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ISSUES AND INNOVATIONS IN NURSING PRACTICE

Effects of multi-sensory stimulation for people with dementia

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Background. Over recent years multi-sensory stimulation (MSS) has become an increasingly popular approach to care and is used in several centres throughout Europe. This popularity could be explained by the limited alternatives available to staff and a widely held belief that MSS is a friendly and highly humane approach. A randomized controlled trial was therefore essential to evaluate the effectiveness and extent of the benefits of MSS.

Aim. To assess whether MSS is more effective in changing the behaviour, mood and cognition of older adults with dementia than a control of activity (playing card games, looking at photographs, doing quizzes, etc.).

Methods. A total of 136 patients from three countries [United Kingdom (UK), the Netherlands and Sweden] were randomized to MSS or activity groups. Patients participated in eight 30-minute sessions over 4 weeks. Ratings of behaviour and mood were taken before, during and after sessions to

investigate immediate effects. Pre-, mid-, post-trial and follow-up assessments were taken to investigate any generalization of effects to cognition and behaviour and mood at home/on the ward or at the day hospital.

Results. There were limited short-term improvements for both the MSS and activity groups immediately after sessions, and limited short-term improvements between the groups during sessions. There were no significant differences between the groups when assessing change in behaviour, mood or cognition at home/on the ward or at the day hospital. In the UK, however, behaviour at the day hospital for both groups remained stable during the trial but deteriorated once the sessions had stopped, and active/disturbed behaviour at home improved but likewise deteriorated once sessions had stopped.

Conclusions. Overall, MSS was found to be no more effective than an activity in changing the behaviour, mood or cognition of patients with dementia in the shortor long-term.

INTRODUCTION

Multi-sensory stimulation (MSS), previously known as snoezelen (Hulsegge&Verheul 1987), originated as a leisure facility for people with learning disabilities. It is an approach aiming to stimulate the senses through the provision of unpatterned visual, auditory, olfactory and tactile stimuli, therefore providing an alternative to cognitive based activities. Preliminary investigations have suggested that MSS is beneficial for individuals with severe learning disabilities (Hutchinson& Haggar 1991, Long & Haig 1992, Ashby *et al.* 1995).

Using MSS with people with dementia has become increasingly popular (Hope 1997) in many countries (Holtkamp *et al.* 1997, Volicer *et al.* 1998). Empirical evidence has demonstrated the detrimental effects of sensory deprivation for normal individuals (Solomon *et al.* 1961), and the resulting behavioural problems for individuals with dementia (Loew & Silverstone 1971). The risks of sensory deprivation for those with dementia increase as individuals with dementia are usually older adults and, therefore, some degree of deterioration in the senses can be expected. For example, there may be a loss or reduction in sight, sound, taste, smell or touch. Furthermore, Bower (1967) has described how progressive neuronal losses, which occur in dementia, lead to impaired processing of sensory stimuli, making normal stimuli confusing.

Settings in which patients spend their time, such as longstay hospitals, have been shown to be unstimulating (Liederman *et al.* 1958), resulting in some degree of sensory deprivation. Norberg *et al.* (1986) reported a considerable risk that patients in the final stages of dementia may receive too little stimulation, or inappropriate stimulation such as doors slamming and patients screaming. In many care settings, meaningful sensual touch is limited, environments may lack sensory stimulatory properties, meals may be dull and bland, and bath times may be unstimulating (MacDonald 2002). It also becomes increasingly difficult for patients to become involved in activities such as reminiscence, board games and quizzes as cognitive abilities deteriorate (Nairn 1995). It is imperative, therefore, that stimulating activities are appropriate to a patient's cognitive level. It may be appropriate for such patients to receive MSS; however, a firm body of evidence is needed to support this claim. It is important to ensure that this vulnerable group is not subjected to costly, inappropriate or ineffective techniques.

Research in this area has been limited (Savage 1996, Morrissey & Biela 1997, Moniz-Cook 1998). Seven studies have been identified concerning the effect of snoezelen with individuals with dementia (Lancioni *et al.* 2002). Whilst studies have reported MSS to be worthwhile therapy (e.g. Moffat *et al.* 1993, Spaull *et al.* 1998), they have used small populations and have lacked control groups (Ellis & Thorn 2000), and in patients with advanced dementia, a lack of studies can in part be explained by a lack of appropriate outcome measures (Witucki & Twibell 1997). In several studies where positive 'within sessions' effects were seen, data were largely qualitative and based on small numbers of snoezelen sessions. Where positive 'immediate post-session' effects were seen, the improvement period was often short (between 5 and 10 minutes) (Lancioni *et al.* 2002).

For many years, three centres [United Kingdom (UK), the Netherlands and Sweden] have been using MSS and have collaborated clinically and in training. In the UK, separate research studies had also been conducted (Baker *et al.* 1997, 2001) and the Netherlands (Holtkamp *et al.* 1997). The three

centres combined their resources in a randomized controlled trial, comparing MSS to a credible control, employing standardized outcome measures. It was felt that an international study would enhance the generalizability of the findings, drawing together different approaches to care yet imposing core similarities. In earlier UK studies, the methodology was successful and practical (Baker *et al.* 1997, 2001). This was developed using patients from three centres to assess whether MSS was more effective than activity in changing the behaviour, mood and cognition of patients with dementia, both in the short- and long-term.

THE STUDY

Aim

This study aimed to test whether or not MSS is more effective than a control activity of playing cards, looking at photographs, doing quizzes, etc. in changing the behaviour, mood and cognition of older adults with dementia.

Method

The reporting method uses guidelines set out in the CONSORT statement (Begg *et al.* 1996). This is the accepted standard for reporting randomized controlled trials.

Design

The effect of eight standardized MSS sessions was compared with a credible control of eight activity sessions in patients with moderate to severe dementia using a randomized controlled trial design. Activity sessions were chosen as a control as they were frequently used with patients with dementia. Care was taken to ensure that MSS and activity sessions were similar, except on the elements that define MSS (Baker *et al.* 2001). However, one group (the Dutch activity group) received sessions from keyworkers familiar to them prior to the study.

The key elements of MSS were to place emphasis on all the senses (except taste). No intellectual or physical demands were placed on the individual and the stimuli presented were unpatterned and non-sequential. Light and sound effects were used, as well as materials for touching and smelling. Light effects included bubble tubes, fibre-optic sprays and moving shapes beamed across the walls. Sound effects included ‘new age’ or pseudo-classical music, which did not distract individuals from exploring other stimuli as familiar music would. Tactile stimulation used satin, cotton wool, shells, etc. Tactile boards made up, used different textures such as rough/smooth, warm/cold, and hard/soft. Sense of smell was stimulated using aromatherapy and lavender bags, etc. All these elements provided an atmosphere of trust, warmth and confidence, where patients could tell staff about their inner worlds through subtle responses such as facial expressions and touch. A non-directive or enabling approach was adopted by staff, in which they followed patients’ lead.

During activity sessions, intellectual and/or physical demands were placed on the individual and the approach was directive; patients were asked to take part in activities such as playing cards, quizzes, and looking at photographs. There was a clear aim and focus to the task. No intentional special multi-sensory experiences were introduced.

In both conditions, there was an internal session structure involving introduction to the session, carrying the session through and winding the session down. The number, frequency and length of sessions were equivalent, as were factors such as one-to-one staff attention and location of sessions. Staff in both approaches interacted in a positive way that provided a warm and safe environment for patients.

The design allowed for a comparison between two different approaches and also one could identify to what extent the specific aspects of MSS had an effect. The study was conducted simultaneously at three centres (UK, the Netherlands and Sweden) between 1996 and 2001. In UK, participants were patients of a day hospital (i.e. they returned to their homes in the evening); in the Netherlands and Sweden participants were residents of a psycho-geriatric ward (i.e. they live on the ward). The study co-ordinator visited each centre to ensure that assessments and procedures were carried out consistently. Researchers from participating countries attended regular meetings to discuss progress, clarify uncertainties and make procedural agreements.

Participants

Apatient was eligible to participate in the study when informed consent was obtained from the consultant psychiatrist and family members, they had a diagnosis of Alzheimer's, vascular or mixed dementia, there were no major psychiatric comorbidities, they were not confined to bed, and they had moderate to severe cognitive impairment as classified by pretrial MMSE scores of 0–17 (Tombaugh&McIntyre 1992).

A total of 136 patients were included: 94 from the UK (MSS, $n = 44$; activity $n = 50$); 26 from the Netherlands (MSS, $n = 13$; activity $n = 13$) and 16 from Sweden (MSS, $n = 8$; activity, $n = 8$). Average age of the MSS group was 81 and 83 years in the activity group. Data used here include data used in Baker *et al.* 2001 ($n = 50$).

Procedure

Patients fulfilling the criteria were randomly assigned to either eight MSS or activity sessions twice a week for 4 weeks. Randomization was created using the PEPI epidemiology software package (Abramson & Gahlinger 1999).

Sessions lasted 30 minutes, unless the participant expressed a desire to leave. They took place on a one-to-one basis with the same keyworker wherever possible (keyworkers were nursing staff, occupational therapists or psychology assistants, who all received equivalent training). Fully equipped MSS rooms were available in the three countries and the keyworker investigated the kind of sensory stimulation that most suited the needs and interests of each individual. This was achieved by talking to staff and relatives about the person's hobbies, the jobs they used to do, and by observation. Equipment was introduced slowly, one item at a time, in order not to overload the individual. Activity sessions were conducted in a separate room area of the hospital ward and activities were chosen according to the individual's interests.

There was no attempt at masking/blinding *per se*, although both approaches were presented to staff and carers as two equally valid approaches to care. Patients were usually unaware that they were taking part in a study, although this was explained to them as far as possible.

Assessments

Two types of assessments were used: short-term assessments to investigate the immediate effects of sessions before, during and after each session and long-term assessments to investigate any carry-over effects to patient's behaviour, mood and cognition on the ward and/or at home and the endurance of any effects 1 month after sessions. These were carried out at pre-, mid-, post-trial and follow-up (see Table 1).

Short-term assessments

A specific rating form (*Interact*) had been devised to record behaviour and mood during MSS and activity sessions (Baker & Dowling 1995). *Interact during* had a total of 22-items with a Likert scale and was scored according to the frequency of occurrence of each behaviour, ranging from 1, not at all to 5, nearly all the time. *Interact during* was completed by the keyworker immediately after sessions based on behaviour during sessions. A shortened version – '*Interact short*' (12 items) – was used to record behaviour on the ward 10 minutes immediately before sessions and 10 minutes immediately after sessions to establish any observable changes. This was not completed by the keyworker but rather by a member of the nursing staff. An inter-rater reliability of $r = 0{\cdot}99$ was found on a small sample (Wareing *et al.* 1998).

[TABLE 1]

In the Netherlands all sessions were videotaped and behaviour was rated by the research assistant using the behaviour observation scale for intra-mural psycho-geriatrics (GIP) (Verstraten & van Eekelen 1988). There were five subscales ranging from 0–104 (higher scores = worse behaviour). Cronbach's α for the subscales was as follows: non-social behaviour = 0·68, disturbances of consciousness = 0·64, repetitive beahviour = 0·60, restless behaviour = 0·87, and sad behaviour = 0·71; total = 0·77.

Long-term assessments

Cognition was assessed by the research assistant using the Mini-Mental State Examination (MMSE) (Folstein *et al.* 1975). Possible scores range from 0 to 30, with higher scores indicating higher cognitive level.

The Behaviour Rating Scale (BRS), part of the Clifton assessment procedures for the elderly (CAPE) (Pattie&Gilleard 1979), was used to assess any change in behaviour at home (UK) or on theward (theNetherlands and Sweden).The four subscales were: physical disability, apathy, communication difficulties, and social disturbance. The sum of the subscales gave a possible range of 0–36. The Behaviour and Mood Disturbance Scale (BMD) (Greene *et al.* 1982) was also used in the UK. There were three subscales summing to 0–124 (apathetic/withdrawn, active/ disturbed, and mood disturbance). Both assessments were completed at home by the carer, or on the ward by a member of staff. Higher scores indicate worse behaviour.

Behaviour within the normal regime of the day hospital was assessed in the UK using the Rehabilitation Evaluation Hall and Baker tool (REHAB) (Baker & Hall 1988). Interrater reliability of 0·80 for the General Behaviour Subscale (scale range 0–126) and 0•77 for the Deviant Behaviour Subscale (scale range 0–21) have been found for older populations (Carson *et al.* 1989). The community skills subscale was not applicable to the current sample and was omitted. Two trained members of nursing staff independently observed behaviour 1 week prior to completing REHAB. A mean score from the two raters was taken to ensure that overall scores were as accurate as possible (Baker & Hall 1988). Higher scores indicate worse behaviour.

In the Netherlands, behaviour on the ward was assessed by trained nursing staff using the GIP. Five subscales summed to give a total score of 0–196. An inter-rater reliability ranging from r = 0•65–0•79 was found in this study.

Power and sample size

At the planning stage, the primary outcome measure was the change in MMSE scores over a month of therapeutic sessions. With 127 patients included in the analysis, and using a 5% significance level, the study had 80%power to detect differences between the two groups of 0•5 SD of the outcome measure.

Data analysis

Patient's progress through the trial is shown in a CONSORT diagram (see Figure 1).

This was an 'intention to treat' study; therefore long-term assessments for patients who dropped out were continued wherever possible and included in the analysis. Where only one or two data points were missing, an estimate replacement was made using interpolation of existing data points. Data analysis was carried out using Statistica 99 Edition. The critical *P*-value was set at 0•05. The main analysis was repeated measures analysis of variance using type II sums of squares (SS). The within-subjects factors were measures over time and the between subjects factors Group (MSS and activity) and Centre (a design factor). Differences between the groups were tested by a group–time interaction (except *Interact during*, which does not include a time factor). Pretrial MMSE scores were subsequently included in the analysis (ANCOVA) to take account of any cognitive differences between the groups. The Bonferroni correction, adjusted for multiple comparisons, was used and, where the assumptions for these analyses were violated, non-parametric tests were used (Mann–Whitney for between group and Wilcoxon for within group differences). Because of low numbers in Sweden (only three participants in the activity group), ANOVAs were carried out on UK and Dutch data only.

Where differences were found, the Swedish data were investigated separately using *t*-tests. Independent samples *t*-tests were carried out between the groups on baseline scores on each long-term assessment. For the Dutch GIP data, independent samples *t*-tests were conducted.

RESULTS

Section 1 – immediate effects of sessions

Interact short (behaviour and mood) (UK, the Netherlands and Sweden)

Table 2 shows mean (SD) and critical *P*-values [group–time interaction for centres (UK and the Netherlands) combined] for each item of *Interact short* based on behaviour before and after sessions.

There were no significant differences between the groups from before to after sessions (group–time interactions). There were significant main effects of time: both groups in both centres related better to others [$F(1,108) = 28•97$, $P < 0•0001$] and were less bored/inactive [$F(1,108) = 48•38$, $P < 0•0001$] after sessions compared with before.

[FIGURE 1]

There were three-way group–centre–time interactions on items 'attending to activities/objects' [$F(1,108) = 8•29$, $P < 0•01$] and 'enjoying selves' [$F(1,108) = 7•02$, $P < 0•01$], where the Dutch activity group were significantly more attentive to their environment ($P < 0•025$) and enjoying themselves more after sessions than before compared with the MSS group ($P < 0•025$). There were also 2-way centre– time interactions on items 'happy/content' [$F(1,108) = 17•74$, $P < 0•0001$] and 'doing things from own initiative' [$F(1,108) = 6•89$, $P < 0•01$]. In this case, both groups in the Netherlands were less happy/content after sessions than before ($P < 0•001$), whilst both groups in the UK remained unchanged.

In the UK, on the other hand, both groups did more on their own initiative after sessions ($P < 0•0000$), as did the Swedish groups [mean before = 2•0 (1•17); mean after = 1•85 (1•18), $P < 0•05$]. There was no change in the Netherlands.

Interact during (behaviour and mood) (UK, the Netherlands and Sweden)

Table 3 shows the mean (SD) and critical *P*-values [main effect of group for centres (UK and the Netherlands) combined] for each item of *Interact during* based on behaviour during sessions.

There were differences between the groups during sessions. The MSS group recalled significantly more memories than the activity group [$F(1,108) = 6•4$, $P < 0•01$], whereas the activity group touched objects/equipment more appropriately [$F(1,108) = 19•13$, $P < 0•0001$] and were more attentive to activities/objects [$F(1,108) = 10•12$, $P < 0•01$] than the MSS group. However, when baseline MMSE scores were taken into account (ANCOVA), the difference between the groups in 'recalling memories' disappeared. There were differences between the groups according to centre (group–centre interaction) in 'tracking observable stimuli' [$F(1,108) = 5•31$, $P < 0•05$] and in how 'relaxed/content' participants were [$F(1,108) = 12•36$, $P < 0•05$]. In both cases, the Dutch Activity group was rated as more observant ($P < 0•01$) and relaxed ($P < 0•001$) than the MSS group.

There were also differences between the centres during sessions. The Dutch sample were significantly more tearful/ sad than the UK sample [$F(1,108) = 16•6$, $P < 0•0001$], less happy/content [$F(1,108) = 21•5$, $P < 0•0001$] and did less from their own initiative [$F(1,108) = 7•7$, $P < 0•01$]. On the other hand, they were less bored/inactive [$F(1,108) = 6•0$, $P < 0•05$] and less fearful/anxious [$F(1,108) = 9•8$, $P < 0•01$] than the UK sample.

GIP (the Netherlands only)

Table 4 shows the mean (SD) and critical *P*-values for each subscale of the GIP during sessions. There were no differences between the groups.

Summary of section 1

There were no statistically significant differences between the groups from before to after sessions. The only differences to emerge resulted from the two groups responding differently in the two centres. However, *both* groups related better to others and were less bored/inactive after sessions than before. During sessions, it was found that the groups responded differently in the two centres on a few areas of behaviour. However, there were also differences between the groups not affected by centre: the MSS group recalled more memories than the activity group (accounted for by pretrial cognitive differences) and the activity group touched objects/equipment more appropriately and were more attentive to activities/ objects than the MSS group. In the Netherlands, there were no behavioural differences between the groups during sessions, as assessed by the GIP.

[TABLE 2]

Section 2 – carry-over of effects to behaviour, mood and cognition on the ward and/or at home and the endurance of any effects at 1-month follow-up

Baseline differences

Pretrial cognitive testing (MMSE) revealed significant baseline differences between the groups in the Netherlands and in both centres combined: the MSS group were at a higher level of cognitive ability than the activity group. On the GIP Total Score and Oppositional Subscale (the Netherlands) the MSS group showed significantly fewer behavioural problems than the activity group. Table 5 shows the baseline scores.

MMSE (cognition) and BRS (behaviour) (UK, the Netherlands and Sweden)

Mean scores, SD and critical *P*-values [group–time interaction for centres (UK and the Netherlands) combined] are shown in Table 6. The change over time on the MMSE was similar in both the MSS and activity groups and overall the difference was not significant. The mean difference between the groups from pre- to post-trial, highlighting the effect of MSS, was -0•3 (95% CI -1•4 to 0•7), indicating that the activity group improved by 0•3MMSEpoints over and above the MSS group.

For behaviour at home and on the ward (BRS), the change over time was similar in both groups and not significantly different.

BMD (behaviour and mood) and REHAB (behaviour) (UK only)

Table 7 gives the descriptive statistics for BMD (behaviour and mood) and REHAB (behaviour). There were only main effects of time (both groups) on these assessments. On subscale active/disturbed of the BMD there was a significant difference over pre-, mid- and post-trial assessments [$F(2,182) = 3•85$, $P < 0•05$] and between post-trial and follow- up [$F(1,91) = 6•55$, $P < 0•05$]. The whole sample were less active/disturbed at post-trial compared with pretrial, with a mean improvement of -1•4 points (SD 6•1, 95% CI -2•7 to -0•2) ($P < 0•05$). These gains were lost at follow-up as both groups became *more* active/disturbed, with a mean deterioration of 1•5 points (SD 5•6, 95% CI 0•3–2•7) ($P < 0•01$).

[TABLE 3]

[TABLE 4]

On REHAB (behaviour) subscales total general behaviour and deviant behaviour, there were no differences at pre-, midor post-trial, but there were main effects of time between post-trial and follow-up. In each case, the whole sample scored significantly higher at follow-up, indicating a deterioration of behaviour once sessions had stopped. For total general behaviour [$F(1,85) = 8•41$, $P < 0•01$], the mean increase in behavioural problems was 3•6 points (SD 11•4, 95% CI 1•1–6•0) and for deviant behaviour [$F(1,85) = 4•92$, $P < 0•01$] 0•4 points (SD 1•8, 95% CI 0•04–0•8).

GIP (the Netherlands only)

There were no behavioural differences between the groups during the trial [see Table 8 for mean (SD)].

Summary of section 2

Despite randomization, the MSS group were at a slightly less advanced stage of dementia than the activity group. In the UK, total general behaviour and deviant behaviour on the ward (REHAB) appears to have held stable during MSS and activity sessions but deteriorated once the sessions had stopped. On subscale ‘active/disturbed’ of the BMD (behaviour and mood), the behaviour of both groups had improved by the end of the trial, but had likewise deteriorated at 1-month follow-up. There

were no differences between the groups on the BRS (behaviour) (UK and the Netherlands) or on the Dutch GIP behavioural assessment.

[TABLE 5]

[TABLE 6]

[TABLE 7]

[TABLE 8]

Section 3 – severity of dementia

In order to investigate whether severity of dementia had an effect on outcome, pretrial MMSE scores were grouped: a score of between 0 and 9 equated to severe dementia and 10 upwards to moderate dementia. The Dutch sample was excluded because of small numbers in each cognitive group. Of all the outcome measures used, there was only a difference (group–time–cognitive level interaction) on the BRS subscale apathy [$F(1,83) = 7•20$, $P < 0•01$]. In the severe cognitive range the MSS group were significantly less apathetic at posttrial, with a mean improvement from pre- to post-trial of -0•4 points (SD 1•1, 95% CI -0•9 to 0•1) compared with the activity group, whose apathy increased by 0•6 points (SD 1•6, 95% CI 0•0–1•2) ($P < 0•05$). In the moderate cognitive range, on the other hand, the MSS group became more apathetic (0•4 SD 1•6, 95% CI -0•3 to 1•1) and the activity group less apathetic [-0•4 SD 1•4, 95% CI -1•3 to 0•5), ns].

DISCUSSION

To our knowledge, this was the first large-scale RCT to evaluate the effectiveness of MSS against a credible control condition. Moreover, the research took place in three countries in an attempt to enhance the generalizability of the findings.

Immediate effects of sessions

There were no overall differences between the MSS and activity groups from before to after sessions. The only differences found were because of the groups responding differently in the two centres. However, both groups in UK and the Netherlands were less bored/inactive and related better to others after sessions. Whilst these were positive outcomes, they should be viewed with caution in relation to the number of *Interact short* items analysed (12 items). The positive immediate effects on behaviour reported in our earlier study (Baker *et al.* 2001) were not, therefore, replicated here.

During sessions, the MSS group (UK and the Netherlands) recalled significantly more memories than the activity group, although this was explained by pretrial cognitive differences. The activity group showed improvements on a practical level, as they touched objects/equipment more appropriately and were more attentive to activities/objects than the MSS group. This might be expected in activity sessions, where there is a clear aim and focus, unlike MSS sessions that are nondirective (Baker *et al.* 2001).

There were also differences between the groups according to centre (UK and the Netherlands) during sessions. The Dutch activity group was rated as tracking more stimuli and as more relaxed/content than the Dutch MSS group. The data suggest that the Dutch activity group was responding more positively to sessions than the MSS group and than both groups in the UK. For example, on *Interact short* they were also rated as being more attentive to their environment and enjoying themselves more than the MSS group. Mean scores during sessions show they held eye contact more appropriately, related better to others, were less restless/aggressive, more co-operative and enjoyed themselves more than the Dutch MSS group. Mean for both groups in the UK were about the same (except for enjoying themselves). It is also apparent from videotaped sessions that the Dutch activity group showed less disturbed behaviour than the MSS group (although there was greater variability in the scores of the MSS group). Whilst these differences were not significant, there is good reason to highlight them. The

Dutch activity group was unique in that it received sessions from keyworkers familiar with them prior to the research. This illustrates the importance of staff relationships, particularly with this client group (MacDonald 2002). Most of us feel more relaxed and able to explore the environment around us when with familiar people, and so this is probably even more pertinent to those with declining cognitive abilities and confusion. Additionally, a keyworker who is very familiar with individuals may understand their behaviour, likes and dislikes more comprehensibly than a relative stranger, and may, therefore, deliver activities in a more effective and enjoyable manner (Allen 2001).

Long-term outcomes

In the UK, total general behaviour on the ward and deviant behaviour on the ward held relatively stable during the 4-week trial for patients in *both* MSS and activity groups, but deteriorated once the sessions had stopped (1-month follow-up). This highlights a potentially important *positive* benefit of one-to-one MSS and activity sessions for a client group whose pattern of behaviour is usually that of steady decline. Two explanations can be suggested. First, staff were aware that sessions had ceased. This may have unintentionally influenced their perceptions of behaviour on the ward (i.e. negatively), as it may have done during the course of the 4-week trial (i.e. positively). Alternatively, the changes were real and may be explained in terms of a 'negative withdrawal effect', i.e. time spent in the day hospital without the extra stimulation and one-to-one attention may have been even more difficult for patients to cope with than before.

Small improvements in behaviour for *both* groups were also found at home (UK only), on the subscale active/ disturbed of the BMD (i.e. has to be prevented from wandering outside, fails to recognize familiar people, appears restless and agitated). Carers rated patients as less active/ disturbed at the end of the trial compared with at the start, although these gains were lost at 1-month follow-up. Again, an explanation for this may be that patients were missing the extra stimulation provided during the trial and therefore displayed more disturbed/agitated behaviour when it was withdrawn. This explanation does, however, receive limited support, as behaviour and mood at home/on the ward assessed by the BRS (UK and the Netherlands) did not substantiate these changes, nor did the other subscales of the BMD or the GIP in the Netherlands. Despite limited support for actual change in behaviour, we cannot exclude this possibility. Even small improvements, in any area of behaviour, may be positive for both family carers and patients and may serve to improve their quality of life at home (Kempenaar *et al.* 2001).

There were no significant changes in cognition between the groups over the course of the trial. The current study had sufficient power to detect a difference between the groups of 0•5 SD of MMSE change over 1 month. The actual SD was 2•7 points; half a SD therefore represents a mean difference of roughly 1•4 points. This figure may be used in future sample size calculations with a similar population.

International meeting

Following an international meeting, the general impression independently reported by colleagues was that the less cognitively able seemed to enjoy and benefit from MSS sessions more than those who were more able, and vice-versa for the activity group. Of the outcome measures used, it was only on the BRS apathy subscale (i.e. helps out at home, socializes, etc) where this was statistically the case (UK only). This finding concurs with that of Wareing *et al.* (1998), who found a reduction in apathy for those with severe dementia. The lack of support for the research groups' observations may be attributed to the posthoc nature of this investigation, i.e. deciding on cut-off points for the severe and moderate groups was carried out to ensure that adequate numbers fell into each cognitive group for the purposes of analysis. It may be prudent in future to stratify patients into several cognitive groups, or to look specifically at those with a very low cognitive level in order to ensure adequate numbers to investigate this issue more comprehensibly.

Methodological issues

Great care was taken throughout to standardize approaches between the two conditions and across the three centres. One shortfall of the study was that not all of the long-term assessments were carried out at follow-up (i.e. MMSE and BRS). If they had been, this might have given added support to the 'stabilization of behaviour' explanation of sessions. This would have been strengthened if each centre had carried out all of the long-term assessments (i.e. REHAB, BMD and GIP). Furthermore, due to

such small numbers taking part in Sweden and their relatively high drop out rate, Sweden was withdrawn from the overall joint analysis, which therefore slightly weakened the multi-centred aspect of the study.

CONCLUSION

In conclusion, MSS was not found to be more effective than activity in changing the behaviour, mood or cognition of patients with dementia, in the short- or long-term. Behaviour on the ward remained stable during the 4-week trial for *both* groups and disturbed behaviour at home slightly improved, although generally there was limited evidence to support this. We speculated that where sessions were working differently, particularly in the Netherlands, the activity group may have been responding more positively because they were with familiar people during sessions. This may hold important implications for the delivery of suitable activities for this client group in the future. This was a carefully controlled trial involving three international centres unlike previous studies before it (Moffat *et al.* 1993, Spaull *et al.* 1998) and, whilst we did not find a superiority of MSS over an activity, we did find improvements for some aspects of functioning for both approaches to care. Future research should focus on less able individuals as this may provide a clearer understanding of the role of sensory stimulation for those who are unable to participate in more cognitively demanding activities. Patients with dementia require appropriate stimulation and this should be considered as part of the humane care for this group. We therefore need to find the most effective means of providing this care.

WHAT IS ALREADY KNOWN ABOUT THIS TOPIC

• Pioneering research into sensory stimulation for people with dementia began in the mid 1990s in the UK with positive findings.
• This approach to care uses non-verbal communication skills to enable people to engage in occupation and therefore crosses cultural boundaries easily.
• Application of this approach has therefore gained rapide recognition nationally and internationally.

WHAT THIS PAPER ADDS

• The international multi-centre approach employed in the study adds to the generalizability of the findings.
• Only a small number of studies have been published on this subject, making this paper a valuable contribution to the literature.
• This study is one of only a few randomized controlled trials in this area.

TABLES AND FIGURES

Table 1 Overview of the long-term assessments and their points of administration

Domain	Pretrial Before sessions begin	Mid-trial After four sessions	Post-trial After eight sessions	Follow-up One month after sessions
Behaviour	BRS		BRS	
	REHAB*	REHAB*	REHAB*	REHAB*
	GIP**		GIP**	GIP**
Mood	BMD*	BMD*	BMD*	BMD*
Cognition	MMSE		MMSE	

*UK only; **the Netherlands only.
BRS, Behaviour Rating Scale; REHAB, Rehabilitation Evaluation Hall and Baker Scale; GIP, Behaviour Observation Scale for Intra-mural Psycho-Geriatrics; BRS, Behaviour Rating Scale; MMSE, Mini-Mental State Examination.

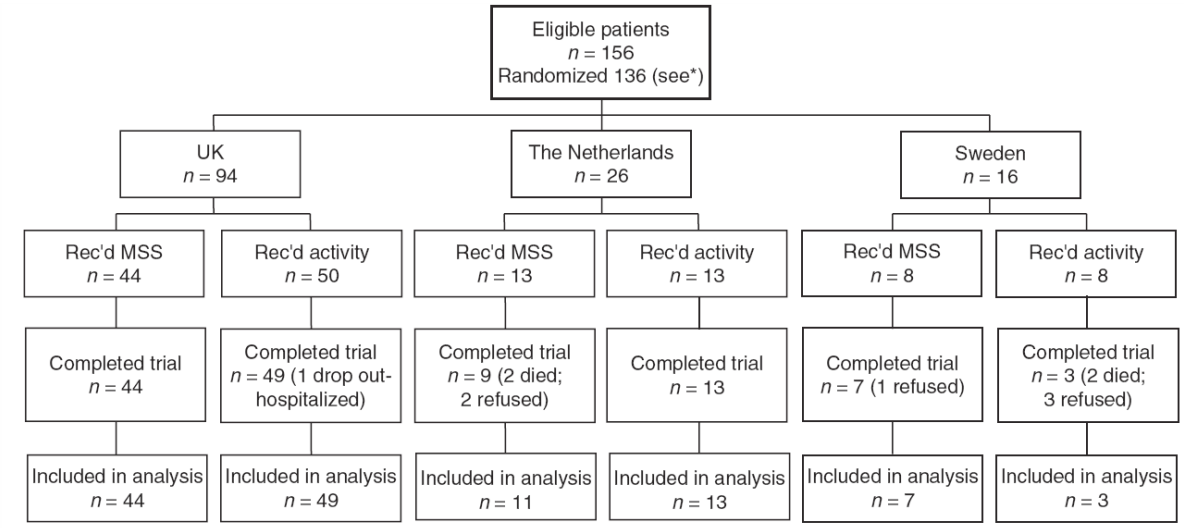

Figure 1 CONSORT diagram. *20 participants from the Netherlands were not randomized. Eight were transferred to another ward, five died, three had not given informed consent and four carers did not respond to the initial letter. MSS: multi-sensory stimulation.

Table 2 Means scores for each group and centre on *Interact Short* (before and after sessions)

		Centre				
		UK		The Netherlands		
Interact Short item	Group	Before	After	Before	After	*P* value
Tearful/sad	MSS	1.1 (0.3)	1.1 (0.2)	1.3 (0.4)	1.4 (0.7)	
	Activity	1.1 (0.2)	1.1 (0.3)	1.1 (0.2)	1.2 (0.2)	0.98
Happy/content	MSS	3.9 (0.8)	3.9 (0.8)	3.6 (0.8)	3.0 (0.7)	
	Activity	3.7 (0.9)	3.7 (0.8)	4.2 (0.5)	3.5 (0.7)	0.99
Fearful/anxious	MSS	1.5 (0.7)	1.5 (0.7)	1.4 (0.7)	1.1 (0.1)	
	Activity	1.4 (0.5)	1.4 (0.5)	1.0 (0.1)	1.1 (0.2)	0.52
Confused	MSS	2.0 (0.8)	2.1 (0.9)	1.8 (0.6)	1.9 (0.7)	
	Activity	2.3 (0.9)	2.3 (0.8)	1.8 (0.5)	1.8 (0.6)	0.40
Talked spontaneously	MSS	2.3 (0.9)	2.5 (0.9)	2.7 (0.6)	2.9 (0.7)	
	Activity	2.1 (0.9)	2.4 (0.9)	2.3 (0.7)	2.9 (0.5)	0.09
Related well	MSS	3.0 (0.9)	3.3 (0.9)	2.7 (0.6)	2.8 (0.8)	
	Activity	2.8 (1.0)	3.1 (1.0)	2.5 (0.5)	2.9 (0.7)	0.75
Attentive/focused on environment/objects	MSS	3.1 (0.9)	3.5 (0.9)	3.5 (0.8)	3.4 (0.9)	
	Activity	3.2 (0.9)	3.5 (0.8)	3.4 (0.5)	3.8 (0.7)	0.40
Did things from own initiative	MSS	2.4 (0.9)	2.8 (1.1)	1.9 (0.5)	1.8 (0.5)	
	Activity	2.4 (0.8)	2.6 (0.9)	1.7 (0.5)	1.8 (0.5)	0.57
Wandering, restless or aggressive	MSS	1.4 (0.5)	1.3 (0.5)	1.1 (0.2)	1.5 (0.9)	
	Activity	1.5 (0.8)	1.5 (0.8)	1.2 (0.6)	1.3 (0.6)	0.76
Enjoying self, active or alert	MSS	3.0 (0.9)	3.4 (1.0)	2.9 (1.0)	2.8 (1.0)	
	Activity	2.9 (0.9)	3.2 (0.8)	2.8 (0.6)	3.3 (0.7)	0.35
Bored, inactive or sleeping inappropriately	MSS	1.6 (0.6)	1.4 (0.4)	1.3 (0.4)	1.1 (0.2)	
	Activity	1.7 (0.5)	1.4 (0.5)	1.7 (0.7)	1.3 (0.3)	0.08
Relaxed, content or sleeping appropriately	MSS	3.8 (0.7)	3.8 (0.8)	3.1 (0.6)	3.0 (0.9)	
	Activity	3.5 (0.7)	3.6 (0.8)	3.2 (0.7)	3.4 (0.7)	0.27

Table 3 Means Scores for each group and centre on interact during sessions

	Centre				
	UK		The Netherlands		
Interact during item	MSS	Activity	MSS	Activity	*P* value
Tearful/sad	1·1 (0·3)	1·1 (0·2)	1·4 (0·5)	1·4 (0·4)	0·61
Happy/content	4·0 (0·9)	3·8 (1·0)	2·9 (0·8)	2·9 (0·6)	0·40
Fearful/anxious	1·4 (0·5)	1·4 (0·5)	1·1 (0·3)	1·1 (0·1)	0·91
Confused	2·1 (0·9)	2·5 (0·9)	1·6 (0·5)	1·5 (0·4)	0·03*
Talked spontaneously	3·4 (1·0)	3·1 (1·0)	3·6 (0·9)	3·2 (0·5)	0·07
Recalled memories	2·3 (1·0)	1·8 (0·7)	2·3 (0·7)	2·2 (0·8)	0·01
Spoke clearly	3·6 (1·1)	3·4 (1·3)	4·3 (0·6)	3·5 (1·0)	0·12
Spoke sensibly	3·2 (1·2)	3·1 (1·2)	4·0 (0·9)	3·1 (0·9)	0·17
Talked with normal length sentences	3·4 (1·3)	3·1 (1·2)	4·1 (1·0)	3·5 (0·9)	0·12
Held eye contact	3·5 (0·9)	3·5 (1·0)	3·6 (1·0)	4·0 (0·5)	0·70
Touching	2·1 (1·0)	2·0 (0·9)	2·3 (0·9)	1·8 (0·6)	0·38
Related well	4·0 (1·0)	3·9 (1·0)	4·0 (1·1)	4·4 (0·5)	0·87
Co-operated	4·0 (1·0)	4·0 (1·0)	4·0 (0·8)	4·4 (0·4)	0·46
Tracked observable stimuli	3·5 (0·8)	3·7 (1·0)	3·0 (1·2)	4·2 (0·6)	0·02†
Touched objects/equipment appropriately	2·8 (1·0)	3·7 (1·1)	3·3 (1·1)	4·0 (0·6)	0·000
Attentive/focused on environment/objects	3·5 (0·8)	3·9 (0·9)	3·0 (0·9)	4·2 (0·5)	0·002
Comments/questions about activities/objects	2·5 (0·8)	2·5 (0·9)	2·6 (0·8)	2·3 (0·5)	0·99
Did things from own initiative	2·7 (1·1)	2·7 (0·8)	2·0 (0·8)	2·3 (0·5)	0·76
Wandering, restless or aggressive	1·3 (0·5)	1·3 (0·6)	1·5 (0·7)	1·1 (0·2)	0·38
Enjoying self, active or alert	3·6 (1·0)	3·9 (1·0)	3·1 (0·9)	3·6 (0·6)	0·05‡
Bored, inactive or sleeping inappropriately	1·3 (0·4)	1·3 (0·4)	1·1 (0·9)	1·1 (0·2)	0·47
Relaxed, content or sleeping appropriately	3·3 (0·8)	3·1 (1·2)	2·7 (1·0)	4·1 (0·5)	0·75

*Non-parametric test non-significant ($P = 0·09$).
†Superseded by a group–centre interaction ($P < 0·05$).
‡Non-parametric test non-significant ($P = 0·06$).

Table 4 Mean GIP scores during sessions (the Netherlands only)

GIP	MSS	Activity	*P* value
Total score (range 0–104)	11·0 (7·9)	7·6 (2·3)	0·17
Non-social behaviour	5·2 (2·1)	4·8 (1·0)	0·55
Disturbances of consciousness	2·4 (5·8)	0·8 (0·5)	0·35
Repetitive behaviour	0·6 (0·9)	0·4 (0·4)	0·38
Restless behaviour	1·7 (2·2)	0·9 (1·0)	0·26
Sad behaviour	1·0 (1·5)	0·7 (0·6)	0·44

GIP, Behaviour Observation Scale for intra-mural psycho-geriatrics.
MSS, multi-sensory stimulation.

Table 5 Baseline scores for each group and centre on long-term outcome measures including critical *P*-values

		MSS			Activity			
Assessment	Centre	*n*	Mean (SD)	95% CI	*n*	Mean (SD)	95% CI	*P* value
MMSE (range 0–30)	UK	44	8·8 (6·6)	6·8–10·8	49	6·5 (5·4)	4·9–8·1	0·06
	The Netherlands	10	12·1 (4·1)	9·2–15·0	8	7·8 (4·5)	4·0–11·5	0·05
	Centres combined	54	9·4 (6·3)	7·7–11·2	57	6·7 (5·3)	5·3–8·1	0·01
BRS Total Score (range 0–36)	UK	44	16·0 (4·7)	14·5–17·4	48	16·7 (5·0)	15·3–18·2	0·45
	The Netherlands	13	16·5 (5·4)	13·2–19·7	13	19·6 (6·4)	15·7–23·5	0·19
	Centres combined	57	16·1 (4·8)	14·8–17·4	61	17·3 (5·4)	16·0–18·7	0·18
BMD								
Total score (range 0–124)	UK only	44	56·4 (13·4)	52·4–60·3	49	55·9 (16·6)	51·1–60·6	0·86
Active/disturbed (range 0–60)			23·9 (6·8)	21·8–25·9		24·0 (9·5)	21·3–26·7	0·94
REHAB								
General behaviour (range 0–126)	UK only	43	50·1 (30·0)	40·8–59·3	44	55·3 (25·9)	47·5–63·2	0·38
Deviant behaviour (range 0–21)			1·1 (1·8)	0·6–1·6		1·3 (1·7)	0·7–1·8	0·68
GIP total score (range 0–196)	The Netherlands only	13	44·6 (10·1)	38·5–50·7	13	53·6 (11·4)	46·7–60·5	0·04

Table 6 Mean scores for each group and centre on the MMSE and BRS total score

			MSS			Activity		
Assessment	Centre	*n*	Pretrial Mean (SD)	Post-trial Mean (SD)	*n*	Pretrial Mean (SD)	Post-trial Mean (SD)	*P* value
MMSE (range 0–30)	UK	43	8·9 (6·6)	9·0 (7·1)	49	6·5 (5·4)	7·0 (5·3)	
	The Netherlands	9	12·6 (4·03)	12·3 (3·5)	5	9·4 (4·8)	9·2 (6·1)	
								0·56
BRS total score (range 0–36)	UK	42	15·8 (4·6)	16 (4·8)	45	16·8 (5·1)	17·6 (5·6)	
	The Netherlands	11	16 (5·5)	17 (5·6)	13	19·6 (6·4)	20·4 (3·7)	
								0·49

MSS, multi-sensory stimulation; BRS, Behaviour Rating Scale; MMSE, Mini-Mental State Examination.

Table 7 Descriptive statistics: mean and SD (UK only)

		MSS					Activity			
Scale/subscale	*n*	Pretrial Mean (SD)	Mid-trial Mean (SD)	Post-trial Mean (SD)	Follow-up Mean (SD)	*n*	Pretrial Mean (SD)	Mid-trial Mean (SD)	Post-trial Mean (SD)	Follow-up Mean (SD)
REHAB	43					44				
General behaviour (range 0–126)		50·1 (30·0)	49·7 (29·5)	49·9 (29·3)	54·2 (30·0)		55·3 (25·9)	55·4 (25·5)	58·6 (27·0)	61·3 (28·2)
Deviant behaviour (range 0–21)		1·1 (1·8)	1·4 (2·2)	1·3 (2·1)	2·0 (2·8)		1·3 (1·7)	1·5 (2·1)	1·5 (2·1)	1·7 (2·1)
BMD	44					49				
Total score (range 0–124)		56·4 (13·4)	52·6 (14·4)	53·4 (13·9)	55·3 (16·4)		55·9 (16·6)	55·1 (19·4)	55·2 (19·7)	55·5 (18·2)
Active/disturbed (range 0–60)		23·9 (6·8)	22·0 (7·4)	22·3 (7·3)	23·9 (8·9)		24·0 (9·5)	23·0 (10·5)	22·7 (9·3)	24·1 (8·6)

MSS, multi-sensory stimulation; REHAB, Rehabilitation Evaluation Hall and Baker Scale, BMD, behaviour and mood.

Table 8 Mean GIP scores during the trial and at 1-month follow-up (the Netherlands only)

	Pretrial		Post-trial		Follow-up	
Total score (range 0–196)	Mean (SD)	*n*	Mean (SD)	*n*	Mean (SD)	*n*
MSS	44·6 (10·1)	13	46·2 (12·5)	11	48·2 (13·6)	10
Activity	53·6 (11·4)	13	56·3 (12·6)	12	59·6 (10·8)	11

MSS, multi-sensory stimulation; GIP, Behaviour Observation Scale for Intra-mural Psycho-geriatrics.

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