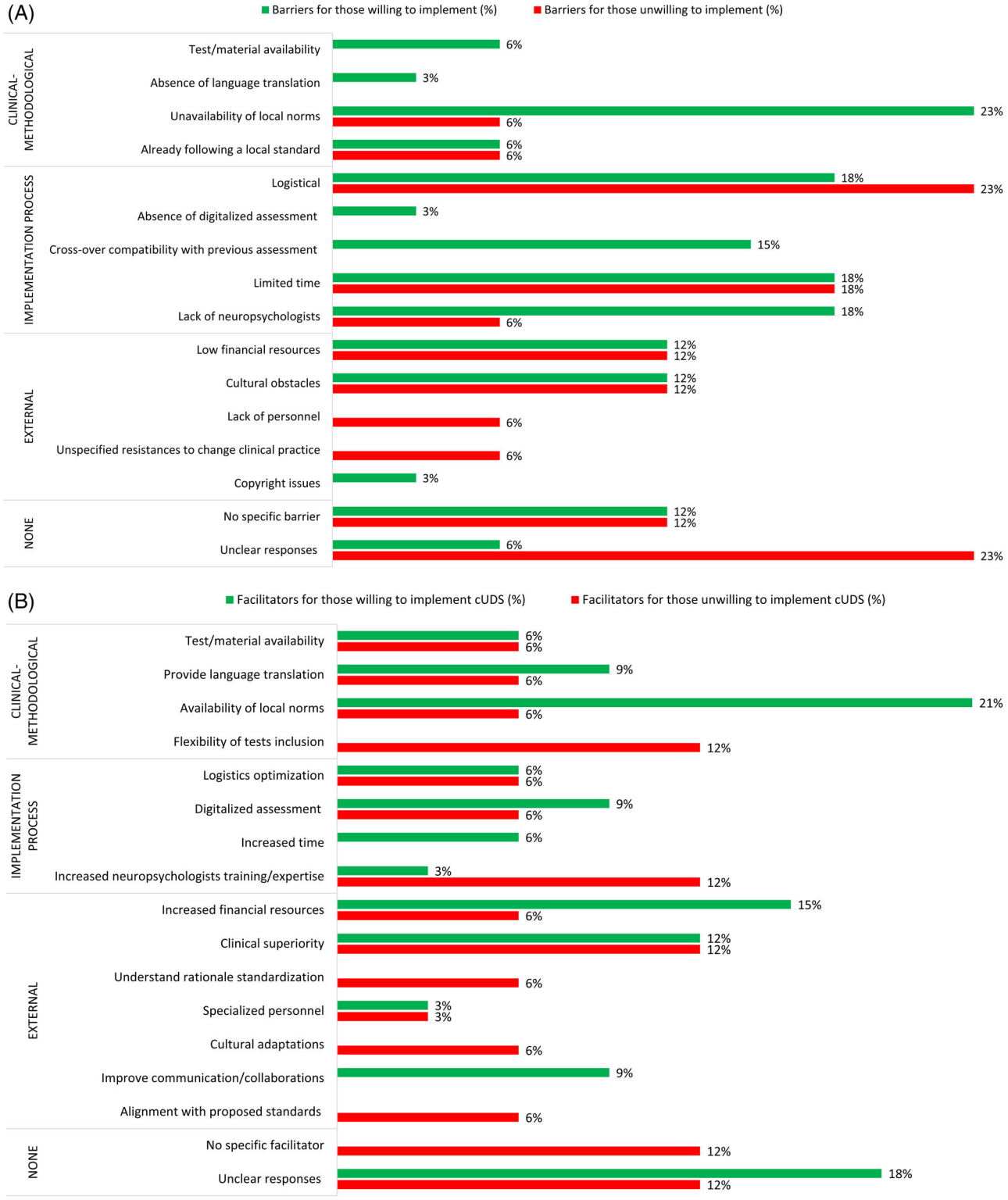

FIGURE 3 Barriers and facilitators by willingness to implement the cUDS. In the (A) and (B) charts, the y axis reports barriers' or facilitators' labels clustered according to three main domains: clinical-methodological, implementation process and external factors, for clinicians willing (green, $N = 33$) and those unwilling (red, $N = 18$) to implement the cUDS. Numbers in the bars represent the responses' frequency percentage calculated for each coded category. For space and illustrative purposes, the displayed range is between 0% and 25%. For the display of the full range percentage (0% to 100%) please refer to Figure S6 of the Supplementary Material.

TABLE 1 Respondents' profiling

Centers information						**Median, interquartile range**
Years of practice, head of department						25, 10
Years of practice, neuropsychologist						16, 11
Centers main specialization						**N (%)**
Neurodegenerative disorders (memory clinic)						46 (90)
Psychiatry						1 (2)
Tertiary hospital						3 (6)
Services offered by the centers						**N (%)**
Neurology						43 (84)
Psychology						40 (78)
Psychiatry						32 (63)
Geriatrics						31 (61)
						Median, interquartile range
Number of new patients/year						500, 550
Cognitive assessment length (minutes)						90, 60
Patients severity stage	**N (%)**					
Assessment frequency	**< 4 %**	**4%-30 %**	**31%-60 %**	**61%-95 %**	**96%-100 %**	
Subjective cognitive decline	10 (20)	37 (72)	4 (8)	0 (0)	0 (0)	
Mild cognitive impairment	1 (2)	21 (41)	26 (51)	3 (6)	0 (0)	
Dementia	1 (2)	12 (23)	31 (61)	7 (14)	0 (0)	
Other*	30 (59)	20 (39)	1 (2)	0 (0)	0 (0)	
Use of formal definition to diagnose mild cognitive impairment	**49 (96)**					
Assessment frequency	**< 4 %**	**5%-30 %**	**31%-60 %**	**61%-95 %**	**96%-100 %**	**Unanswered**
Winblad et al. (2004)	34 (67)	5 (10)	0 (0)	3 (6)	7 (14)	0 (0)
Albert et al. (2011)	14 (27)	4 (8)	9 (18)	10 (19)	12 (23)	2 (4)
Petersen et al. (2018)	21 (41)	3 (6)	10 (19)	5 (10)	10 (20)	2 (4)
APA (2013)	40 (78)	3 (6)	1 (2)	3 (6)	2 (4)	2 (4)

Note: Numbers denote median, interquartile range (IQR) values, and frequency ranges of the main features of the services offered by the EADC memory clinics according to respondent clinicians.
*Of the 19 clinicians that provided an open comment when responding "other" than neurocognitive disorders, 63% reported to diagnose psychiatric disorders (mostly depression). In total, 51 clinicians responded from 46 EADC centers.

having already a local standard (e.g., Germany) reported logistical-organizational issues.

3.4.2 | Clinicians unwilling to implement

Figure 3A shows that clinicians not willing to implement the cUDS (*N* = 18) were mainly concerned about logistics (23%), time (18%), and cultural obstacles (12%). For instance:

> "*Difficulty to add more tasks in our existing protocol (90 min) and difficulty to follow same order of the tasks within the protocol*" (ID: 49, Table S3.B).

They reported as main factors facilitating use the demonstrated evidence of cUDS clinical superiority (12%), flexibility of tests inclusion (12%), training and/or availability of experienced neuropsychologists (12%) (Figure 3B). Twenty-three percent reported unclear statements concerning hurdles. To this regard, clarifications on reasons for disagreement by unwilling clinicians (N = 16/18) mostly related to limited time and the use of local standards (Table S3.B). Other reasons were the perceived need of individualized cognitive assessment and the lack of compatibility with existing datasets based on local tests (Table S3.B). An example is:

> *"We prefer to use a specific battery tailored for each patient"* (ID: 19, Table S3.B).

In the case of Germany, skepticism was mostly related to the need of scientifically proven cUDS higher diagnostic performance compared to cognitive assessment as usual:

> "*The CERAD-NAB we use is easy to administer and has norm values in the German language. If we change our test battery, there is not any more a comparability with the patients we assessed with the CERAD until then*" (ID: 14, Table S3.B).

Nonetheless, 43% of clinicians ($N = 22/51$) mentioned as additional feedback the need of improved communication and collaboration with stakeholders at the European level (Table S3.D).

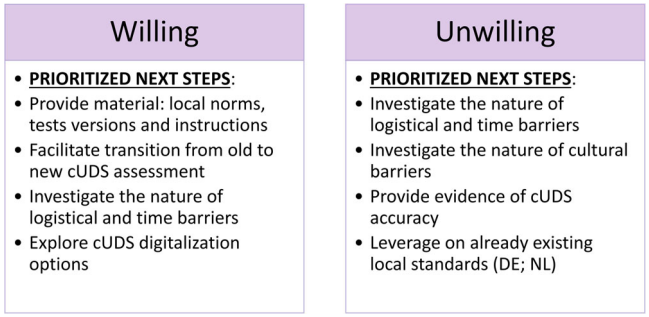

FIGURE 4 Prioritized next steps for clinicians willing and unwilling to adopt the cUDS. We identified and prioritized required next steps for implementation based on clinicians' reported barriers and facilitators, stratified by willingness to implement.

4 | DISCUSSION

With this study, we investigated the feasibility and acceptability of cUDS implementation in EADC academic memory clinics, showing that 65% of answering clinicians would be willing to implement cUDS. The NACC created a standard battery, the UDS-3, and implemented it with a top-down strategy that linked its use with National Institutes of Aging (NIA) funding as an Alzheimer's Disease Center.[7] In Australia, the Alzheimer's Disease Network conducted a survey asking clinicians about the most commonly used cognitive testing tools in public and private memory clinics, to define a standard that may be more easily applied in clinics.[15] Although other standardization efforts are ongoing worldwide (e.g., UDS-3 for research purposes,[7] CN-NORM for pre-clinical AD[16]) and nationally (e.g., Spain,[32] Netherlands[33]), the one most relevant to our work was published by the Australian colleagues.[15] Consistent with our results, they found considerable variability in terms of assessment practices and organizational aspects (e.g., funding, staff availability)[15]; however, we provided an analysis of how and why those aspects can affect the implementation of a defined standard cognitive battery.[2]

4.1 | Implications for future standardization

This survey results allowed us to identify key elements necessary to structure future implementation based on end-users needs and constraints.[17,18] The first step is to provide the necessary materials, such as translations, cultural adaptations, and local norms, for each European country (Figure 4), especially for Northern European regions that expressed a high propensity to use a common battery. For countries already using a local standard, it is necessary to provide conversion tables to translate scores[34] and ensure datasets compatibility (Figure 4). More general needed actions consist of, but are not limited to, feasibility analysis adopting cUDS to evaluate its implementation in real-world settings (e.g., pilot studies),[24] the creation of a standard operating procedure,[13] and the development of digital tools to harmonize data entry, ultimately facilitating score computation, display, storage, and sharing.[35] In light of the cultural variability and the foreign patients' assessment requests across EU regions, an additional step is to generate normative values in different languages.

4.2 | Addressing resistances to change clinical practice

As expected, clinicians showed resistance to change their clinical practice.[23] Uncertainties were often based on a different understanding of the context of use. For example, some clinicians interpreted cUDS as a tool for defining underlying etiologies, rather than detecting objective cognitive impairment as a diagnostic gateway. Others intended the cUDS for research purposes and/or for the identification of preclinical AD or showed concerns about individualized evaluations:

> "*In my clinical practice, I adopt an individual cognitive assessment according to the cognitive complaint expressed by the patient and/or relatives* […]" (ID: 48, Table S3.B).

The Harmonization Consortium did not intend to preclude patients' customized testing or clinicians' decision-making during the full diagnostic process.[36] Rather, a standard assessment aimed at providing a baseline of quality standard for clinical routine,[13] which allows using consistent definitions and processes across clinics.[2] Therefore, communication of the context of use may deserve more specific attention in the future.[2] Participatory and implementation methodologies (e.g., workshops, surveys, process evaluations) have already been used for this purpose.[2,17,37] However, future efforts should improve the communication flow among institutions. Change Management frameworks[38] can also be adopted to help in setting up methodologies and tools to manage knowledge within a health-care infrastructure, while keeping the flow of communication open with the research field.[39] Another source of uncertainty was related to time and finances. According to regression analysis, acceptability by clinicians was not statistically significantly related to higher economic reimbursement, as we would have rather expected. Although these results could be due to the small sample size, data revealed a fair amount of time and finances

dedicated to cognitive assessment. Yet, when asked directly, clinicians perceived time and financial resources as barriers, such as:

> *"If we would implement the whole cUDS, time and refunding by the Health Care System are not enough"* (ID: 42, Table S3.A)

We hypothesize that this discrepancy is due to concrete obstacles of different national funding policies, but also to clinicians' uncertainties regarding the added-value of the standardization initiative, leading to the overestimation of other potential obstacles.[40] To overcome this issue, it will be important to provide up-to-date evidence of cUDS superior diagnostic performance to both policy-makers and clinicians.

> *" […] If this battery shows in this context [research] that it helps to have a better management of the patients […] than an individualized cognitive assessment, then the interest of such an harmonization would be more evident"* (ID:48, Table S3.C).

Future feasibility studies will also be needed to test the logistical-organizational processes in the different memory clinics (e.g., actual administration time, resources needed, etc.), ultimately increasing clinicians' motivation to change their clinical practice. Alternatives to save time and finances may consist of trying to create a shorter version of cUDS, provide training for the administration and digitalization options (Table S3.D). An example:

> *"Website containing information about test battery (description of test, standardized, and translated instructions, etc.,)"* (ID: 16, Table S3.D).

4.3 | Diagnostic performance

One specific uncertainty was related to the lack of evidence on cUDS diagnostic performance compared to other cognitive batteries (e.g., CERAD-NAB). The cUDS, based on the UDS-3,[7] was developed to be more sensitive to MCI detection than the CERAD-NAB, which is specific for AD-dementia.[41] The two batteries overlap for some tests (the Trail Making Test A-B, Figures copy/recall, Boston Naming Test, and Verbal Fluency Tasks). However, the cUDS aims to further improve MCI detection by including the FCSRT and the SET.[2] The FCSRT increases the diagnostic and prognostic performance in detecting AD-MCI.[42,43] Additionally, the SET supports the identification of patients with Frontotemporal lobar degeneration based on their social symptomatology.[2] Finally, the cUDS includes the MoCa, which demonstrated better performance than the Mini-Mental State Examination.[44,45] Further bolstering the selection of the cUDS as a common metric in Europe is the indirect evidence from the UDS-3 demonstrating the invariance of its measures across demographic groups and follow-up times,[46] as well as its concordance with Clinical Dementia Rating (CDR)-based diagnosis of MCI (CDR score = 0.5).[45,47] The above evidence, together with the urgent need for standardization, led to the consensual proposal of the cUDS as an appropriate standard for clinical practice.

5 | CONCLUSIONS

In this study, we showed acceptance from clinicians, although still moderate, to proceed into the implementation of a standard cognitive assessment in European academic memory clinics. The next steps are the provision of materials and tools to facilitate the transition from the local to the cUDS battery, together with the management of logistical, financial and time issues. Nonetheless, there are some limitations. Although we achieved a relatively high participation (64%), EADC centers only included academic memory clinics and cannot be considered representative of the whole European context. Also, the use of a priori domains for the interpretation of clinicians' answers has the advantage to understand the mechanisms of implementation, but narrows data interpretation to the researchers' perspective and expertise.[26,29] This approach is more susceptible to "preconception bias", while giving a detailed analysis of some theoretical aspects.[18] However, adopting such approach ensures replicability, comparability and reliability of results, especially when ICR is calculated to minimize subjectivity and variability (Section S3).[26,29] Despite limitations, this study has two important implications. First, by importing methods from implementation science, we provided guidance and support for the implementation of an improved diagnostic procedure. Based on these findings, future studies can identify country- and context-specific requirements of adaptations (Figure 1).[23] Second, this methodology can be used to help accelerate the adoption of new neuroscientific developments into clinical practice, even beyond cognitive testing (e.g., biomarkers).[10,18,19] More studies along this line may help speed clinical dementia research and overcome the difficulties related to translating clinical scientific discoveries into everyday clinical practice.

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CONFLICTS OF INTEREST

The authors report no conflicts of interest. For all the survey respondents involved in this study, informed consent was not necessary. Author disclosures are available in the supporting information.

REFERENCES

1. Gauthier, S, Rosa-Neto, P, Morais, JA, Webster, C. World Alzheimer Report 2021 Journey through the diagnosis of dementia (29 September 2021). London, England: Alzheimer's Disease International.
2. Boccardi M, Monsch AU, Ferrari C, et al. Harmonizing neuropsychological assessment for mild neurocognitive disorders in Europe. *Alzheimers Dement*. 2022;18(1):29-42. [https://doi.org/10.1002/alz.12365]
3. Maruta C, Guerreiro M, Mendonça Ade, Hort J, Scheltens P. The use of neuropsychological tests across Europe: the need for a consensus in the use of assessment tools for dementia. *Eur J Neurol*. 2011;18(2):279-285. [https://doi.org/10.1111/j.1468-1331.2010.03134.x]
4. Costa A, Bak T, Caffarra P, et al. The need for harmonisation and innovation of neuropsychological assessment in neurodegenerative dementias in Europe: consensus document of the Joint Program for Neurodegenerative Diseases Working Group. *Alzheimers Res Ther*. 2017;9(1):27. [https://doi.org/10.1186/s13195-017-0254-x]
5. Paulino Ramirez Diaz S, Gil Gregório P, Manuel Ribera Casado J, et al. The need for a consensus in the use of assessment tools for Alzheimer's disease: the Feasibility Study (assessment tools for dementia in Alzheimer Centres across Europe), a European Alzheimer's Disease Consortium's (EADC) survey. *Int J Geriatr Psychiatry*. 2005;20(8):744-748[https://doi.org/10.1002/gps.1355]
6. Berres M, Monsch AU, Bernasconi F, Thalmann B, Stähelin HB. Normal ranges of neuropsychological tests for the diagnosis of Alzheimer's disease. *Stud Health Technol Inform*. 2000;77:195-199.
7. Weintraub S, Besser L, Dodge HH, et al. Version 3 of the Alzheimer Disease Centers' Neuropsychological Test Battery in the Uniform Data Set (UDS). *Alzheimer Dis Assoc Disord*. 2018;32(1):10-17. [https://doi.org/10.1097/WAD.0000000000000223]
8. *American Psychiatric Association. Diagnostic and statistical manual of mental disorders: Neurocognitive Disorders (NCD)*. 5th edition. 2013.
9. Baier RR, Mitchell SL, Jutkowitz E, Mor V. Identifying and supporting nonpharmacological dementia interventions ready for pragmatic trials: results from an expert workshop. *J Am Med Dir Assoc*. 2018;19(7):560-562. [https://doi.org/10.1016/j.jamda.2018.02.011]
10. O'Bryant SE, Gupta V, Henriksen K, et al. Guidelines for the standardization of preanalytic variables for blood-based biomarker studies in Alzheimer's disease research. *Alzheimers Dement*. 2015;11(5):549-560[https://doi.org/10.1016/j.jalz.2014.08.099]
11. Midtbust MH, Alnes RE, Gjengedal E, Lykkeslet E. Perceived barriers and facilitators in providing palliative care for people with severe dementia: the healthcare professionals' experiences. *BMC Health Serv Res*. 2018;18(1):709. [https://doi.org/10.1186/s12913-018-3515-x]
12. Molnar FJ, Benjamin S, Hawkins SA, Briscoe M, Ehsan S. One size does not fit all: choosing practical cognitive screening tools for your practice. *J Am Geriatr Soc*. 2020;68(10):2207-2213[https://doi.org/10.1111/jgs.16713]
13. Chen C, Kan T, Li S, Qiu C, Gui L. Use and implementation of standard operating procedures and checklists in prehospital emergency medicine: a literature review. *Am J Emerg Med*. 2016;34(12):2432-2439. [https://doi.org/10.1016/j.ajem.2016.09.057]
14. Manghani K. Quality assurance: importance of systems and standard operating procedures. *Perspect Clin Res*. 2011;2(1):34-37[https://doi.org/10.4103/2229-3485.76288]
15. Mehrani I, Kochan NA, Ong MY, Crawford JD, Naismith SL, Sachdev PS. Organisational aspects and assessment practices of Australian memory clinics: an Australian Dementia Network (ADNeT) Survey. *BMJ Open*. 2021;11(2):e038624. [https://doi.org/10.1136/bmjopen-2020-038624]
16. Wang H, Fan Z, Shi C, et al. Consensus statement on the neurocognitive outcomes for early detection of mild cognitive impairment and Alzheimer dementia from the Chinese Neuropsychological Normative (CN-NORM) Project. *J Glob Health*. 2019;9(2):20320.[https://doi.org/10.7189/jogh.09.020320]
17. De Silva MJ, Breuer E, Lee L, et al. Theory of Change: a theory-driven approach to enhance the Medical Research Council's framework for complex interventions. *Trials*. 2014;15(1):267. [https://doi.org/10.1186/1745-6215-15-267]
18. Moore GF, Audrey S, Barker M, et al. Process evaluation of complex interventions: medical research council guidance. *BMJ*. 2015;350:h1258. [https://doi.org/10.1136/bmj.h1258]
19. Tappen RM, Wolf DG, Rahemi Z, et al. Barriers and facilitators to implementing a change initiative in long-term care using the interact® quality improvement program. *Health Care Manag (Frederick)*. 2017;36(3):219-230. [https://doi.org/10.1097/HCM.0000000000000168]
20. Palmer JA, Parker VA, Mor V, et al. Barriers and facilitators to implementing a pragmatic trial to improve advance care planning in the nursing home setting. *BMC Health Serv Res*. 2019;19(1):527. [https://doi.org/10.1186/s12913-019-4309-5]
21. Rycroft-Malone J, Seers K, Eldh AC, et al. A realist process evaluation within the Facilitating Implementation of Research Evidence (FIRE) cluster randomised controlled international trial: an exemplar. *Implement Sci*. 2018;13(1):138. [https://doi.org/10.1186/s13012-018-0811-0]
22. Yousefi Nooraie R, Kwan BM, Cohn E, et al. Advancing health equity through CTSA programs: opportunities for interaction between health equity, dissemination and implementation, and translational science. *J Clin Transl Sci*. 2020;4(3):168-175. [https://doi.org/10.1017/cts.2020.10]
23. Moore G, Campbell M, Copeland L, et al. Adapting interventions to new contexts-the ADAPT guidance. *BMJ*. 2021;374:n1679. [https://doi.org/10.1136/bmj.n1679]
24. Kernebeck S, Holle D, Pogscheba P, et al. A tablet app- and sensor-based assistive technology intervention for informal caregivers to manage the challenging behavior of people with dementia (the insidedem study): protocol for a feasibility study. *JMIR Res Protoc*. 2019;8(2):e11630. [https://doi.org/10.2196/11630]
25. Di Lorito C, Pollock K, Harwood R, et al. Protocol for the process evaluation of the promoting activity, independence and stability in early dementia and mild cognitive impairment (PrAISED 2) randomised controlled trial. *Maturitas*. 2019;122:8-21. [https://doi.org/10.1016/j.maturitas.2019.01.001]
26. Mayring P. Qualitative Content Analysis: Theoretical Background and Procedures. In: Bikner-Ahsbahs, A, Knipping, C, Presmeg, N. (eds) *Approaches to Qualitative Research in Mathematics Education. Advances in Mathematics Education*. Dordrecht: Springer, 2015 https://doi.org/10.1007/978-94-017-9181-6_13
27. Eikemo TA, Kunst AE, Judge K, Mackenbach JP. Class-related health inequalities are not larger in the East: a comparison of four European regions using the new European socioeconomic classification. *J Epidemiol Community Health*. 2008;62(12):1072-1078. [https://doi.org/10.1136/jech.2007.072470]
28. Olsen W. Triangulation in social research: qualitative and quantitative methods can really be mixed. In *Developments in Sociology* Vol. 20, ed. M. Holborn, London: Macmillan; 2004.
29. Burla L, Knierim B, Barth J, Liewald K, Duetz M, Abel T. From text to codings: intercoder reliability assessment in qualitative content analysis. *Nurs Res*. 2008;57(2):113-117. [https://doi.org/10.1097/01.NNR.0000313482.33917.7d]
30. Surr CA, Parveen S, Smith SJ, et al. The barriers and facilitators to implementing dementia education and training in health and social care services: a mixed-methods study. *BMC Health Serv Res*. 2020;20(1):512. [https://doi.org/10.1186/s12913-020-05382-4]
31. Frederiksen KS, Nielsen TR, Appollonio I, et al. Biomarker counseling, disclosure of diagnosis and follow-up in patients with mild cognitive impairment: A European Alzheimer's disease consortium survey. *Int J Geriatr Psychiatry*. 2021;36(2):324-333. [https://doi.org/10.1002/gps.5427]

32. Alegret M, Espinosa A, Vinyes-Junqué G, et al. Normative data of a brief neuropsychological battery for Spanish individuals older than 49. *J Clin Exp Neuropsychol*. 2012;34(2):209-219. [https://doi.org/10.1080/13803395.2011.630652]
33. Jansen WJ, Handels RL, Visser PJ, et al. The diagnostic and prognostic value of neuropsychological assessment in memory clinic patients. *J Alzheimers Dis*. 2016;55(2):679-689. [https://doi.org/10.3233/JAD-160126]
34. Roalf DR, Moberg PJ, Xie SX, Wolk DA, Moelter ST, Arnold SE. Comparative accuracies of two common screening instruments for classification of Alzheimer's disease, mild cognitive impairment, and healthy aging. *Alzheimers Dement*. 2013;9(5):529-537. [https://doi.org/10.1016/j.jalz.2012.10.001]
35. Sabbagh MN, Boada M, Borson S, et al. Rationale for Early Diagnosis of Mild Cognitive Impairment (MCI) supported by emerging digital technologies. *J Prev Alzheimers Dis*. 2020;7(3):158-164. [https://doi.org/10.14283/jpad.2020.19]
36. Lukiw WJ, Vergallo A, Lista S, Hampel H, Zhao Y. Biomarkers for Alzheimer's Disease (AD) and the application of precision medicine. *J Pers Med*. 2020;10(3):138. [https://doi.org/10.3390/jpm10030138]
37. Gove D, Diaz-Ponce A, Georges J, et al. Alzheimer Europe's position on involving people with dementia in research through PPI (patient and public involvement). *Aging Ment Health*. 2018;22(6):723-729. [https://doi.org/10.1080/13607863.2017.1317334]
38. Giussi MV, Baum A, Plazzotta F, Muguerza P, González Bernaldo de Quirós F. Change management strategies: transforming a difficult implementation into a successful one. *Stud Health Technol Inform*. 2017;245:813-817.
39. Della Mea V, Pittaro M, Roberto V. Knowledge management and modelling in health care organizations: the standard operating procedures. In: Wimmer, MA (eds). Knowledge Management in Electronic Government. KMGov 2004. Lecture Notes in Computer Science(), vol 3035. Springer, Berlin, Heidelberg; 2004. [https://doi.org/10.1007/978-3-540-24683-1_15]
40. Nickerson RS. Confirmation bias: a ubiquitous phenomenon in many guises. *Rev Gen Psychol*. 1998;2(2):175-220.
41. Morris JC, Heyman A, Mohs RC, et al. The consortium to establish a registry for Alzheimer's disease (CERAD): I. Clinical and neuropsychological assessment of Alzheimer's disease. *Neurology*. 1989;39(9):1159-1165. [https://doi.org/10.1212/WNL.39.9.1159]
42. Beck IR, Gagneux-Zurbriggen A, Berres M, Taylor KI, Monsch AU. Comparison of verbal episodic memory measures: consortium to establish a registry for Alzheimer's disease–Neuropsychological Assessment Battery (CERAD-NAB) versus California Verbal Learning Test (CVLT). *Arch Clin Neuropsychol*. 2012;27(5):510-519. [https://doi.org/10.1093/arclin/acs056]
43. Sala I, Illán-Gala I, Alcolea D, et al. Diagnostic and prognostic value of the combination of twomeasures ofverbalmemory in mild cognitive impairment due to alzheimer's disease. *J Alzheimers Dis*. 2017;58(3):909-918.
44. Nieuwenhuis-Mark RE. The death knoll for the MMSE: has it outlived its purpose? *J Geriatr Psychiatry Neurol*. 2010;23(3):151-157. [https://doi.org/10.1177/0891988710363714]
45. Dodge HH, Goldstein FC, Wakim NI, et al. Differentiating among stages of cognitive impairment in aging: Version 3 of the Uniform Data Set (UDS) neuropsychological test battery and MoCA index scores. *Alzheimers Dement (N Y)*. 2020;6(1):e12103. [https://doi.org/10.1002/trc2.12103]
46. Kiselica AM, Webber TA, Benge JF. The uniform dataset 3.0 neuropsychological battery: factor structure, invariance testing, and demographically adjusted factor score calculation. *J Int Neuropsychol Soc*. 2020;26(6):576-586. [https://doi.org/10.1017/S135561772000003X]
47. Hayden KM, Jones RN, Zimmer C, et al. Factor structure of the National Alzheimer's Coordinating Centers uniform dataset neuropsychological battery: an evaluation of invariance between and within groups over time. *Alzheimer Dis Assoc Disord*. 2011;25(2):128-137. [https://doi.org/10.1097/WAD.0b013e3181ffa76d]

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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