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Cognitive stimulation for the treatment of Alzheimer's disease

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In recent years, there has been an increase in the recognition and use of psychosocial interventions for dementia. This has coincided with an increase in high-quality research in the area, and restrictions in the use of drug therapies for Alzheimer's disease in the UK. Cognitive stimulation therapy (CST) is a brief group treatment for people with mild-to-moderate dementia, based on the theoretical concepts of reality orientation and cognitive stimulation. It involves 14 sessions of themed activities which typically run twice a week over a 7-week period. A multicenter, randomized controlled trial showed significant benefits in cognition and participant-rated quality of life when comparing CST versus no treatment. These benefits in cognition were comparable to those gained through medication, and CST also proved to be cost-effective. Influenced by this research, the latest guidelines released by NICE recommended cognitive stimulation only as an intervention for treating the cognitive symptoms of dementia. This perspective describes how CST was developed and evaluated, its use in clinical settings and issues for future investigation, such as individualized CST.

KEYWORDS: Alzheimer's disease • cognitive stimulation • CST • dementia • group therapy • quality of life

In the UK, over 600,000 older people have dementia, the most common type, comprising about 70% of cases, being Alzheimer's disease [1]. Dementia has an immense social and economic impact on health and social care services, and on family carers. Drug treatments such as cholinesterase inhibitors have an important role in dementia care, but have a limited impact on the illness and are not suitable for all patients. Psychosocial treatments for dementia, such as reality orientation (RO) have been used in the UK and internationally for 50 years. However, there has historically been a paucity of high-quality research on their effectiveness, with studies being either small, of poor methodological quality, or both [2]. However, in the UK in recent years, increased emphasis has been placed on the value of psychosocial interventions for dementia. There appear to be a number of factors driving this changing culture. First, the controversial guidance produced by NICE [3] only recommends the use of dementia medication for people with Alzheimer's disease scoring between 10 and 20 on the Mini-Mental State Examination (MMSE) [4] (i.e., people with moderate-to-severe dementia). This leaves many

people with early dementia with no treatment options, possibly with untoward psychological consequences. Second, the evidence-base for psychosocial therapies is growing, owing to increasingly rigorous research (including randomized controlled trials [RCTs]) being published. Third, there is an increased emphasis on the importance of quality of life (QoL) for people with dementia, in addition to cognitive change [5]. Some psychosocial studies have shown that QoL can improve as a result of interventions such as cognitive stimulation therapy (CST) [6].

The 2006 NICE-Social Care Institute for Excellence (SCIE) guidelines for dementia, under 'interventions for cognitive symptoms and maintenance of function', recommended that "people with mild/moderate dementia of all types should be given the opportunity to participate in a structured group cognitive stimulation program. This should be delivered irrespective of any antedementia drug received by the person with dementia" [3]. This recommendation recognized CST as the nonpharmacological treatment of choice for the cognitive symptoms of dementia and was based on the

strong evidence-base for its effectiveness, including the recent clinical trial of CST by Spector and colleagues [6], which is the focus of this review.

What is cognitive stimulation?

The first influential work described as ‘cognitive stimulation’ was published by a research team in France [7]. They argued that the adult brain has the potential for regeneration, demonstrated, for example, through rehabilitation following a stroke. They developed a program entitled ‘cognitive stimulation’, which aimed to apply similar strategies of rehabilitation for people with dementia, primarily Alzheimer’s disease. Their treatment aimed to capitalize on preserved skills, such as implicit memory, and the use of mental imagery, which they used to stimulate encoding, consolidation and retrieval of information. Their intensive 5-week program, evaluated as a RCT with 56 participants, led to significant cognitive changes in a sample primarily with Alzheimer’s disease (90%). Activities included word association and categorizing words and objects.

In many ways, this intervention appeared to be a more actively engaging version of RO, a treatment for dementia which has been in use for several decades [8]. RO involves the presentation, repetition and use of time, place and person-related orientation material, either throughout the day or in a group basis. It had an important influence in the 1960s and 1970s, as it was probably the first approach that aimed to improve the cognitive abilities of people with dementia. By the 1980s, it became subject to criticism, for example, for being insensitive to the needs of the individual [9]. In the literature, it was often presented as a rote and uninspiring intervention. However, a *Cochrane* systematic review on RO for dementia [10], combining the results of six RCTs, found significant benefits in both cognition and behavior following RO. Additionally, RO was found to be more beneficial than generic ‘social activities’, suggesting that there was something specific to the approach which was rehabilitative.

One of the most influential studies on cognitive stimulation to date was carried out by the authors in a large randomized controlled clinical trial based at University College London [6]. Their aim was to develop a new group treatment for people with dementia, based on the evidence of what works from past research studies. In addition to conducting the systematic review on RO, Spector and colleagues reviewed the literature on other nonpharmacological therapies, for example on reminiscence therapy, highlighting good quality studies with positive outcomes. Drawing on the RO review, along with this more general literature review, they extracted features from individual programs that appeared to be effective. An initial pilot program [11] was then modified into a new 14-session program. It was named CST because it was significantly influenced by the work of Breuil *et al.*, who at the time presented a treatment with the strongest methodology and results [7].

CST was evaluated as a multicenter, single-blind RCT [6]. A total of 201 participants were recruited in 23 centers: 18 residential homes and five day centers. All participants met the Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV criteria for dementia and scored between 10 and 24 on the MMSE with an average score of 14 (indicating moderate dementia). Other inclusion criteria were an absence of any significant visual or auditory impairment, learning disability or major physical health problem, as all may have interfered with their participation. No participants were on acetylcholinesterase inhibitors.

CST treatment

The 14 CST sessions each fell within general themes as follows:

- Physical games
- Sound
- Childhood
- Food
- Current affairs
- Faces/scenes
- Word association
- Being creative
- Categorizing objects
- Orientation
- Using money
- Number games
- Word games
- Team quiz

Each session lasted for 45 min and started with the same warm-up activity, usually throwing a soft ball between participants and getting them to state, for example, their name or favorite food. In the first session, the group selected a name for itself and a song to be sung at the beginning of each session. Attention was drawn to a board used to display information such as the day and date, name of group and members, and an item in the news headlines (which was discussed). Groups, led by a researcher and a member of staff within the setting, ran twice a week for 7 weeks. The control participants received treatment as usual, which usually involved doing no structured activity whilst the groups were being run.

CST was designed to stimulate people in an implicit, natural way, reducing the anxiety that can accompany feeling ‘put on the spot’. For example, in the faces session, participants were shown a selection of faces from the past. Discussion involved what the characters had in common, how they differed, who was more attractive, and so on. This usually enabled recall of names without people being directly questioned. Sessions involved multisensory stimulation; for example, matching common sounds to pictures. Reminiscence was integrated as a means of orientation; for example, through comparing old and

new coins and prices. Finally, each session was designed to be flexible, providing a choice of activities to cater for the groups' needs and abilities.

Results from the CST trial

The main finding was the significant benefit for the treatment compared with the control group in two measures of cognitive function: the MMSE (a brief measure of cognitive function) and the Alzheimer's Disease Assessment Scale – Cognition (ADAS-Cog) [12], a more detailed measure of cognition used routinely in drug trials. On the MMSE, the treatment group improved on average by 0.9 points and controls deteriorated by 0.4 points, with an effect size of 0.32. There was also a significant difference between the treatment and control group in QoL using the QoL scale in Alzheimer's disease (QoL-AD) [5]. This involved asking participants to rate their own QoL on a Likert scale, covering 13 domains in a structured interview. Of interest, the improvement in cognition appeared to directly contribute to improvement in perceived QoL [13]. There were no significant changes following CST in the other areas investigated (depression, anxiety, behavior and communication). An intention-to-treat analysis was used.

The cost-effectiveness of CST was analyzed by a team at the London School of Economics [14]. The analysis involved balancing the benefits following CST (in both cognition and QoL) with the costs of implementing the treatment. The results revealed that CST is relatively inexpensive and that it is more cost-effective than treatment as usual. It has been demonstrated that a 1-point difference on the MMSE is associated with a substantial reduction in the costs of caring for patients with dementia [15], indicating that this is a clinically relevant benefit.

Limitations

As mentioned previously, it is unclear whether CST has any lasting benefits, as there was no long-term follow-up. It is hard to identify to what extent the benefits shown were a result of CST *per se*, or due to more nonspecific benefits obtained when offering any group activity. An active social control group was omitted for two reasons. First, the RO systematic review showed that RO led to significant benefits in cognition, even when using a social control group; and CST has a similar theoretical basis to RO. Second, identifying an appropriate control activity with no cognitive element is complex, and most well-run group activities will automatically lead to nonspecific benefits such as enjoyment. However, an absence of a social control group is a limitation to this study. Finally, none of the scales rated by the staff (e.g., mood, behavior and communication) showed significant improvements for the CST group. In many cases, it was difficult to get the same staff member to complete pre- and post-treatment measures, and their perceptions about the groups may have resulted in bias.

Why might CST be effective?

An optimal learning environment is formed through creating consistency between sessions, through the same warm-up activities, the use of the group name and song, and the RO board. Additionally, cues are provided to aid retrieval and there is an emphasis on implicit (rather than explicit) learning. There is increasing evidence that people with dementia can learn and be rehabilitated [16], and evidence that mental stimulation can lead to an increase in cognitive reserve [17]. More generally, CST is a person-centered approach, aimed to cater to the needs, abilities and interests of the group. People are given the chance to give their opinions and make a contribution, working directly against what Kitwood described as a 'malignant social psychology' [18]. The groups positively reinforced questioning, thinking and interaction, something which might not always occur in care settings. There were some therapeutic elements, which would be expected within a group setting, such as an awareness that others are in the same position to oneself, and an enjoyable social experience.

These ideas remain hypotheses. Future research might address them further, for example through evaluating which elements of cognition (e.g., memory, language or visuospatial skills) are more susceptible to change or conducting qualitative research investigating what carers believe may have led to changes.

Is CST more effective for particular types of dementia?

The original cognitive stimulation work used a sample of which 90% has a diagnosis of Alzheimer's disease [7]. In the large CST trial, dementia subtype was not ascertained for many participants, and therefore not analyzed. This was primarily because many people, whilst meeting the diagnostic criteria, had not been given a formal diagnosis, and establishing the type of dementia may require further investigations, including neuropsychological testing and imaging. This would have been beyond the scope of the research, and there was no reason to believe that the subtype of dementia would impact on their experience of CST.

Using CST in clinical practice

A comprehensive CST training manual is available [19]. The manual includes the guiding principles of CST, a session by session plan, details of equipment needed and ways of monitoring progress. A 1-day certified training course in CST is also available. CST was designed to be delivered by anyone working with people with dementia, such as nurses, occupational therapists, care staff and psychologists, provided they follow the manual, have some training in dementia care and receive supervision and support.

Group leaders require skills such as the ability to be person-centered and flexible, adapting the content of the sessions and their style of interaction according to the needs of the group.

For example, some people find orientation to reality empowering, others may find it distressing. Group leaders need to be able to manage individual and group dynamics, such as dealing with a participant who takes over the group and enabling quieter members to contribute. They also need to respond appropriately if somebody gets upset in the group; for example, if discussion brings up painful memories from the past. We found that many people in residential settings were not accustomed to groups and were generally demotivated. It was important to find a way of motivating and encouraging people to come to sessions, without pushing people against their will. To cope with and reflect on such issues, clinical supervision is essential. Past research and our clinical experience suggests that groups should ideally consist of between five and eight participants. This may be amended according to clinical judgment or the demands of the setting.

The results of the trial showed that some groups did better than others. One explanation might be that the impact of the broader environment affected how much CST impacted on people's functioning. For example, 1.5 h of CST a week may not have been sufficient to combat the negative, institutionalized living environment experienced in some residential homes. Another consideration is the make-up of the group. Within a research context, it is not possible to establish groups together according to people's interests and abilities. However, if CST is used in a clinical setting, consideration should be made as to which individuals fit well together. We observed that a good gender balance generally worked better than, for example, having four women and one man. We also found that groups worked better when participants were at similar stages of dementia, so that activities could be pitched at a level that suited most people. Additionally, people at earlier stages of dementia sometimes became frustrated with the more confused, which could disrupt the group process.

Finally, CST was designed as a twice-weekly intervention, yet this may not always be practical; for example, if people are traveling a distance to attend groups. Weekly CST groups, sometimes of longer duration, have shown great success in rural settings, including Bedfordshire and Hertfordshire.

Long-term effects

One thing that remains unclear is the effectiveness of CST over a longer period of time. A pilot study examined the effectiveness of maintenance CST (MCST), which involved 16 weekly sessions following immediately on from CST [20]. This longer treatment of nearly 6 months led to modest but continual improvements in cognition. However, this was a small pilot study and as such should be interpreted with caution. Other authors have demonstrated cognitive benefits from RO over 8- and 30-month periods, respectively [21,22]. A large RCT, evaluating the effectiveness of MCST over approximately 8 months (and then providing further follow-up), funded by a program grant from the National Institute for Health Research (NIHR),

has just begun. It is led by Professor Orrell and Dr Spector at University College London and Professor Woods at the University of Wales, Bangor, UK.

Cognitive stimulation & behavioral change

The two studies of cognitive stimulation reported [6,7] did not lead to any changes in behavior. Yet, cognitive communication stimulation [23], which focused on verbal communication, functional abilities of daily life and quality of life, seemed to help functional abilities. The intervention was designed to generalize to other areas; participants were given homework that involved their carers and were encouraged to participate in hobbies and activities at home. Interestingly, benefits in discourse and functional abilities were not present after the initial intervention, but emerged 8 months later, suggesting that benefits may have arisen from slowly changing habits in daily life (e.g., homework assignments). These findings suggest that people need to be encouraged and supported in their functional abilities, such as washing and dressing, in order to expect any improvements in behavior. Increased cognitive function is not sufficient to change behavior.

CST & medication

In the Spector *et al.* study, the measure of cognition used was the ADAS-Cog, which enabled the effects of CST to be directly compared with that of the drug trials [6]. A numbers needed to treat analysis revealed that for no deterioration or small improvements on the ADAS-Cog, CST was not quite as effective as rivastigmine, donepezil or galantamine. However, for larger improvements (4 points on the ADAS-Cog), CST was as effective as galantamine and tacrine and more effective than rivastigmine or low doses of donepezil.

There appears to be a good case for offering both CST and cholinesterase inhibitor medication for suitable patients. Three recent studies have looked at the combined effect of cognitive stimulation and donepezil for people with Alzheimer's disease. The first compared donepezil and RO/CST with RO/CST alone, finding enhanced cognition in participants receiving both treatments [24]. Another study compared the combined effect of cognitive-communication stimulation and donepezil with donepezil alone in a RCT of 54 people with mild-to-moderate Alzheimer's disease [23]. The stimulation program consisted of 8-weeks of 1.5-h sessions that covered discussions of current events, life story work and participant-led discussion on topics of their choice, such as music. After the 8-week intervention, staff met with individuals monthly, to keep them involved in activities which had been planned and to limit attrition up to the 12-month assessment interval. The donepezil plus stimulation group manifested a slower rate of decline in discourse function, functional abilities and global functioning, and showed reduced apathy and irritability compared with the donepezil-only group. However, most of these changes were not statistically significant and the authors suggested that more

intervention was necessary. Finally, a study comparing donepezil with donepezil plus CST found that the addition of CST seemed to slow the rate of cognitive decline better than donepezil alone [25]. In our new study of longer term CST, participants will also be offered cholinesterase inhibitor medication, provided they are willing and eligible.

Individualized cognitive stimulation

Carer-led, individualized CST/RO led to significant cognitive benefits when carers were trained in offering RO and provided with training manuals [24]. In addition to three CST/RO sessions a week, carers were encouraged to stimulate people with dementia in reality-based communication 2–3 times a day. Another study also found that individualized CST was better at improving cognitive outcomes than a number of individualized interventions [26]. Some people are not suitable for CST, for example because they do not want to be part of a group, and many people do not have access to it. There appears to be a real demand for an individualized version of CST, particularly by home carers; hence, the authors are planning to develop and evaluate an individualized version of CST in the near future. The work on cognitive communication stimulation suggests that future treatment might point towards group CST, combined with carers supporting and stimulating people at home, both cognitively and through their functional tasks [23].

Expert commentary

In the last 10 years, there has been a remarkable transformation of this area, from one of almost historical interest, to the current situation of an intervention widely regarded as being of some benefit to a large number of people with dementia. By the mid-1980s, research on RO, the precursor of cognitive stimulation, had virtually ground to a halt, except perhaps in Italy. Now, there is international research interest in CST, and indications of it being seen as an intervention that should be widely available. For example, in the UK, the National Audit Office report (2007) highlighted that cognitive stimulation is reported to be available in their area by 29% of community mental health teams for older people [27].

The evidence-base has grown in rigor, with large, multicenter trials now becoming available. The results from Spector *et al.*, where results on cognitive change varied between centers, help to explain the mixed results from previous small-scale, single center studies [6]. The development of valid and reliable self-report QoL measures has enabled the perspective of the person with dementia to be incorporated fully into the evaluation of the intervention.

Evaluating change in behavior and function through informant rating scales remains difficult; to some extent, such ratings are as informative about the informants as they are about the people with dementia, particularly where the behavior is seen as challenging. In care homes, there is the additional problem of consistency between raters, with staff changes and turnover meaning that different staff may rate on each occasion. Staff completing

the ratings will have had different levels of opportunity to have observed the behaviors in question, and keeping such informants blind to the treatment being received is difficult. Interestingly, in the Spector *et al.* study, all the significant findings related to aspects of the evaluation completed by the blind researcher directly with the person with dementia. None of the informant ratings showed significant change. In the community setting, where the informant is typically a family carer, at least a consistent rater can be identified, and if the intervention influences their perspective and perception, this is an important outcome in its own right. These are clearly areas where the evaluation technology needs to be developed and refined further.

Five-year view

There has been a huge interest in cognitive stimulation and 'brain training' in the general population, fuelled by the popular Nintendo computer game 'Dr Kawashima's brain training'. There have been suggestions in the media that such activity might be helpful in reducing the risk of developing dementia. This is based on findings of a link between maintaining participation in cognitively stimulating activities and a reduced risk of developing dementia in populations of older people [28,29]. However, it is worth noting that in these prospective studies, the cognitive activities were as diverse as reading, watching television, playing a musical instrument and dancing. Although cognitive training (repeated practice on specific cognitive tasks) has not been shown to have any benefits for people with dementia [30], it is likely that in the next 5 years there will be many attempts to develop and apply computerized cognitive stimulation/training to people with dementia. Some reports are already available [31] describing the use of an interactive multimedia internet-based system for people with dementia, with more promising results [32].

Within the next 5 years, we anticipate that CST will be seen as a basic expectation, with all care settings for people with dementia being required to provide stimulation. The major challenge will be in maintaining standards, and maintaining creativity and freshness, so that CST does not become a rote exercise and lose its person-centered aspects. Increasingly, we anticipate that family carers will be taught to use CST at home. It may be that increased availability of, and familiarity with, interactive computer delivered activities will be a great assistance to care settings and family carers in providing support and ideas for their own efforts.

Financial & competing interests disclosure

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Key issues

- Cognitive stimulation for people with dementia has been developed and evaluated in the last 10 years or so, and builds on previous work on reality orientation, within a person-centered care framework.
- A specific 7 week, 14 session, group cognitive stimulation therapy (CST) program has been evaluated in a multicenter randomized controlled trial, and benefits on both tests of cognition and self-reported quality of life were demonstrated.
- The effect sizes for cognition associated with CST were comparable to those reported for the cholinesterase inhibitors.
- CST appears to add to the benefits of cholinesterase inhibitors.
- Further work is needed to evaluate the longer term effects of CST. Preliminary indications suggest that once-weekly maintenance sessions are helpful for at least a further 6 months.
- CST can also be delivered successfully by family carers, and individual CST is also feasible. The extent to which the group and social context adds to its effects remain to be evaluated.
- Computerized cognitive stimulation training programs are being developed [32].
- Further information is available on the website: www.cstdementia.com.

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