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JAMDA 16 (2015) 63–70

JAMDA

journal homepage: www.jamda.com

Original Study

Maintenance Cognitive Stimulation Therapy: An Economic Evaluation Within a Randomized Controlled Trial

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Keywords:
Cognitive stimulation therapy
dementia
cost
cost-effectiveness
randomized controlled trial
acetylcholinesterase inhibitors

A B S T R A C T

Background: Cognitive Stimulation Therapy (CST) is effective and cost-effective for people with mild-to-moderate dementia when delivered biweekly over 7 weeks.
Aims: To examine whether longer-term (maintenance) CST is cost-effective when added to usual care.
Methods: Cost-effectiveness analysis within multicenter, single-blind, pragmatic randomized controlled trial; subgroup analysis for people taking acetylcholinesterase inhibitors (ACHEIs). A total of 236 participants with mild-to-moderate dementia received CST for 7 weeks. They were randomized to either weekly maintenance CST added to usual care or usual care alone for 24 weeks.
Results: Although outcome gains were modest over 6 months, maintenance CST appeared cost-effective when looking at self-rated quality of life as primary outcome, and cognition (MMSE) and proxy-rated quality-adjusted life years as secondary outcomes. CST in combination with ACHEIs offered cost-effectiveness gains when outcome was measured as cognition.
Conclusions: Continuation of CST is likely to be cost-effective for people with mild-to-moderate dementia.

Cognitive stimulation therapy (CST) is an evidence-based, group intervention for people with mild-to-moderate dementia, involving themed activities to stimulate cognitive function. It is both effective and cost-effective when delivered biweekly over 7 weeks.[1–3] Would continuation of CST for longer generate additional advantages? Evidence from a pilot study of continued CST suggested improvements in cognitive function.[4]

A randomized controlled trial found that maintenance CST (MCST), delivered weekly for 24 weeks (plus usual care), improved patient quality of life compared with usual care alone.[5] It also found that MCST improves cognition for people with dementia taking acetylcholinesterase inhibitor medication (ACHEIs). Given intensifying pressure on health and social care resources, a key question facing commissioners, and one that was recently posed by the

The University of Bangor receives royalties for the sales of the Making a Difference manuals on behalf of RTW; AS receives payment for running training courses on Cognitive Stimulation Therapy, but no support from any organization that might have an interest in the submitted work in the previous 3 years; there are no other relationships or activities that could appear to have influenced the submitted work.

We acknowledge funding from the National Institute for Health Research (NIHR) under its Programme Grants for Applied Research scheme (RP-PG-0606-1083). The views expressed in this paper are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. Current controlled trials registration ISRCTN26286067.

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http://dx.doi.org/10.1016/j.jamda.2014.10.020

National Institute for Health and Care Excellence, is whether cognitive stimulation is also cost-effective.[6]

Methods

Centers

Eighteen centers were recruited in London, Essex, and Bedfordshire: 9 care homes and 9 community centers (day centers, community mental health teams, and voluntary organizations). Another 3 centers were approached: 1 refused and 2 were excluded because they had insufficient participants meeting inclusion criteria. The study has received ethical approval by the Barking & Havering Local Research Ethics Committee, reference number 08/H0702/68 in October 2008.

Participants

Participants were eligible for inclusion if they met DSM-IV criteria for dementia,[7] scored between 0.5 and 2.0 (mild-to-moderate) on the Clinical Dementia Rating (CDR),[8] could communicate in English, could see and hear well enough to participate in CST, did not have major physical illness or disability (eg, urinary tract infection, delirium, or stroke) that could affect participation, or have a diagnosed learning disability.

Design

Participants completed 7 weeks of standard CST (14 twice-weekly sessions of 45 minutes), and were then immediately entered into a single-blind, multicenter, pragmatic randomized controlled trial comparing MCST added to usual care with usual care alone. There was no modification in design or eligibility criteria from the study protocol.[9]

Randomization

Participants were randomized to either the intervention group receiving weekly MCST for 24 weeks in addition to usual care or the control group receiving usual care alone.[5] Although usual care did not include any intervention similar to MCST, care offered to participants varied among centers. Participants were randomized in equal proportions after stratifying for center, whether ACHEI was prescribed, and previous CST group. Data storage and transfer were performed to avoid contamination. The nature of the intervention precluded blinding of participants, but researchers conducting interviews and the statistician analyzing outcomes were blind to group assignment. Researchers conducting the economic evaluation were not blind to assignment.

Outcome Measures

Participants were assessed at baseline (before randomization), after 3 months (intermediate end point), and after 6 months (primary end point).

There were 2 primary outcomes:

- cognition measured by ADAS-Cog (Alzheimer's Disease Assessment Scale-Cognition subscale): lower scores reflect better cognition[10]
- quality of life measured by QoL-AD (Quality of Life-Alzheimer's Disease scale): higher scores reflect better quality of life[11]

Secondary outcomes were

- Mini-Mental State Examination (MMSE): higher scores reflect better cognition[12]
- Neuropsychiatric Inventory (NPI): lower scores reflect better behavior[13]
- ADCS-ADL (Alzheimer's Disease Co-operative Study—Activities of Daily Living Inventory): higher scores reflect greater ability in activities of daily living (ADLs)[14]
- DEMQOL, a dementia-specific quality-of-life scale completed by participants (self-report), family carers, or care center workers (proxy): higher scores indicate better quality of life[15]
- proxy version of QoL-AD, completed by family carers or care center workers: higher scores reflect better quality of life[11]
- EQ-5D-3L, a generic health-related quality of life measure completed by participants (self-report), family carers or care center workers (proxy)[16]

Utility values were calculated from both generic and dementia-specific quality of life measures) to compare gain in quality-adjusted life years (QALYs) using both participant-reported and proxy-reported measures. QALYs were calculated from EQ-5D and Proxy EQ-5D using societal weights, York A1 Tariff,[17] by combining ratings on mobility, self-care, usual activities, pain/discomfort, and anxiety and depression domains to calculate utility values. QALYs were also calculated from dementia-specific measures (DEMQOL-U and DEMQOL-PROXY-U) using an algorithm based on societal weights.[18] QALYs were calculated by "area under the curve" analysis, with linear interpolation between assessment points.

Previous findings[19] suggest that a difference in score of 1.4 points on the MMSE can be considered "minimum clinically important." We could not find suggestions for clinically important differences on the other measures.

Resource Use and Cost Measures

The Client Service Receipt Inventory[20] was adapted to capture data on all health and social care services used in the previous 3 months by participants and inputs from unpaid family and other carers. It was completed with family carers or center care workers 3 times (at randomization, 3 months and at 6 months).

Unit costs reflected long-run marginal opportunity costs, taken from the Personal Social Services Research Unit (PSSRU) compendium for 2011.[21] We discounted at 3.5% for items providing benefit for more than 1 year, such as equipment or adaptations. Medication costs came from the British National Formulary.[22] Costs for equipment and adaptations came from market sources. Where necessary, unit costs were adjusted to 2011 prices using the Consumer Price Index.

Calculating the cost of MCST itself took into account the 1-day training course for facilitators (averaging £1.50 per subsequent MCST session, assuming skills acquired lasted 5 years), material and equipment used at each session (£1 per MCST session), and costs of the 2 cofacilitators (1 researcher, costing £130 per session; 1 care worker, costing £25 per session; the difference is due to preparation and travel time). Transport costs were added for participants who traveled to community centers for sessions and requested travel refunds (average £1.44 per person per session).

Average total cost per MCST session was £157.46 in care homes and £158.90 in community centers. Average number of participants per session was 5.

Cost-Effectiveness Analyses

The main cost-effectiveness analyses were conducted from a health and social care perspective. Further analyses added costs for unpaid carer time (societal perspective). The primary economic evaluation measured effectiveness by, in turn, each primary outcome as stated in

the analysis plan (ADAS-Cog, QoL-AD). These analyses show the additional cost to the health and social care system of achieving a 1-point difference in each outcome from adding MCST to usual care.

Secondary economic evaluations were cost-utility analyses, again from each perspective, using utilities computed first from EQ-5D and Proxy EQ-5D, and then from DEMQOL and Proxy DEMQOL. These secondary analyses show the cost of achieving 1 additional QALY from adding MCST to usual care.

We also conducted cost-consequences analyses, looking at other secondary outcomes (MMSE, ADCS-ADL, proxy QoL-AD) alongside costs.

There were 4 potential results from each cost-effectiveness analysis:

1. MCST is less costly and more effective than usual care: the decision-maker would be attracted to MCST;
2. MCST is more costly and less effective than usual care: the decision-maker would be unlikely to recommend, commission, or deliver MCST;
3. MCST is less costly but less effective than usual care; and
4. MCST is more costly and more effective than usual care.

If MCST is less costly and more effective than usual care, or is more costly and less effective, then advice to the decision-maker is generally straightforward, although measurement error generates some uncertainty. However, if MCST is cheaper but less effective, or if MCST is more expensive but also more effective, the decision-maker must weigh up the outcome and cost differences; the decision will depend on the *value* attached to differences in outcome. In these circumstances we calculate the incremental cost-effectiveness ratio (ICER):

$$\mathrm{ICER} = \Delta C/\Delta E,$$

where ΔC is difference in mean costs between MCST and usual care, and ΔE is mean difference in outcome.

ICERs were estimated with the Seemingly Unrelated Regression (SUR) model using Stata (Stata Corp, College Station, TX). Each cost and outcome measure in turn was included in a bivariate system that implemented a regression on treatment allocation (MCST or usual care), controlling for participant age at baseline, gender, ethnicity, marital status, whether or not taking AChEIs, CDR score at baseline, having a staff (paid) or family (unpaid) carer, center type (community or care home), and center (location). Cost equations also controlled for cost in the 7-week period before baseline (obtained by standardizing 3-month retrospective baseline data), and each outcome equation controlled for the corresponding measure at baseline. Multiple imputation was used for missing data.[23] Incremental cost and outcome coefficients and their correlation were estimated with 1000 bootstrap replications to address possible skewness. Using a series of hypothetical values for willingness-to-pay (λ) for 1 additional unit of outcome (eg, a 1-point difference in ADAS-Cog), net-benefits (NB) were calculated as:

$$\mathrm{NB} = \lambda^{*}\Delta E - \Delta C$$

The range of willingness-to-pay values was £0 to £6000 for all outcome measures except the QALY (£0 to £100,000). Resultant net-benefit values were used to plot cost-effectiveness acceptability curves (CEACs), showing the probability that MCST is a cost-effective addition to usual care. Probability values were derived from the normal cumulative distribution of NBs.

An advantage of using the SUR method is a gain in efficiency compared with ordinary least-squares regression methods.[24]

In additional subgroup analyses, we examined whether there was complementarity between MCST and use of AChEI medications by adding an interaction term to the regressions.

Sensitivity Analysis

We explored a societal perspective rather than health and social care perspective: we attached a cost to unpaid care time assuming an *opportunity cost* approach, with each hour of unpaid care set equal to national minimum wage (£6.00 per hour), which could represent the opportunity cost to carers of providing support, assuming they could alternatively be in employment.

A further sensitivity analysis examined cost-effectiveness after adjusting intervention costs to more closely resemble those expected outside a trial. The intervention cost would be lower, because MCST would be delivered by 2 members of staff in the care setting (costing £25 per session), with 1 taking 30 minutes to plan the session, an additional cost of £12.50 per session. It is also expected that staff will train for the intervention by reading the Maintenance CST manual[5] as opposed to receiving face-to-face training, as in the main analysis, eliminating the training cost component. In this scenario, average total cost per MCST session is £63.78 in care homes and £65.22 in community centers (less than half the cost in the main analysis).

However, we cannot estimate the impact that these changes would have on the *outcomes* from CST, and so adjusting costs down can only be a partial sensitivity analysis.

Results

Participant Characteristics

Data were collected for 236 people at baseline, 218 at 3 months and 199 at 6 months. Randomization produced relatively well-balanced samples: there was a slight imbalance with regard to marital status.[5]

Outcomes

At 6 months, self-rated quality of life measured by QoL-AD was higher for the MCST group than for controls, but there was no intergroup difference in cognition measured (ADAS-Cog or any secondary outcomes). At 3 months, there were no intergroup differences

Table 1
Use of Services, Equipment, Adaptations, and Medications by Allocation Group and Time Point

Variable	Control		Intervention	
Prebaseline (7 wk)				
Residential care	56	54%	56	49%
Hospital services	24	23%	32	28%
Day services	85	82%	98	86%
Equipment and adaptations	13	13%	17	15%
Community services	36	35%	53	46%
Medications	97	93%	110	96%
n	104	100%	114	100%
1–3 mo				
Residential care	56	54%	55	48%
Hospital services	39	38%	39	34%
Day services	84	81%	95	83%
Equipment and adaptations	17	16%	15	13%
Community services	44	42%	56	49%
Medications	102	98%	109	96%
n	104	100%	114	100%
4–6 mo				
Residential care	49	53%	49	46%
Hospital services	30	32%	35	33%
Day services	77	83%	92	87%
Equipment and adaptations	11	12%	17	16%
Community services	37	40%	52	49%
Medications	88	95%	102	96%
n	93	100%	106	100%

Table 2
Health and Social Care and Societal Perspective Costs, Including Intervention Costs, by Allocation Group and Time Point

	Control	Intervention	Difference Between the Groups		
	Mean (SD)	Mean (SD)	Mean Difference	*P* Value	Adjusted *P* Value
Health and social care perspective					
Prebaseline (7 wk), n	104	114			
Residential care	2688.6 (2682.5)	2380.1 (2643.6)	308.5	.4	.33
Hospital services	84.7 (274.2)	73.4 (215.2)	11.3	.73	.65
Day services	172.6 (325.3)	193.7 (389.7)	−21.1	.66	.86
Equipment and adaptations	2 (7.3)	2.3 (7.6)	−0.3	.76	.73
Community services	185.4 (338.8)	218.9 (310.4)	−33.5	.44	.72
Medications	98.4 (88.3)	127.4 (97)	−29	.02	.02
CST intervention	174.2 (68.1)	164.2 (54.7)	10	.23	.51
Total costs	3405.9 (2407)	3160 (2383.7)	245.9	.45	.36
1–3 mo, n	104	114			
Residential care	4563.9 (4513.5)	4072.2 (4564.8)	491.7	.42	.36
Hospital services	164.4 (425.4)	169.3 (433.2)	−4.9	.93	.88
Day services	401.6 (920.6)	440.1 (894.7)	−38.5	.75	.82
Equipment and adaptations	8.8 (39.6)	8.8 (44.1)	0	1	.94
Community services	509.7 (872.6)	494.1 (741.8)	15.6	.89	.14
Medications	178.6 (146.1)	197.2 (147.5)	−18.6	.34	.45
MCST intervention	—	299.9 (140.4)	—	—	—
Total costs	5826.9 (4083.5)	5681.5 (4062.4)	145.4	.79	.14
4–6 mo, n	93	106			
Residential care	4591.1 (4615.7)	4023.1 (4571.9)	568	.38	.4
Hospital services	142.5 (386)	147.7 (407.9)	−5.2	.93	.95
Day services	280.4 (623.2)	421.1 (991.7)	−140.7	.22	.33
Equipment and adaptations	10.9 (45)	6 (16.3)	4.9	.33	.29
Community services	473.3 (847.6)	471.6 (740.2)	1.7	.99	.09
Medications	193.8 (163.5)	194.8 (140.4)	−1	.97	.94
MCST intervention	—	322.5 (224.5)	—	—	—
Total costs	5692 (4132.7)	5586.8 (4033.7)	105.2	.86	.53
1–6 mo, n	93	106			
Residential care	9116.4 (8930.7)	8157.8 (9092)	958.6	.45	.94
Hospital services	268.7 (497.8)	302.2 (569.4)	−33.5	.66	.7
Day services	696.1 (1471)	858.5 (1646)	−162.4	.47	.77
Equipment and adaptations	20.3 (84.2)	14.1 (52.9)	6.2	.54	.37
Community services	963.4 (1662.1)	958.2 (1397.2)	5.2	.98	.09
Medications	375.1 (289.6)	391.2 (269.5)	−16.1	.68	.9
MCST intervention	—	623.8 (341.4)	—	—	—
Total costs	11440 (7971.6)	11305.7 (7873)	134.3	.91	.24
Societal perspective					
Prebaseline (7 wk), n	104	114			
Total health and social care costs	3405.9 (2407)	3160 (2383.7)	245.9	.45	.36
Unpaid carer costs	680.3 (1126.6)	1053.5 (1659.8)	−373.2	.05	.03
Total societal costs	4086.2 (1982.2)	4213.5 (2036.3)	−127.3	.64	.02
1–3 mo, n	104	114			
Total health and social care costs	5826.9 (4083.5)	5681.5 (4062.4)	145.4	.79	.14
Unpaid carer costs	1655 (3163.8)	2572.2 (3894.2)	−917.3	.05	.1
Total societal costs	7481.9 (3517.2)	8253.7 (3549.8)	−771.8	.11	.02
4–6 mo, n	93	106			
Total health and social care costs	5692 (4132.7)	5586.8 (4033.7)	105.2	.86	.53
Unpaid carer costs	2053.1 (3666.7)	2820.4 (4228.2)	−767.3	.17	.78
Total societal costs	7745.2 (3633)	8407.2 (3680.9)	−662.1	.2	.56
1–6 mo, n	93	106			
Total health and social care costs	11440 (7971.6)	11305.7 (7873)	134.3	.91	.24
Unpaid carer costs	3752.4 (6416.2)	5504.4 (8089.7)	−1752	.08	.34
Total societal costs	15192.4 (6294.1)	16810.1 (6757.7)	−1617.7	.08	.12

on the 2 primary outcomes, but the MCST group had significantly better proxy-rated quality of life (both QoL-AD and DEMQOL) and ADLs (ADCS-ADL).[5]

Service Use

The groups are quite balanced at baseline in relation to service utilization (Table 1), although the usual care group make more use of residential services, and symmetrically less use of community services. This gap in residential care use widened slightly post-baseline. This intergroup difference was not a randomization failure, but a consequence of sample attrition: individuals in the intervention group were less likely to drop out of the study if living in the community and more likely to drop out if living in a care home. It may be that individuals in the community received more support from their family carers to participate.

Over the study period, there were few changes in service use patterns, except that both groups used more hospital services.

Costs

Cost of MCST itself averaged £623 per participant. Looking across all health and social care service costs, residential care was the single largest single item (Table 2). Consistent with service use patterns, average residential care costs looked slightly higher in the control than intervention group because slightly more people in the usual

Table 3
Incremental Cost-Effectiveness Ratios Over 1 to 6 Months

	Incremental Cost	Incremental Effect	ICER
	(£, 2010/11) Mean [95% Bootstrap CI]	Mean [95% Bootstrap CI]	
MCST vs TAU (health and social care perspective)			
1–6 mo			
ADAS-Cog	473.89 [−315.45–1263.23]	−0.65 [−4.08–2.77]	TAU dominant
QoL-AD	473.46 [−315.61–1262.53]	1.78 [−0.39–3.95]	266
MMSE	474.01 [−316.15–1264.17]	0.85 [−0.48–2.18]	558
ADCS-ADL	471.57 [−317.67–1260.81]	0.95 [−2.50–4.39]	498
Proxy QoL-AD	472.70 [−314.60–1260.01]	0.07 [−1.63–1.76]	7050
Proxy DEMQOL	472.31 [−338.46–1283.07]	1.13 [−2.48–4.74]	419
QALY (EQ-5D)	474.81 [−314.38–1263.99]	0.0013 [−0.0200–0.0223]	365,276
QALY (Proxy EQ-5D)	473.60 [−315.48–1262.68]	0.0176 [−0.0050–0.0403]	26,835
QALY (DEMQOL)	518.39 [−346.60–1383.39]	0.0039 [−0.0092–0.0170]	132,539
QALY (Proxy DEMQOL)	401.52 [−441.99–1245.04]	0.0062 [−0.0049–0.0173]	64,785
ACHEIs/MCST vs ACHEIs			
1–6 mo			
ADAS-Cog	465.57 [−781.21–1712.35]	0.74 [−7.86–9.34]	630
QoL-AD	466.17 [−780.11–1712.45]	0.78 [−3.76–5.33]	597
MMSE	465.55 [−781.46–1712.55]	2.63 [−0.97–6.22]	177
ADCS-ADL	468.22 [−777.54–1713.97]	1.47 [−7.63–10.57]	319
Proxy QoL-AD	466.90 [−779.24–1713.03]	−0.37 [−4.90–4.16]	ACHEIs dominant
Proxy DEMQOL	468.75 [−779.83–1717.33]	4.81 [−7.11–16.74]	97
QALY (EQ-5D)	464.72 [−783.02–1712.46]	0.0257 [−0.0178–0.0692]	18,068
QALY (Proxy EQ-5D)	465.88 [−780.99–1712.75]	0.0262 [−0.0190–0.0714]	17,787
QALY (DEMQOL)	494.01 [−819.14–1807.17]	0.0004 [−0.0498–0.0505]	1,308,421
QALY (Proxy DEMQOL)	360.43 [−913.85–1634.72]	0.0025 [−0.0304–0.0354]	143,979
MCST vs TAU (societal perspective)			
1–6 mo			
ADAS-Cog	1143.07 [−336.50–2622.63]	−0.64 [−4.06–2.79]	TAU dominant
QoL-AD	1143.14 [−335.45–2621.73]	1.78 [−0.40–3.95]	643
MMSE	1145.46 [−333.57–2624.50]	0.85 [−0.48–2.18]	1350
ADCS-ADL	1137.30 [−344.55–2619.15]	0.98 [−2.50–4.46]	1162
Proxy QoL-AD	1138.41 [−340.40–2617.23]	0.07 [−1.62–1.76]	15,258
Proxy DEMQOL	1137.73 [−356.55–2632.02]	1.13 [−2.48–4.74]	1004
QALY (EQ-5D)	1145.72 [−332.72–2624.16]	0.0013 [−0.0197–0.0222]	882,801
QALY (Proxy EQ-5D)	1142.78 [−338.64–2624.20]	0.0176 [−0.0050–0.0403]	64,842
QALY (DEMQOL)	1574.56 [−176.49–3325.60]	0.0039 [−0.0092–0.0171]	400,993
QALY (Proxy DEMQOL)	1259.07 [−252.22– 2770.36]	0.0061 [−0.0050–0.0173]	205,079
MCST vs TAU (implementation of the intervention "in practice")			
1–6 mo			
ADAS-Cog	121.04 [−669.32–911.39]	−0.65 [−4.08–2.77]	Usual care dominant
QoL-AD	120.56 [−669.51–910.64]	1.78 [−0.39–3.95]	68
MMSE	121.20 [−669.91–912.31]	0.85 [−0.48–2.18]	143
ADCS-ADL	118.81 [−671.40–909.01]	0.95 [−2.50–4.39]	126
Proxy QoL-AD	119.81 [−668.30–907.91]	0.07 [−1.63–1.76]	1786
Proxy DEMQOL	117.07 [−693.74–927.88]	1.13 [−2.48–4.74]	104
QALY (EQ-5D)	122.08 [−668.07–912.23]	0.0013 [−0.0200–0.0223]	93,912
QALY (Proxy EQ-5D)	120.74 [−669.30–910.78]	0.0176 [−0.0050–0.0403]	6841
QALY (DEMQOL)	162.13 [−701.89–1026.15]	0.0039 [−0.0092–0.0170]	41,425
QALY (Proxy DEMQOL)	47.51 [−797.21–892.24]	0.0062 [−0.0049–0.0173]	7666

TAU, Treatment as Usual.

care–only group were living in care homes, although mean difference was not statistically significant. In fact, the only significant cost difference between MCST and usual care–only groups was for medications (at baseline only).

Total health and social care costs over 6 months were slightly but not significantly lower for the MCST group (£11,306 vs £11,440); however, this comparison does not adjust for baseline covariates, in particular that the MCST group had slightly lower costs than the usual care–only group before baseline. The cost-effectiveness analyses adjusted for these covariates, showing that the intervention group was more costly than the control group (see the next section).

Cost-Effectiveness (at 6 Months)

By 6 months, and after adjustment for baseline covariates, participants receiving MCST plus usual care had slightly but not significantly *higher* health and social care costs than participants receiving usual care alone. The adjusted intergroup cost difference ranges between £401 and £518 (Table 3) depending on the outcome being analyzed (because this affects baseline measures used in statistical adjustment).

Combining costs and outcomes we generate the ICERs (Table 3). Mean cost per 1-point difference on QoL-AD was £266. Looking at the CEAC for this outcome, the probability that MCST would be seen as cost-effective is 90% at willingness-to-pay of about £1400 (Figure 1). There are no established willingness-to-pay thresholds for QoL-AD against which to compare this finding, but for a 1-point difference on a 40-point scale, a cost of only £1400 looks modest.

Based on previous studies,[2] the effect size of "standard" CST on QoL-AD scale is 0.4 SD, which is a modest increment. In this study the difference at follow-up for MCST was 1.78 points (0.34 SD). A 2-point difference in QoL-AD can be considered clinically significant, and costs only £2800 to achieve.

For ADAS-Cog, the probability that MCST would be seen as cost-effective was low across all willingness-to-pay values (Figure 2).

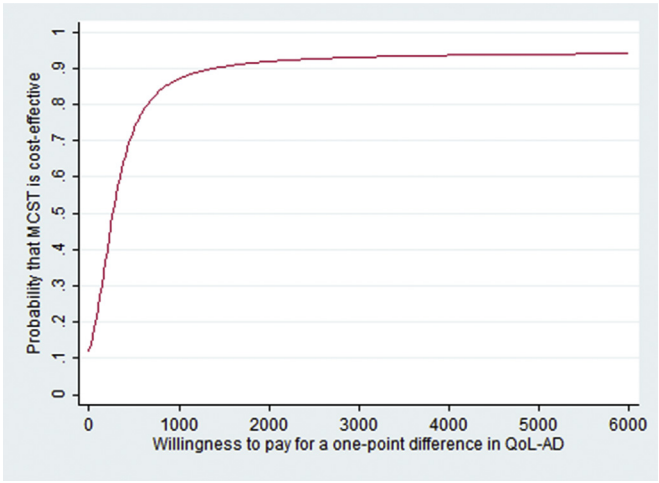

Fig. 1. Cost-effectiveness acceptability curve: MCST vs usual care; 6 months, health and social care perspective, with effectiveness measured on the QoL-AD scale.

Although there was no significant intergroup difference on the MMSE, the cost-effectiveness analyses suggest that MCST would be a cost-effective addition to usual care at low willingness-to-pay thresholds. Howard et al[19] suggested that a difference of 1.4 on MMSE is clinically significant; the mean cost of achieving this difference through MCST is £781.

When QALYs were measured using proxy EQ-5D ratings, mean ICER was £26,835; from the CEAC the probability that MCST would be cost-effective was 40% at the £20,000 threshold associated with National Institute for Health and Clinical Excellence (NICE) recommendations, and 54% at the £30,000 threshold.[25] For none of the other QALY measures was there evidence that MCST would be cost-effective (Table 3).

Interaction With Use of ACHEIs

Examination of the impact of ACHEI use on the effectiveness of MCST found no significant differences in outcomes except MMSE, adjusting for baseline covariates.[5] Participants taking ACHEI medications randomized to MCST had the smallest decline in cognitive functioning; participants taking ACHEIs randomized to usual care—only had the largest.

Total health and social care (including intervention) costs over 6 months were £7248 for participants randomized to MCST taking ACHEIs, £13,482 for participants randomized to MCST *not* taking ACHEIs, £9256 for the usual care group taking ACHEIs, and £12,381 for the usual care group *not* taking ACHEIs. On average, individuals not taking ACHEIs made greater use of health and social care resources. An interaction term for MCST and ACHEI in the SUR regressions showed a positive interaction between MCST and ACHEI for MMSE, significant at 3 months (bootstrapped coefficient = 2.39, $P = .06$) and almost significant at 6 months (bootstrapped coefficient = 2.63, $P = .11$). Mean ICERs are reported in Table 3. By reference to self-reported and proxy-rated EQ-5D, MCST in combination with ACHEI appears more cost-effective than ACHEI treatment with usual care, with mean ICERs below the NICE £20,000 threshold.[25]

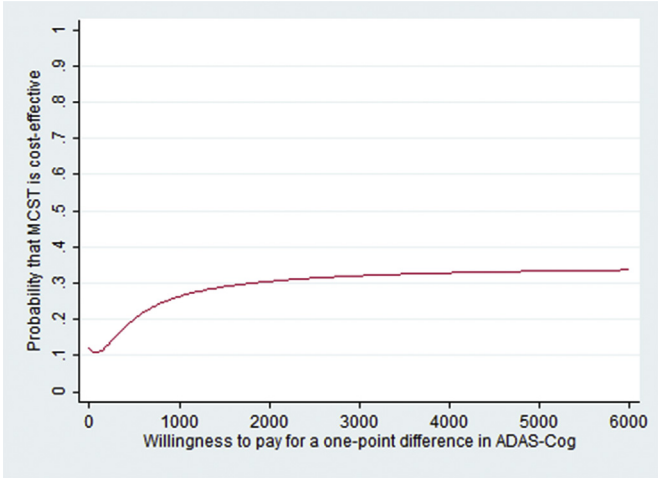

Fig. 2. Cost-effectiveness acceptability curve: MCST vs usual care; 6 months, health and social care perspective, with effectiveness measured on the ADAS-Cog scale.

Sensitivity Analyses

We repeated the analyses from a societal perspective. When looking at unadjusted differences, unpaid carer costs were not significantly higher at 5% level for the MCST group compared with the usual care—only group over 6 months (Table 2). Adjusted differences were not significant for most aggregates, with the exception of pre-baseline unpaid carer and total costs.

Estimated ICERs from the societal perspective show that usual care dominated MCST when looking at ADAS-Cog (Table 3). For QoL-AD, the estimated ICER was £643 over 6 months. Assuming MCST costs more closely resembling those in standard practice showed that MCST was more cost-effective than usual care (Table 3). In particular, the ICER for QoL-AD decreased to £68 over 6 months. Among secondary outcomes, the ICER was £143 for each 1-point difference on MMSE and £126 for each 1-point difference on ADCS-ADL. Cost per QALY was quite low: £6,841 when generated from proxy-rated EQ-5D and £7666 from proxy-rated DEMQOL over 6 months.

Discussion

Summary

Previous studies show that CST is effective in improving cognition and quality of life[2] and cost-effective.[3] CST is endorsed in NICE clinical guidelines.[6] Orrell et al[5] showed that people with dementia receiving CST who then continue with the therapy for another 24 weeks had better quality of life at 6 months compared with people who instead continued with usual care. Adjusting for baseline covariates, health and social care costs for MCST were slightly although not statistically significantly higher than for usual care—only.

The 2 primary outcomes for the trial were quality of life measured by QoL-AD and cognition measured by ADAS-Cog. On the former, MCST was cost-effective compared with usual care at 6 months; on the latter, MCST was not cost-effective at 6 months.

Four of 8 secondary outcome measures in the study were QALY measures. Results were mixed. MCST was cost-effective for cognition measured by MMSE, ability in ADLs, and proxy-rated quality of life measured by proxy QoL-AD and proxy DEMQOL. For QALYs calculated from proxy EQ-5D, MCST was also cost-effective against the NICE threshold of £30,000 per QALY. For the remaining 3 QALY outcomes, MCST was not cost-effective at 6 months.

Sensitivity analyses conducted from a societal perspective again produced mixed cost-effectiveness findings.

Subgroup analyses found that combining MCST and ACHEI was more cost-effective than ACHEI and usual care by reference to a number of outcomes, including cost per QALY.

Comparison With Other Studies

There is only 1 previous economic evaluation of CST: CST delivered twice-weekly over 7 weeks was cost-effective, with mean cost per incremental difference in MMSE of £75, and mean cost per incremental difference in QoL-AD of £23 (from a health and social care perspective).[3] In the present study, cost per incremental difference on these same 2 measures at 6 months, even allowing for price inflation over time, was much higher (£558 and £266, respectively). The earlier study also found a significant improvement in cognition measured by ADAS-Cog; there was no similar difference in our new study. These results may arise because the usual care group in the current study continued to experience benefits from their initial 7 weeks of CST. Although based on relatively few studies, the Cochrane review of cognitive stimulation[2] suggested that benefits in terms of cognition were evident, for example, 3 months after the end of CST.

Although there have been numerous economic studies of medications for treating dementia,[26] none has looked at interactions with CST to allow comparison with the present trial.

Strengths and Limitations

Orrell et al[5] discuss a number of strengths and limitations of the trial. One limitation of the economic analysis is that unpaid carers or care staff who completed proxy ratings were not blind to treatment allocation, opening up the risk of detection bias. Some cost-effectiveness advantages found for MCST, at 3 and 6 months, were based on proxy ratings.

Studies that compare usual care with an intervention added to usual care, and which recruit across multiple sites, have the advantage that "usual care" potentially reflects a *range* of treatment and care arrangements, making it easier to generalize findings to other contexts. On the other hand, variation in what constitutes "usual care" between sites may affect outcomes and costs. However, there was no site-related imbalance in the randomization procedure in this pragmatic trial, and the cost-effectiveness analyses adjusted for site.

A common limitation of economics studies in the dementia field is uncertainty surrounding the costing of unpaid care. It is inherently difficult to measure time spent supporting someone with dementia, and there are various ways to attach costs to that time. These uncertainties only affect analyses from a societal perspective.

The EQ5D and DEMQOL-based QALY measures do not provide consistent cost-effectiveness findings. This is not unexpected, because EQ-5D is a generic quality-of-life indicator, whereas DEMQOL is dementia-specific. Previous studies have shown that for people with dementia, self-rated and proxy quality-of-life measures often have low levels of overall agreement and therefore cannot be assumed to substitute for each other (eg, Arons et al[27]). For these reasons, we have reported results using both approaches.

Implications for Policy and Practice

The importance of promoting new strategies for improving care and support for people with dementia was highlighted in the formal declaration from the G8 Dementia Summit, December 2013: "We [Health and Science Ministers] … call for greater innovation to improve the quality of life for people with dementia and their carers while reducing emotional and financial burden." Our new study of the cost-effectiveness of maintenance CST contributes modestly to the evidence base.

The economic case for continuing CST beyond an initial 7-week twice-weekly program is mixed. Although maintenance CST did not increase health and social care costs (or costs of unpaid care), outcome gains were modest over 6 months. On economic grounds, a case could be argued for adding MCST to usual care if the outcomes of primary concern are self-rated quality of life, interviewer-rated cognition (measured by MMSE), or proxy-rated QALYs (from the EQ-5D). But the economic case for MCST cannot be made by reference to other outcomes: it was not that MCST participants fared less well as assessed by those other measures, but that the small (even if insignificant) increase in costs associated with MCST did not appear to be justified by the outcomes. Following a research stream recommended by NICE, we found that combining MCST with ACHEI medication has economic advantages over ACHEI with usual care alone. Moreover, MCST looks more cost-effective than usual care when costs are used that more closely resemble those in standard practice. Rolling out MCST more widely (beyond the research context) might therefore have economic advantages, although we do not know from this study whether outcomes would be different.

Acknowledgments

We thank all the trial participants, their carers, center managers, center staff, a range of health care practitioners, and Lauren Yates, Kier Yong, Linda Smith, Deepak Shankar, and Caroline O'Haire for data collection and entry, and completion of trial documentation. The study was approved by the Barking and Havering Local Research Ethics Committee, ethical approval reference number: 08/H0702/68 in October 2008. The dataset is available from the corresponding author at damico@lse.ac.uk. Participants' consent was obtained, but the data presented are anonymized and risk of identification is low.

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