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Development and preliminary validation of the Meaningful and Enjoyable Activities Scale (MEAS) in mild dementia

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Background: Engaging in meaningful activity is an important contributor to well-being in late life. This study aimed to develop a new measure of meaningful and enjoyable activities in people living with mild dementia.

Methods: The study consisted of four phases: (a) a review of measures of meaningful activity in older people; (b) interviews with people with dementia and their carers (n = 32), (c) expert opinion; and (d) feasibility testing in a pilot randomised controlled trial (n = 63).

Results: The development process resulted in a 20-item questionnaire. The Meaningful and Enjoyable Activities Scale (MEAS) evidenced appropriate levels of internal consistency (α = .79). Higher scores correlated with higher functional independence (r = −.605, P < .001), patient (r = .330, P = .010) and carer-rated patient quality of life (r = .505, P < .001). Multiple regression analyses showed that functional independence made a significant independent contribution in predicting higher levels of meaningful activity (F[7,45] = 6.75, P < .001, R^2 = .512; β = −.444, P = .001). Confirmatory factor analysis indicated that a revised three-factor 9-item model provided good fit for the data (X^2 = 22.74, P = .54, GFI = 0.93, RMSE = 0.00), with leisure-time physical activity, social engagement and mentally stimulating activities as the key dimensions.

Conclusion: Our study provides support for the construct of meaningful activity in people with mild dementia. Although we find preliminary evidence that the MEAS has adequate psychometric properties, future large scale studies are required to test its validity further and responsiveness to change.

KEYWORDS
meaningful activity, measurement, mild dementia, psychological theories of ageing, psychometric properties, reliability, validity

1 | INTRODUCTION

In line with contemporary theories of adult development, meaningful activities, defined as those that provide emotional, creative and intellectual stimulation,[1] are associated with higher levels of well-being and quality of life throughout an individual's life span.[2] Psychological theories of ageing argue that engaging in meaningful and purposeful activity becomes more important as individuals age, representing an important psychological need.[3] According to models of continuity[4] and the selection, optimisation and

compensation framework,[5] older people maximise their health and quality of life through selecting and investing in highly valued activities, with the continuation of these central to maintaining positive psychological well-being.[6] Similarly activity theories of ageing[7] posit that successful ageing stems primarily from remaining active, sustaining social interactions and one's personal identity, whereas low levels of social and activity engagement place older people vulnerable to social detachment and withdrawing from remaining active.[8,9]

Accumulating evidence from longitudinal studies shows that engagement with hobbies and purposeful activity extends longevity, and healthy life expectancy in older people,[10] reducing incidence of disability and chronic health conditions.[11,12] Despite however both evidence and theory highlighting the important role of meaningful activity for maintaining psychological well-being in late life,[11] evidence base for older people experiencing cognitive impairment remains limited. Engaging in meaningful and purposeful activity is particularly important for people living with dementia, as they often experience disengagement from every day rewarding activities.[13] Qualitative studies indicate that people with dementia may be experiencing restricted access to meaningful activities partly due to the social impact of receiving a diagnosis characterised by lack of experiencing agency, and opportunities to remain socially engaged.[14] Maintaining a high sense of purpose in life and remaining socially integrated is considered an important psychological need for people with dementia, which currently remains unaddressed by community-based psychosocial interventions.[13] To allow for the evaluation of future interventions targeting meaningful activity in people with dementia, outcome measures are needed that are reliable, valid and sensitive to change within the context of interventions.[15] A validated measure designed to capture meaningful activity in people with mild dementia would facilitate further research in the area and strengthen the evidence base of patient centred outcomes.[13]

In the present study, we aimed to develop a new measure of meaningful and enjoyable activities for people with mild dementia, guided by psychological theories of ageing, patients' every-day experiences, carer feedback and expert opinion.[4,7,16] We followed specific steps that need to be undertaken in order to develop a new scale[15] via a series of four phases, to ensure the measure was appropriate to the population studied and meaningful for people with dementia, their families and clinicians. We additionally investigated the construct validity of meaningful activity by deriving specific hypotheses from theory about predictor variables. We hypothesised that higher levels of meaningful activity would predict higher levels of independence, higher levels of quality of life for people with dementia, and lower levels of psychological distress which we measured by carer-ratings of patient depression and experience of neuropsychiatric symptoms. A secondary aim therefore was to offer insights regarding the theoretical and clinical implications of the construct of meaningful activity in people with mild dementia.

Key Points

- A new scale to measure meaningful activity for people with mild dementia was developed.
- The scale was cross-sectionally and longitudinally associated with functional independence, symptoms of depression and patient and carer-rated quality of life for people with dementia.
- The scale showed adequate internal consistency, showing it captures a three-dimensional construct.
- Future research is required to further validate the scale and test its responsiveness to change.

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2 | METHODS

2.1 | Ethical considerations

The London - Camberwell St Giles Research Ethics Committee approved the study (REC 16/LO/0540). Written informed consent was obtained from all people with dementia and their carers.

2.2 | Participants

People with dementia and their family carers were recruited through National Health Service (NHS) secondary care services, and community mental health teams for older people. Participants were recruited if they: (a) had a diagnosis of mild dementia of any type (Mini Mental State Examination Score - [MMSE] ≥ 18[17]; (b) were living in the community; and (c) had a family carer who was able to take part and act as an informant.

2.3 | Phase 1. Literature review of measures of meaningful and enjoyable activity in older people

The purpose of the literature review was to identify existing scales measuring meaningful and enjoyable activities in people with and without cognitive impairment. We performed a search using Medline and Google Scholar (performed 07/2017), using the following keywords: 'pleasant activities', 'activity scheduling', 'pleasant events' and 'older people' or 'dementia'.

2.4 | Phase 2. Developing the item pool

We used a mixed methods approach which combined both qualitative and quantitative methods to generate and refine the concept of meaningful and enjoyable activity in mild dementia and identify types of meaningful and enjoyable activities people engage in their every-day life. A total of 32 participants took part in this phase.

2.4.1 | Qualitative data on meaningful and enjoyable activities in mild dementia

We conducted 16 individual interviews with people with dementia and 16 individual interviews with family carers, which were designed to obtain patient and carer input about the importance of meaningful activity and type of activities people engage in. All activities mentioned by participants were coded with information grouped under specific concept groups, using framework analysis conducted by two researchers.[18] All interviews were audio recorded and transcribed, and lasted approximately 45 minutes.

2.4.2 | Quantitative data on meaningful and enjoyable activities in mild dementia

After the qualitative interviews, participants (n = 32; same sample as above) were asked to complete a questionnaire containing a list of 53 activities (initial pool of items; see Table S1). Each dyad/participant was asked to rate each activity in terms of frequency and indicate whether the person with dementia engages in any other activity not present in the list.

2.5 | Phase 3. Expert opinion

Our experts (n = 7) were selected from a research group covering expertise in: (a) old age psychiatry, (b) clinical psychology of older people, (c) dementia care and (d) being a family carer (expert by experience). The expert group contributed to generating the initial pool of items, review of qualitative data and developing the final pool of items to be tested in the feasibility study.

2.6 | Phase 4. Feasibility of the scale within the context of a pilot randomised controlled trial, and factor structure

The feasibility of the scale was tested in a pilot randomised controlled trial (n = 63; see Orgeta et al[19]). In order to investigate the scale's construct validity we examined the scale's association with: (a) activities of daily living (Bristol Activities of Daily Living Scale: BADLS[20]); (b) depressive symptoms (Cornell Scale for Depression in Dementia: CSDD[21]), (c) self- and carer-rated dementia-specific quality of life (DEMQOL and DEMQOL-proxy[22]) and (d) generic self- and carer-rated quality of life for people with dementia (European Quality of Life-5 Dimensions: EQ-5D[23]), (e) neuropsychiatric symptoms (Neuropsychiatric Inventory: NPI[24]), (f) carers' mental and physical health (Short Form questionnaire-12 items: SF-12[25]), (g) carers' depression and anxiety (Hospital Anxiety and Depression Scale: HADS[26]) and (h) carers' health-related quality of life (EQ-5D[23]).

2.7 | Statistical methods

Descriptive statistics were used to assess the association between the scale and demographic variables, including two-tailed independent t tests for dichotomous variables, one way ANOVA for multiple categorical variables and Pearson's correlations for continuous variables. Internal consistency was determined using Cronbach's alpha, and test-retest reliability using Pearson product-moment correlations. We used hierarchical linear regression to assess the independent contributions of demographic and clinical variables to levels of meaningful activity. An alpha level of .05 (two-tailed) was used to measure statistical significance. We used exploratory factor analysis (EFA) to identify the structure of the scale and confirmatory factor analysis (CFA) to assess the quality of the hypothesised factor structure.[27] We used the root mean square error of approximation (RMSEA; values <0.05), and values of the Comparative Fit Index (CFI; values >0.90) and the Good Fit Index (GFI; values >0.90) to assess goodness of fit.[28,29]

3 | RESULTS

3.1 | Phase 1

The literature search identified three scales of meaningful and/or purposeful activity in older people without cognitive impairment with appropriate construct validity and reliability data. These scales were: (a) the Engagement in Meaningful Activities Survey,[30] (b) the California Older Person's Pleasant Events Schedule[31] and the Older Person's Pleasant Events Schedule[32] and its variation known as the Pleasant Events Schedule-AD.[33] We reviewed items across all scales, and response options in order to inform the development of the new scale.[34-36]

3.2 | Phase 2

We used results of the search of current questionnaires, psychological theories of ageing (see Figure 1), behavioural activation therapy manuals and expert input to develop the initial pool of items comprising of 53 activities in total (see Table S1).

3.2.1 | Qualitative data

We interviewed 16 people with mild dementia and 16 family carers about the importance of meaningful activity for every-day life. Characteristics of the sample are presented in Table 1. We used framework analyses to derive information on: (a) the importance of meaningful activity for people with mild dementia, and (b) key life areas of meaningful activity. Five independent themes were generated on the importance of engaging in meaningful activity: (a) retaining mastery and experiencing agency, (b) providing opportunities to compensate for age-related losses and losses associated with dementia/

Theoretical model	
1. Activity theory of ageing	Maintaining high activity patterns to adapt to psychological and age-related losses
2. Selective optimisation with compensation	Narrowing of goals, developing of means to achieve this, and seeking external support when necessary
3. Continuity theory of ageing	Focusing on activities that are goal-related and allow individuals to maintain important roles
4. Behavioural activation theory	Activities are a source of pleasure for the individual and are associated with mastery

FIGURE 1 Psychological theories guiding development of the Meaningful and Enjoyable Activities Scale. [Correction added on 23 June 2020, after first online publication: The image in Figure 1 was previously incorrect and has been updated in this version]

cognitive impairment, (c) allowing for continuity for the individual's roles and 'life story', (d) connecting with others and (e) mobilisation of resources to cope with age-related or dementia-related changes. We identified six life areas of meaningful activity, and categorised activities in the following domains: (a) physical activity, (b) looking after my household, (c) enjoyable and leisure activities, (d) hobbies and personal interests, (e) staying mentally active and (f) social activities/community involvement.

3.2.2 | Quantitative data

We collected data on the frequency of each of the 53 enjoyable and meaningful activities, in order to identify items that were endorsed by >50% of the sample (n = 32; see Table S1).

3.3 | Phase 3

Our expert panel reviewed the final choice of items. At this stage we excluded a total of 27 activities based on low engagement as reported by both qualitative and quantitative data by people with dementia and family carers. The remaining 26 activities were grouped when qualitative input supported overlap between items (eg, 'Doing the dishes' and 'Setting the table' combined in 'Light housekeeping'). As can be seen from Table 1 (see Supporting Information), we retained items with 50% frequency or higher in Phase 2, items emerging as part of a qualitative theme, or items recommended for inclusion on the basis of expert input.

The final questionnaire of Meaningful and Enjoyable Activities Scale (MEAS), comprised a total of 20 meaningful and enjoyable activities rated by carers on an ordinal scale, using a total of five options: 'almost daily', '1-2 times a week', '2-3 times monthly', 'once a month' or 'never'. Total scores were calculated by scoring each option from 0 to 4 (0 being 'never' and 4 being 'almost daily'; maximum score 80), with higher scores indicative of higher levels of meaningful activity.

3.4 | Phase 4

3.4.1 | Internal consistency and test-rest reliability

An acceptable level of internal consistency was established [α = .79, 95% confidence interval (CI): (0.69 to 0.85)] and at 12 weeks, test-retest reliability was strong (r = .802, P < .001). Inter-item correlations were acceptable (expected <0.5), except in two instances.

3.4.2 | MEAS and demographics

MEAS scores were not influenced by sex ($t[59]$ = 0.540, P = .591), ethnicity ($F[8, 52]$ = 0.627, P = .646), levels of education ($F[4, 56]$ = 0.912, P = .463), marital ($F[5, 55]$ = 1.913, P = .107) or living status ($F[2, 58]$ = 0.178, P = .838) of the person with dementia. We found no association between MEAS and age of people with dementia (r = −.171, P = .186), MMSE scores (r = .165, P = .284), time living with the diagnosis (r = −.051, P = .698), use of AchEIs ($t[59]$ = 0.687, P = .495) or antidepressants ($t[59]$ = 0.690, P = .493). MEAS scores were not associated with carer age (r = .212, P = .100), sex ($t[59]$ = −1.06, P = .294), ethnicity ($F[9, 51]$ = 0.942, P = .498), education ($F[4, 55]$ = 0.685, P = .606), marital ($F[5, 55]$ = 1.242, P = .302) or living status ($F[2, 58]$ = 0.633, P = .535), whereas the association between MEAS and caregiving relationship approached significance ($F[4, 56]$ = 2.381, P = .062).

3.4.3 | Construct validity

At baseline, Pearson product-moment correlations showed that the MEAS was significantly positively associated with higher self and carer-rated quality of life for the person with dementia. As hypothesised higher scores on the MEAS were associated with higher levels of functional independence, and lower levels of depression and neuropsychiatric symptoms. Lower MEAS scores predicted higher depression and NPI-related distress in carers. The association of

TABLE 1 Demographics of people with dementia and family carers taking part in individual interviews (N = 32)

	Mean (SD) or N (%)
People with dementia	
N = 16	
Age (years)	81.9 (8.2)
Sex	
Female	12 (75)
Ethnicity	
White British	10 (63)
Irish/Other White	2 (12)
Black Caribbean/Black African	3 (18)
Other	1 (6)
Dementia type	
Alzheimer's disease	9 (56)
Alzheimer's disease mixed/atypical	5 (31)
Unspecified	2 (13)
MMSE	25.2 (3.0)
Carers N = 16	
Age (years)	61.1 (13.7)
Sex	
Female	9 (56)
Ethnicity	
White British	9 (56)
Irish/Other White	3 (18)
Black Caribbean/Black African	2 (13)
Other mixed	2 (13)
Relationship to participant	
Spouse/partner	6 (38)
Child/Child in law	9 (56)
Other	1 (6)

TABLE 2 Correlations of MEAS and clinical variables at baseline, 3 and 6 months

	Baseline	3 months	6 months
Patient measures			
DEMQOL	0.250	0.096	−0.068
DEMQOL-proxy	0.232	0.189	−0.027
EQ5D	0.330*	0.401**	0.168
EQ5D VAS	0.100	0.258	−0.053
EQ5D proxy	0.505**	0.595**	0.535**
EQ5D proxy VAS	0.111	0.442**	0.118
BADLS	−0.605**	−0.734**	−0.591**
CSDD	−0.503**	−0.235	−0.242
NPI	−0.275*	−0.408**	−0.295*
Carer measures			
EQ5D	0.156	−0.147	0.149
EQ5D VAS	0.124	−0.012	0.204
SF-12 physical	0.071	−0.015	0.266
SF-12 mental	0.255	0.309*	0.254
HADS depression	−0.365**	−0.291*	−0.270
HADS anxiety	−0.188	−0.065	−0.093
NPI carer distress	−0.265*	−0.402**	−0.286*

Note: n = 63 at baseline; n = 53 at 3 months; n = 51 at 6 months.
Abbreviations: BADLS, Bristol Activities of Daily Living; CSDD, Cornell Scale for Depression in Dementia; DEMQOL, dementia quality of life; EQ-5D, European quality of life-5 dimensions; EQ5D VAS, European quality of life-5 health thermometer; HADS, Hospital and Anxiety Depression Scale; NPI, Neuropsychiatric Inventory; SF-12, Short Form 12 health survey.
*$P < .05$; **$P < .01$.

MEAS with self-rated, and carer-rated patient quality of life was sustained at 3 months. Higher MEAS scores (at 3 months) were associated with higher levels of activities of daily living, lower levels of NPI and higher carer-rated patient health. Associations were also sustained for carer variables, whereby higher MEAS scores correlated with lower symptoms of depression, lower distress and better mental health for carers. Higher ratings on the MEAS at 6 months were predictive of higher functional independence, higher carer-rated patient quality of life and lower NPI. The only carer variable that was significantly associated with MEAS scores at 6 months was carer NPI-related distress (see Table 2).

3.4.4 | Multiple regression analyses

The first linear model predicting baseline MEAS (EQ5D, EQ5D Proxy, BADLS, CSDD, NPI, HADS-D and NPI carer distress – independent variables) was significant ($F[7,45] = 6.750$, $P < .001$, $R^2 = .512$); with BADLS scores the only variable making an independent contribution to the model. The model predicting MEAS at 3 months (EQ5D, EQ5D Proxy, EQ5D Proxy VAS, BADLS, NPI, SF-12 Mental health, HADS-D, NPI distress as predictors) was also significant; ($F[8, 38] = 6.838$, $P < .001$, $R^2 = .590$); with BADLS the only significant predictor. Similarly, in the final regression model predicting MEAS at 6 months [EQ5D Proxy, BADLS, NPI, NPI distress as predictors; ($F[4,43] = 6.634$, $P < .001$, $R^2 = .382$)], levels of every-day function was the only variable making a significant independent contribution to the model (see Table 3).

3.4.5 | Sensitivity to change

We additionally investigated the scale's sensitivity to change. Effect size (ES) values were small to moderate, ranging from 0.03 to 0.43. The 95% confidence intervals ranged from small to large; whereas in all instances intervals did not contain zero. Subgroup analyses by baseline MEAS scores (high vs low; cut-off = 39) indicated that ESs were moderate for the lower MEAS group at both time-points (see Table 4).

TABLE 3 Multiple regression model predicting MEAS score at baseline, 3 and 6 months

	Baseline			3 months			6 months		
	F	R^2	Adjusted R^2	F	R^2	Adjusted R^2	F	R^2	Adjusted R^2
Model	6.750**	.512	.436	6.838**	.590	.504	6.634**	.382	.324
Variables	B	SE B	β	B	SE B	β	B	SE B	β
EQ5D	4.056	5.730	0.104	0.506	5.328	0.012	—	—	—
EQ5D proxy	1.330	6.192	0.037	−0.292	7.642	−0.007	8.082	5.496	0.222
EQ5D proxy VAS	—	—	—	0.146	0.089	0.220	—	—	—
BADLS	−0.560	0.161	−0.444**	−0.634	0.169	−0.533**	−0.538	0.183	−0.471**
CSDD	−0.730	0.397	−0.355	—	—	—	—	—	—
NPI	0.191	0.257	0.201	−0.288	0.257	−0.267	0.081	0.193	0.107
SF-12 mental health	—	—	—	−0.047	0.204	−0.043	—	—	—
HADS-depression	−0.711	0.438	−0.250	−0.428	0.556	−0.142	—	—	—
NPI-carer distress	0.122	0.427	0.084	0.190	0.408	0.106	−0.127	0.376	−0.085

Note: n = 63 at baseline; n = 53 at 3 months; n = 51 at 6 months.
Abbreviations: BADLS, Bristol Activities of Daily Living; CSDD, Cornell Scale for Depression in Dementia; EQ-5D, European quality of life-5 dimensions; EQ5D VAS, European quality of life-5 dimensions health thermometer; HADS, Hospital and Anxiety Depression Scale; MEAS, Meaningful and Enjoyable Activities Scale; NPI, Neuropsychiatric Inventory; SF-12, Short Form 12 health survey.
*p < .05; **p < .01.

TABLE 4 Sensitivity to change for MEAS at 3 and 6 months

	n	Baseline mean score (SD)	n	Endpoint mean score (SD) 3 months	n	Endpoint mean score (SD) 6 months	Mean change endpoint - baseline score to 3 months (95% CI)	Cohen's d	Mean change endpoint - baseline score to 6 months (95% CI)	Cohen's d
Total sample	63	39.07 (12.25)	53	42.26 (12.02)	51	40.12 (11.24)	−2.23 (−4.42 to −0.05)	0.26	0.10 (−2.59 to 2.39)	0.09
Intervention sample	42	40.08 (12.71)	36	44.50 (11.79)	33	42.54 (10.95)	3.68 (1.20 to 6.15)	0.36	1.22 (−2.09 to 4.52)	0.21
Control sample	21	37.14 (11.39)	17	37.53 (11.40)	18	35.67 (10.65)	−0.65 (−4.98 to 3.69)	0.03	−2.44 (−6.25 to 1.36)	0.13
Total sample										
High baseline score (≥39)	29	49.82 (8.01)	27	51.38 (7.22)	25	48.43 (7.93)	1.00 (−2.56 to 4.56)	0.20	−2.69 (−6.92 to 1.53)	0.17
Low baseline score (≤39)	34	29.94 (6.35)	26	33.24 (8.85)	26	32.69 (8.66)	3.52 (0.87 to 6.17)	0.43	2.69 (−0.02 to 5.41)	0.36

Note: n = 63 at baseline; n = 53 at 3 months; n = 51 at 6 months.
Abbreviation: MEAS, Meaningful and Enjoyable Activities Scale.

3.4.6 | Factor structure

We conducted an EFA to establish the structure of MEAS-20. As there are no previous EFAs for meaningful and purposeful activity in people living with dementia, we had no a priori hypotheses about a particular factor structure to emerge from the data. Bartlett's test of sphericity confirmed correlations between items were large enough ($\chi 2$ [190] = 307.39, $P < .001$). The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.641 (above the commonly recommended

value of 0.600), and all communalities (proportion of item's variance explained by the extracted factors) above 0.300, confirming that each item shared some common variance with other items. Initial EFA suggested a 7-factor solution where two factors were represented by only two items. A second analysis, after removing items loading ≤0.40 (eight items), resulted in a 3-factor solution, explaining 34% of the variance.

CFA was conducted on the modified 12-item scale with a 3-factor model indicating that this model was a poor fit for the data
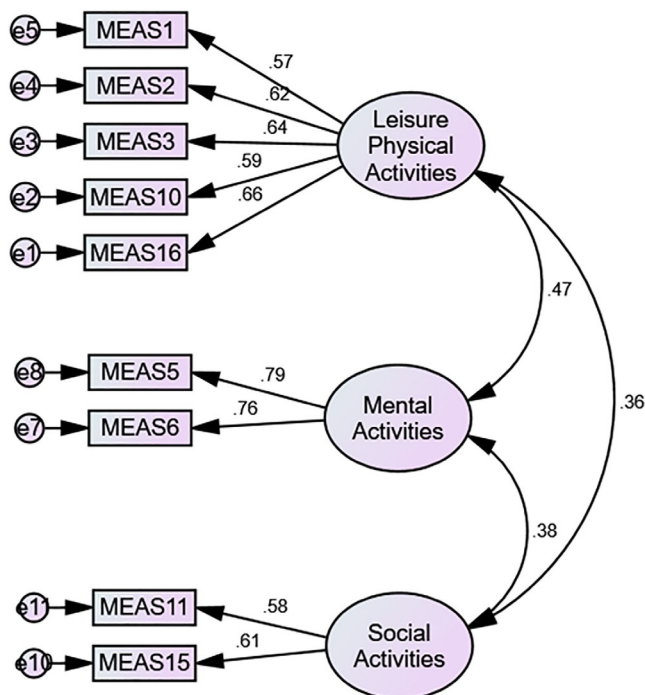
FIGURE 2 Confirmatory factor analysis final model: X = 22.74, P = .54, CFI = 1.00, GFI = 0.93, RMSEA = 0.00; MEAS, Meaningful and Enjoyable Activities Scale [Colour figure can be viewed at wileyonlinelibrary.com]

(X^2 = 69.84, P = .04, CFI = 0.87, GFI = 0.86, RMSEA = 0.07; see Figure S1). Removing three items resulted in a revised 9-item three-factor solution indicative of a good fit, confirming the construct validity of the revised model (X^2 = 22.74, P = .54, CFI = 1.00, GFI = 0.93, RMSEA = 0.00; see Figure 2; see Table S2). Standardised parameter estimates of the measurement model ranged from 0.57 to 0.79, with the three-factors identified reflecting *leisure-time physical activities*, *social engagement* and *mentally stimulating activities*.

4 | DISCUSSION

In this study, we report on the development and preliminary validation of a new scale to measure meaningful and enjoyable activities in people with mild dementia. We used a mixed methods approach in order to develop the new scale incorporating relevant theories, current instruments, expert opinion and both quantitative and qualitative data.[15] Our scale is unique by incorporating patient and carer experience, clinician input and being guided by theoretical models, which are essential steps in the development of instruments and subsequent validation.[15] Our results provide support for the validity of the construct of meaningful activity in people with mild dementia. An important contribution of our study therefore is providing the first evidence base for the clinical and theoretical utility of instruments measuring meaningful and enjoyable activities in mild dementia.

In line with our hypotheses, meaningful activity was significantly associated with both patient and carer outcomes. Our findings are consistent with psychological theories of ageing highlighting that meaningful activity is an important parameter of psychosocial health in older people even within the context of chronic health and disability,[5-9] predictive of higher levels of quality of life.[11] As hypothesised by activity theories of ageing higher levels of meaningful activity were associated with lower levels of depression and overall neuropsychiatric symptoms[37] and better overall physical health status for people with dementia at 3 months.[33]

An important finding of our study is that higher levels of meaningful activity were associated with higher levels of functional independence for people with mild dementia; this suggests that engagement in meaningful activity may be associated with maintenance of functional status; an effect that we observed both at 3 and 6 months. Similarly to longitudinal studies in older people without dementia, this association persisted after controlling for depressive symptoms, self and carer-ratings of quality of life and carer mental health which may be confounding such an association.[12] Given the limited knowledge in the area, it is not possible to ascertain which mechanisms may explain this association. One hypothesis is that people with mild dementia who engage in meaningful activity may experience higher levels of vitality and motivation, which in turn maintains their every-day function. A further potential hypothesis is that continuous engagement in meaningful activity may promote the use of compensatory strategies or exert a stress buffer whereby specific behaviours support individuals to adapt to loss experienced by dementia,[5,38,39] a finding that was supported by our qualitative data. Given the limitations of our study and current research, future studies are needed to determine how effects of meaningful activity may operate. Our preliminary analyses support a multidimensional structure of three underlying constructs of meaningful and enjoyable activity in mild dementia of leisure-time physical activities, social engagement and mentally stimulating activities.

Our findings are consistent with contemporary theories of human motivation and human action[16] highlighting the theoretical importance of the construct of meaningful activity in people with dementia. Our data contribute to current literature by highlighting relevant theories,[3-5] and providing a foundation for the evaluation of interventions that aim to promote meaningful activity in this population.[19] Our results have important implications for dementia care interventions as they suggest that purposeful activity in mild dementia is cross-sectionally and longitudinally associated with maintenance of activities of daily living, similar to evidence in healthy older people.[40] For example, a greater focus on meaningful and purposeful activity may provide important new knowledge for the development of future psychosocial interventions, and interventions that aim to reduce functional disability.

Despite the originality of the findings, our study has several important limitations. Our sample was small limiting the generalisation of our results. Given the small sample size in our study our data on the reliability and validity of the MEAS are only preliminary and require further evaluation. We recruited people with mild dementia who were generally active, therefore our findings cannot be generalised to people with dementia who experience poor mobility and

function or those living with a chronic illness. We did not measure self-ratings of meaningful activity directly by people with dementia, which may have influenced our findings. Although activities of daily living and engagement in meaningful and purposeful activity are generally considered separate constructs they do partly overlap. We were able to test sensitivity to change over 3 and 6 months, but future studies should test responsiveness to change of the MEAS using large samples. Future research should examine the impact of other variables not tested in our study such as the influence of social support, and the effect of physical frailty.

Providing more support and changing social attitudes towards people with dementia's needs for meaningful and enjoyable activity is important for the provision of high quality care and raising quality of life for people living with dementia.

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SUPPORTING INFORMATION

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