'What's cooking?' A comparison of an activity oriented and a table-top programme of therapy on the language performance of people with aphasia.

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Abstract

Background: Many people with aphasia have word finding difficulties, with some showing particular difficulties with verbs. Picture naming therapy is often used to improve naming, but gains are usually limited to therapy items and do not transfer to conversation. Therapy where words are produced in sentences and in real-life activities may be more effective.

Aims: The current pilot study investigated whether an activity oriented therapy approach would be accepted and viable if implemented in a community setting, and whether communicating whilst cooking was more beneficial than using paper-based activities. If successful, we expected that verb production would improve in structured and unstructured tasks in both naming and narrative tasks.

Methods & Procedures: The study employed a case-series repeated measures design, with testing of treated and control items. Seven adults with anomia participated, although only five completed the full programme. Participants were divided into two groups and each group completed both treatments but in different orders. Each treatment was employed for six two-hour sessions over a three week period.

Outcomes & Results: Naming of both treated and untreated verbs showed a statistically significant improvement following both treatments and this continued into the maintenance phase. There was a numerical but not statistically significant gain in the variety of verbs used in spoken narratives. Participants predominantly chose positive terms to describe their experience of the programme, but did not prefer one therapy over the other.

Conclusions & Implications: Preliminary findings suggest that an activity oriented therapy approach, whether it involves carrying out tasks or paper-based activities, can result in clinically meaningful improvements for people with chronic aphasia. Further research using

a randomised control trial is required to determine whether cooking therapy alone is effective.

What this paper adds

What is already known on the subject

Verb naming problems, which commonly occur in aphasic speech, have responded to single word and sentence therapy, although gains have often been for trained words only. Findings that motor areas of the brain are involved in semantic processing of words suggest that an activity-based approach to therapy might facilitate language production. This study investigated whether cooking therapy was viable, whether it increased treatment effects to untrained words and sentence contexts, and if it was more effective than paper-based tasks.

What this study adds to existing knowledge

The pilot study showed that it was possible to deliver activity-based therapy in a community setting and that it was popular with both the participants and the therapist. Although at the group level all participants showed significant improvement in verb retrieval of trained and untrained words after receiving both types of therapy, limitations in the design meant that it was not possible to establish the effectiveness of the cooking therapy alone.

What are the potential or actual clinical implications of this work?

The participants' responses suggest that activity-based therapy is worth exploring further. However, a different research design with more participants is needed to establish the efficacy of cooking therapy.

Introduction

Many people with aphasia have naming difficulties, which impact on their ability to engage in everyday pleasurable and functional activities. Naming accuracy may vary depending on the word class, with some people, particularly those with non-fluent aphasia, exhibiting greater difficulties with verbs than nouns (Mätzig et al. 2009). Moreover, grammatically more complex verbs, such as those with more associated arguments, for example, the verb 'give' which requires three syntactic arguments, a subject and two object arguments, are likely to be harder to produce than simpler ones (Kim and Thompson 2000). These verb production deficits can impair sentence production as verbs serve as the semantic-syntactic interface of a sentence (Boland 1993). Unsurprisingly, problems with verbs and constructing sentences also have an impact on narrative language, making it harder for individuals to convey their personal experiences clearly and to participate in conversations.

The high incidence of verb naming deficits in aphasia has resulted in a range of therapy approaches. These have traditionally been aimed at improving naming of verbs in isolation and sentences and more recently everyday conversation; however, few of these have proved successful at all these levels. The current study presents a pilot investigation into whether an activity-based approach would result in more effective verb retrieval and generalisation to non-structured tasks and everyday speech than a more structured table-top intervention.

Verb retrieval treatments have largely targeted words in isolation. Picture-naming therapy, focusing on the semantic (Wambaugh and Ferguson 2007), phonological (Raymer and Ellsworth 2002) or orthographic properties of words (Best et al. 2002) sometimes in combination with gestures (Boo and Rose 2011), is a popular intervention used for

facilitating word retrieval. The majority of studies report improvement of trained items only, and though some studies report improved sentence production with treated verbs (e.g., Conroy et al. 2009) and an increase in the number of verbs and grammatical sentences in connected speech (Takizawa et al. 2015), therapeutic gains do not always generalise to connected speech tasks and natural communication (Marshall and Cairns 2005). For this to take place other forms of intervention, including those with a conversational or social component, may need to be employed (e.g., Greenwood et al. 2010).

Some researchers argue that verb retrieval is more likely to improve and generalise to connected speech if verbs are targeted in a sentence context (e.g., Bastiaanse et al. 2006). However, although generalised gains have been found in studies using sentence completion tasks (Bastiaanse et al. 2006) and verb argument structure (Webster et al. 2005), these have not always been more effective than single-word therapy (Takizawa et al. 2015). Other researchers have developed word retrieval treatments at the discourse level with the aim of effecting more meaningful communicative changes in real-life (e.g., Peach and Reuter 2010). In these studies, structured discourse differs from natural conversation as it includes the use of a strategy, such as semantic feature analysis (Boyle 2004), combined with correction and feedback from the clinician. Findings from these studies have been mixed, with some participants showing no improvements in discourse measures and others increases in communicative efficiency and/or lexical retrieval, including for non-targeted verbs.

As well as working in sentences, there is evidence that practising language in communicative and meaningful situations may be advantageous. Various researchers suggest that language is learned most effectively when communication is meaningful and socially purposeful and

tasks are based on real-life situations. The context-based treatment used by Hinckley, Patterson and Carr (2001) is one such approach to aphasia intervention that incorporates word retrieval strategies and communicative transactions within a catalogue-ordering task. Participants were successfully encouraged to use multiple modalities to convey messages. Unlike the current study, which uses cooking as an appropriate setting for language use rather than a skill to be trained, the focus for this approach was on improving task performance.

Recent studies suggest there may be advantages in practising language whilst actively carrying out a task, over using pictures and worksheets (Berthier and Pulvermüller 2011). Brain-imaging techniques have revealed that there are multiple links between language and motor circuits that allow for interactive processing of multimodal information. For instance, the areas of the motor cortex involved in leg motion display more activation during the processing of leg-related words, e.g. kick, than during processing of mouth-related words, e.g. lick, and vice versa. Activation of the motor cortex (using transcranial magnetic stimulation) has also been shown to activate and prime words semantically related to the action in people with aphasia (Pulvermüller et al. 2005). Thus strengthening or encouraging the connections to form between language and motor circuits by carrying out the action whilst naming the verb, may result in more successful long-term encoding and retrieval of the concept.

Most studies outlined above aim to improve functioning by strengthening and/or speeding up activation so that individuals with aphasia can re-access linguistic information. Although aphasia recovery may rely predominantly on these processes in the acute phase, improvements are likely to involve new learning for people with chronic aphasia

(Papathanasiou et al. 2017). Consequently, the current study also draws on methods shown to be effective in adult learning. Active learning which engages individuals "in doing things and thinking about the things they are doing" (Bonwell and Eison 1991, p. 2) is a popular method of instruction in higher education. There is growing evidence that active, collaborative, cooperative and problem-based learning are effective at promoting academic achievement. In addition to positively influencing learners' attitudes and study habits these instructional methods have been found to improve retention of material (see review by Prince 2004). Principles of problem-based learning already underpin a number of aphasia therapies, including the integrated discourse treatment for aphasia (ITDA: Milman 2016) approach, in which word retrieval is trained in isolation and in authentic, meaningful discourse contexts.

Small-group interactions have been found to increase both the quantity and functional scope of students' language output. In students learning a second language, hands-on practical group activities have been found to generate more language related to the students themselves and their interests, as well as more shared meaning negotiations and collaborative forms of talk than traditional classroom-based learning (Nikula et al. 2013). The authors suggested that as teachers were less didactic students had more freedom to engage in talk and focus on what interested them. There is evidence that similar issues arise in aphasia group therapy, where the amount of control employed by the clinician affects the variety of speech acts performed by a person with aphasia (Simmons-Mackie et al. 2007). Social group therapy tends to be more inclusive and less therapist-centred, whilst impairment-focused group therapy tends to be more therapist centred. Working co-operatively has also been found to promote interpersonal relationships amongst college

students, improving self-esteem and perceptions of social support (Johnson et al. 1998). Although some of these instructional practices have been used in aphasia therapy, particularly in group intervention (e.g., Avent 2004), greater consideration of how these methods can be incorporated into therapy may promote gains in the performance of people with aphasia.

This study attempted to apply the principles summarized above, to varying degrees, to two different therapy programmes, a table-top therapy and cooking therapy. The activities in the table-top therapy, which employed multiple modalities, aimed to strengthen the connection between semantic, phonological and orthographic properties of verbs and use these items in discourse contexts. In the cooking therapy programme, verbs were produced in an appropriate syntactic, functional and social context; verb naming and communication were centred on cooking a dish. It was hypothesised that training verbs in an activity where physical actions reinforce the semantic features of verbs in combination with discourse that exposes participants to the appropriate argument and syntactic structures would not only enhance production of verb naming but also improve sentence production. Cooking was chosen for the activity-based therapy because it was an activity of daily life involving many different actions, and therefore many different verbs, and there was an end-product that might enable a sense of achievement; working collaboratively whilst cooking ensured that there was a constant exchange of information including the targeted verbs. Thus, in addition to addressing the participants verb naming impairment, both therapies, but in particular the cooking therapy, included some characteristics of the of the World Health Organization's International Classification of Functioning, Disability and Health (ICF) (WHO, 2001) concept of activities and, but to a lesser extent, participation.

The first aim of the current pilot study was to establish whether an activity-based approach (cooking therapy) would be accepted and viable if implemented in a community setting. Second, we aimed to investigate the effectiveness of cooking therapy as compared with a cooking related table-top therapy (pen and paper activities) for retrieval of trained and untrained verbs in picture naming and narrative tasks. Although we expected greater gains in cooking therapy, we predicted that naming accuracy for treated items would increase in both conditions and that this would be greater in picture naming than narrative tasks. We also predicted that gains in verb retrieval in narrative tasks would be greater in the activity-based condition, particularly when narratives were not supported by pictures (retelling of a video clip). Finally, we aimed to investigate whether gains made in therapy were maintained for a minimum of ten weeks.

Materials and methods

Study design

The study employed a case-series two-period repeated measurements crossover design, with testing of treated and control items. The design is outlined in figure 1. An experienced SLT carried out all therapy sessions to control for the quality of delivery. All assessments were conducted and audio-recordings transcribed by researchers who were not involved in delivering the therapy programmes and were blind to therapy allocation.
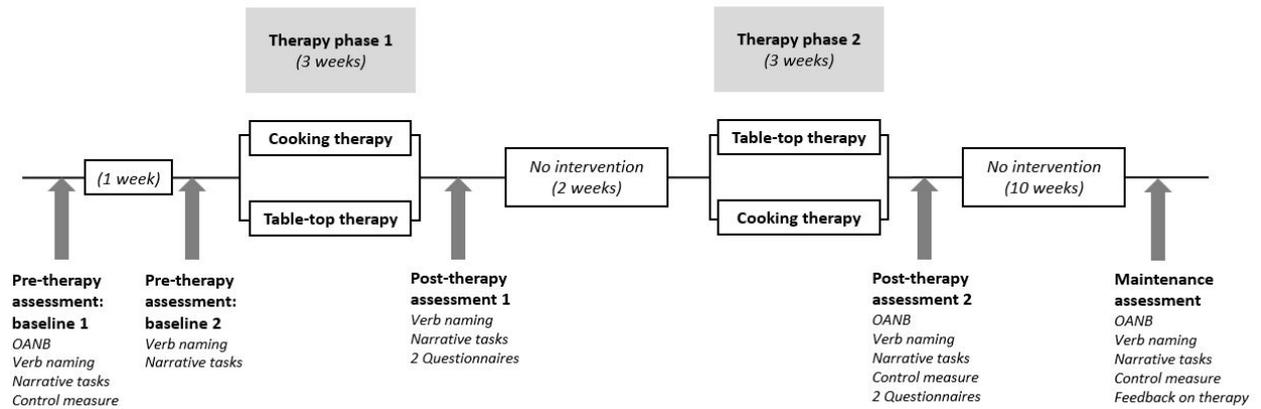
Figure 1. Design of the study

Participants

Seven people with chronic aphasia including word retrieval impairment were recruited from a community clinic in London for this study. They varied in their time post onset, aphasia symptoms and severity, although all of them were in the range of moderate to mild aphasia (see table 1). All participants gave written informed consent and ethical approval was gained from the departmental ethics committee. Convenience sampling was used because the participants needed to be a member of one of the larger pre-existing groups running in the clinic to reduce the likelihood that changes were due to socialising. To be included in the study, participants needed to: i) be at least one year post CVA; ii) have a naming impairment that included problems with verb retrieval, as identified by their speech and language therapist (SLT); iii) be able to read at sentence level, iv) have normal or corrected hearing and vision and v) agree to suspend other language intervention for the period of the study. People were excluded if they i) had a history of a significant neurological illness such as dementia and ii) had a primary language (i.e. in frequency and domains of use) other than English. Participants were expected to attend 12 therapy sessions in total. However, one woman (IT) dropped out after 6/12 sessions at the end of the first phase (table-top therapy)

and was replaced by another woman (BT) for the second phase to maintain group sizes. As their data was incomplete, they were excluded from analysis. One man (MT) missed 2/6 sessions of the cooking therapy programme owing to ill health, but as he attended all the other sessions (10/12) his data are included in the analyses. Four participants lived with a spouse or family member and three lived alone. All participants reported they had been keen cooks before their CVA, but only those living on their own continued to cook after their stroke.

Participants who took part in the table-top therapy first are identified here by the use of T as the second initial (e.g., IT, BT and MT above); participants given the second initial C took part in the cooking therapy first.

Randomisation was achieved by using the random number generator function in MS Excel. The first three names in the randomly sorted list were allocated to cooking therapy first. As participants were randomly allocated to one of two groups for intervention, the groups were not matched for severity or aphasia type.

Table 1. Participant characteristics and results of profile assessments

Participant	Gender	Age	Education level	Time post stroke (months)	Hand used	WAB Aphasia type	AQ	CAL Quality	Quantity	CLQT	OANB List B Nouns Actions (n=50) (n=50)		Living arrangement
TC	M	51.8	School	62	P	Broca's	51.8	34	26	2.8 (mild)	42	20	with spouse
JC	M	58	University	60	P	Wernicke's	63.0	39	41	2.6 (mild)	21	19	alone
YC	M	49.9	School	48	NP	Anomic	84.8	54	50	3.4 (mild)	47	41	with spouse
RT	F	68.3	University	83	P	Anomic	87.3	64	70	3.0 (mild)	43	41	alone

MT	M	61.6	School	56	P	Wernicke's	61.6	26	43.5	2.8 (mild)	31	25	with spouse
IT*	F	55.6	University	57	NP	Anomic	82.2	71	64	3.4 (mild)	41	43	alone
BT*	F	56.3	School	60	P	Conduction	86.2	28	57	3.0 (mild)	50	50	alone

Key: Participant identification - C= cooking therapy first; T= table-top therapy first; M = male; F = female; P = preferred; NP = non-preferred; School = formal education up to age 16; WAB = Western Aphasia Battery (Kertesz, 2006); AQ = aphasia quotient; Key: CAL = Communicative Activity Log (Pulvermuller et al., 2001); CLQT = Cognitive Linguistic Quick Test (Helm-Estabrooks, 2001); OANB = Object Action Naming Battery (Druks & Masterson, 2000)

* These participants were excluded from analysis IT did not complete the therapy and BT was a replacement

Materials and procedures

In order to obtain a detailed picture of each participant, we asked them to complete a number of assessments: the Western Aphasia Battery-Revised (WAB-R; Kertesz 2006), which was used to establish the type and level of aphasia severity, the Cognitive Linguistic Quick Test (CLQT; Helm-Estabrooks 2001), which was used to determine the relative contribution of cognitive deficits to language deficits, and the self-evaluation version of the Communicative Activity Log (CAL; Pulvermüller et al. 2001), which was used to determine the participants' perception of the quantity and quality of their communication. The results of these profile assessments are shown in table 1.

Outcome Measurement

In order to establish whether improvements in performance were due to therapy and whether gains generalized, repeated measures were obtained on a number of tests prior to intervention to ensure stability before therapy commenced, after each intervention and ten weeks later. Participants were administered the following tests:

- List B of The Object Action Naming Battery (OANB; Druks and Masterson 2000), which was used to determine confrontation naming ability of verbs and nouns.

- A 32-item bespoke verb naming task, which was used to compare naming of treated and untreated verbs. The stimuli were photographs. Sixteen items were cooking verbs that were used in the therapy programmes and formed the treated set; and 16 items were other verbs matched for key psycholinguistic variables, particularly word frequency and number of syllables, and these formed the untreated set. Name agreement for the pictures was established (93% or greater with 10 older adult controls, mean age 53 years). The photographs were presented in random order on

a computer screen, to prevent any order-related bias, with the instruction to name the picture with one word. The final response within 10 seconds was scored as correct or not.

- Two narrative tasks, which were both used to measure verb use and syntactic complexity:

i) a procedural narrative task of how to make an omelette. Verbal and nonverbal encouragement was given, but no prompts were provided.

ii) a video description of a 1:12 minute cooking scene clip from the film 'Mrs Doubtfire'. This clip was selected because it is light hearted and shows sequences of action related to the theme of the study intervention with minimal dialogue that provides lots of opportunities for the production of verbs. Participants were told that they would see a film clip and then they were going to tell the assessor as much as they could about what they had seen. When they had watched the film they were asked "Now tell me as much of the story as you can". General prompts such as "What happened next?" or "Go on" were used if they stopped for more than 30 seconds or if the person seemed to falter. Recording continued until participants concluded the story or indicated they had finished.

Each narrative was audio-recorded and subsequently transcribed verbatim; the transcription included phonological fillers, pauses, false starts and extraneous utterances. For each transcription the following values were calculated, the number of events, the number of complete and grammatical utterances and the number of different verb types produced in the two narrative tasks were combined. In counting the verbs we included the copula 'be', perseverations were treated as one verb. All

samples were analysed by the first and second authors separately, and disagreements were resolved by discussion.

- The Arithmetic subtest of The Wide Range Achievement Test-3 (WRAT-3; Wilkinson 1993), which was used to control for any general cognitive improvement or spontaneous change.

- Two measures of the participants' perceptions of the therapy. The first required them to select as many words as they wanted out of a choice of 16 that they most associated with completing each programme (e.g. valuable, communicative, difficult and tiring; for the full set see figure 4). The second measure was a forced choice written questionnaire investigating i) which condition the participants liked better, ii) which condition they thought helped them more and iii) which condition required them to work harder, were collected. Both measures were administered by an SLT unconnected with the study.

Assessments were usually conducted over a maximum of two sessions lasting no more than one hour each, but this depended on the number of tests being completed, the language level of the participant and their level of fatigue. In order to reduce the burden of testing the OANB and the WRAT were not administered immediately after therapy phase 1.

Intervention

Following baseline testing, participants were placed into groups of three and received either cooking therapy for three weeks or table-top therapy. After a two weeks rest phase, the groups swapped interventions for the next three weeks. Each session lasted for two hours. Twelve sessions in all were completed, six sessions for each therapy, two sessions per week. This meant that for the first three weeks the impact of the interventions could be gauged

against each other. Both therapy programmes combined work on words, sentences and discourse, although more targeted work at these different levels occurred in the table-top therapy. Examples of a recipe and two table-top therapy tasks are provided in appendix A.

Cooking therapy

The cooking therapy involved preparing and cooking six different dishes (e.g., omelette and cauliflower cheese), which were devised by the research team. Cooking included tasks such as weighing, chopping, mixing, stirring and melting ingredients. Recipes were trialled and filmed so that images could be used in the therapy tasks. In addition the written versions of the recipes were reviewed by a person with aphasia who was an advisor to the project. Participants worked individually, but were encouraged to support each other, with the SLT giving additional help when required. There were three table-top stoves and plenty of space for all participants to take part in food preparation. Simple step-by-step written and pictorial recipes were developed for each of the dishes and these were given to each participant at the start of the session. During the session, participants were encouraged to talk about what they were doing and refer frequently to the recipe, however, this was kept as close to normal conversation as possible. Participants took the dish home with them and reported back in the following session what they thought about it. One group, comprising JC, YC and TC, was keen to have their dishes marked and ranked according to taste and presentation by a member of staff. This was done for their group, but was not requested by the second group.

Table-top therapy

The table-top therapy involved producing cooking terms for a different set of six dishes in the form of spoken and written exercises. Participants had their own worksheets but were encouraged to work collaboratively to complete them. Not all tasks were completed in every session, but a range of activities was completed to ensure that words were retrieved and used in different contexts. Errors were corrected and answers were provided as necessary, but no record was kept of individual use of language during these sessions. Worksheets were kept in the clinic and not taken home.

At the end of the whole programme, participants were given a pack containing all 12 recipes to take home.

Statistical Analyses

Data were analysed with SPSS version 21. For the picture naming outcome measures for the group, an analysis of variance (ANOVA, $p < .05$) with post hoc t tests (with Bonferroni adjustments) was performed. Tests for normality, examining standardized skewness and the Shapiro-Wilks test ($p > .05$) had indicated the data were statistically normal. The effect size of $\eta 2$ was also calculated for each variable using SS effect/SS total. At the level of the individual, Cochran's Q tests with post hoc McNemar tests (with Bonferroni adjustments) were used to compare pre- versus post-treatment scores. To determine changes in narrative before and after therapy, the Wilcoxon signed ranks test was used.

Results

The overall performance of the group for each outcome measure is reported first, followed by analysis of individual performance, although only participants who showed a significant change are reported.

Verb-naming accuracy post-therapy

Figure 2 shows the numbers of verb pictures correctly named at each assessment point for the five participants who completed both therapy programmes. Visual inspection suggests that naming accuracy improved for all participants from pre-therapy baselines to the maintenance phase.
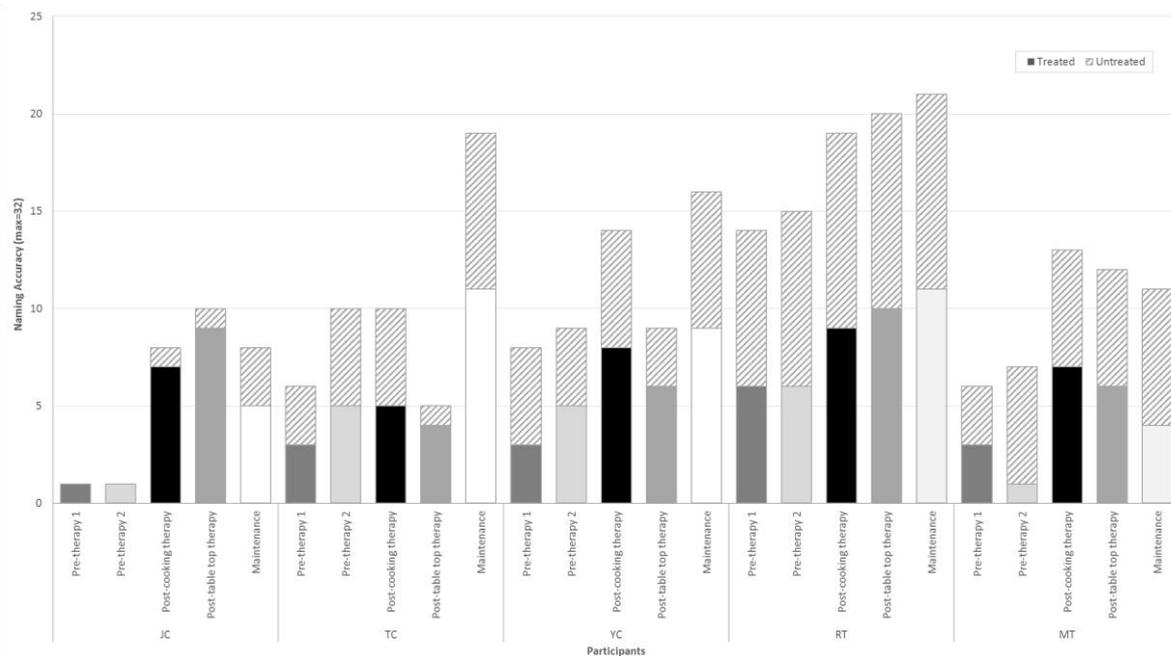
Figure 2. Verb naming accuracy data for each participant with aphasia at each assessment point. (RT and MT completed the table-top therapy before the cooking therapy; TC, JC and YC completed the cooking therapy first.)

The data were analysed with a three-way mixed ANOVA with verb type (treated vs untreated) and time of testing (pre-therapy 1 vs pre-therapy 2 vs post-therapy 1 vs post-therapy 2 vs maintenance) as the within subjects factors and order of therapy (cooking first vs table-top therapy first) as the between subjects factor. See Table 2 for ANOVA results.

Table 2. Results of three-way mixed ANOVA for the verb-naming test.

Source	df	Mean Square	F	Significance	Effect size (η^2)
Time	4,12	23.49	6.45	0.01*	0.47
Verb type	1,3	0.56	0.12	0.75	0.56
Order of therapy	1,3	68.16	1.60	0.30	0.35
Time x verb type	4,12	5.90	3.95	0.03*	0.1
Time x order of therapy	4,12	3.05	0.84	0.53	0.05
Verb type x order of therapy	1,3	27.60	5.78	0.10	0.12
Time x verb type x order of therapy	4,12	1.14	0.76	0.57	0.02

Results of the ANOVA showed there was a significant main effect of time with a large effect size. Post hoc comparisons using t-test with Bonferroni correction indicated that verb naming was significantly better at post-therapy 1 than pre-therapy 1 (p=.026) and in the maintenance phase when compared to pre-therapy 2 (p=.016).[1] There were no significant main effects of verb type or order of therapy, although the latter factor had a large effect size. There was a significant interaction between time of testing and the verb type with a medium effect size. Post hoc t-tests showed that the therapy programmes had a significant

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[1] Because the small scale sample size made it difficult to detect assumption violations, non-parametric analysis (Friedman Test with post hoc Wilkinson Signed Ranks tests) was also applied, This showed a statistically significant difference of time; in particular, there was a statistically significant improvement in naming in the maintenance condition when compared to both pre-therapy baselines, Therefore, as parametric and non-parametric tests show the same patterns, we're reporting the ANOVA results.

effect on the naming of both treated and control items in the maintenance phase (control items at maintenance vs pre-therapy 1 t(4) = -5.488, p=.005 and pre-therapy 2 t(4) = -4.472, p=.011; treated items at maintenance phase vs pre-therapy 1 t(4) = -4.147, p=.014 and pre-therapy 2 t(4) = -9.021, p=.001). However, only treated items were named significantly better immediately post table-top therapy (pre-therapy 1 vs table-top, t(4) = -4.147, p=.014) and following the cooking therapy when compared to either of the pre-therapy conditions (cooking vs pre-therapy 1 t(4) = -5.171, p=.007 vs pre-therapy 2 (t(4) = -3.497 p=.025), whereas control items were only named better at post cooking therapy vs pre-therapy 1 t(4) = -4.811, p=.009. No significant interactions were found between time of testing and order of therapy and verb type and order of therapy. There was also no significant interaction between the three factors combined: time, verb type and order of therapy.

In summary, at the group level improved accuracy of verb naming was found at the maintenance phase with gains made for both treated and control items regardless of the order of therapy. Overall, there was no significant difference between scores on treated and control items. However, it appears that whereas treatment resulted in the immediate and then continued improvement in naming of treated items, control items mainly showed improvement at the maintenance phase.

For individual participants, differences in naming accuracy after the two therapies were statistically significant for three participants (all of whom received the cooking therapy first: JC, TC and YC). As comparisons between assessments 1 and 2 in the mixed ANOVA described above showed no significant difference for any of the participants, indicating that prior to therapy naming performance was stable, only pre-therapy 2 data was used when

examining the differences between pre-therapy and post-therapy naming accuracy scores for individuals. Overall, Cochran's Q test indicated that there was a significant difference between the four assessment points for three of the five participants with large effect sizes, JC $Q(3) = 11.181$, $p < 0.01$, V = 0.47, TC $Q(3) = 23.538$, $p < 0.001$, V = 0.51 and YC $Q(3) = 8.143$, $p = 0.043$, V = 0.29. Post hoc analysis with McNemar tests (with a Bonferroni correction applied (.05/6), resulting in adjusted alpha level of .008 per test) were conducted on the scores for these participants. This revealed that JC's naming after table-top therapy was significantly better than his naming pre-therapy (p=.004) (although maintenance vs pre-therapy and vs cooking therapy, both p=.016). For TC, verb naming was only significantly better at maintenance than pre-therapy (p=.004) and table-top therapy ($p < 0.001$) (maintenance vs cooking therapy p=.012). No significant trends were observed for YC.

Object Action Naming Battery (OANB)

Figure 3 shows the numbers of action pictures correctly named at each assessment point for the five participants who completed both therapy programmes. A two-way 3 (time: pre, immediately post both therapies (i.e. time-point 4) and maintenance) × 2 (verb type: object vs. nouns) repeated-measures ANOVA was conducted on the OANB naming scores. This revealed a significant main effect of verb type with a large effect size, $F(1, 4)$=14.08, p=.02, η^2= 0.47, indicating that objects were named significantly better than verbs, and a significant main effect of time with a large effect size $F(2, 8)$=4.74, p=.044, η^2 = 0.17, reflecting improved naming post-therapy. However, there was no interaction between time and verb type $F(2, 8)$=.466, p=.64, η^2 = 0.01. This suggests that for the group, improvement in naming post therapy was the same for actions and objects.
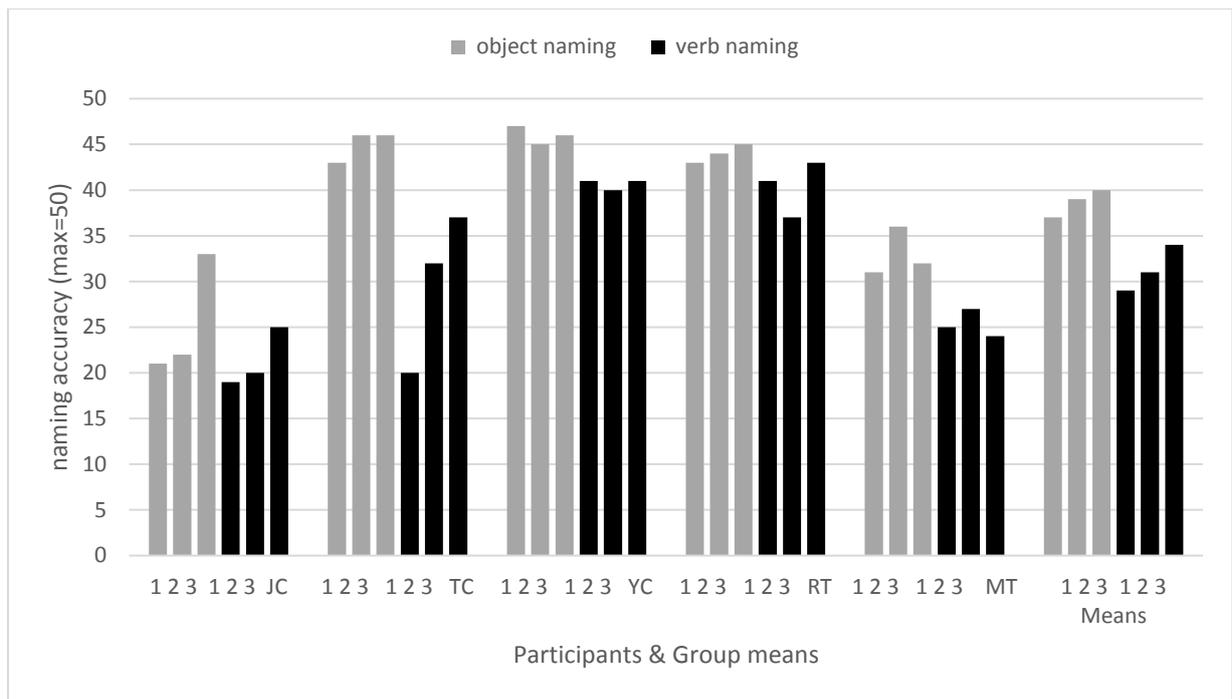
Key: 1 = pre-therapy; 2= post-therapy; 3 = maintenance

Figure 3. Pre-therapy, post therapy and maintenance naming accuracy of both objects and actions in the OANB for each participant with aphasia and the group means.

Two participants, TC and YC, showed an increase in action naming accuracy: the percentage of verbs that were accurately named for TC was 40% pre-therapy, 64% post-therapy and 74% at maintenance, Q(2) = 15.267, $p < .001$, and for YC 58% pre-therapy and 80% for both post-therapy and maintenance, Q(2) = 11.000, $p = .004$. Pairwise comparisons using Bonferroni corrected $\alpha = .0167$ revealed that for both participants significantly more verbs were named correctly post-treatment than pre-treatment (TC: Q(1)=6.545, $p = .011$ and YC: Q(1) = 7.118, $p = .007$) and maintenance than pre-treatment (TC: Q(1) = 11.560, $p = .001$ and YC: Q(1) = 7.118, $p = .007$), but that there was no significant difference in the number of verbs named in the two post therapy conditions, TC: Q(1) = .200, $p = .655$ and YC: Q(1) =

.000, p = 1.00. Thus, for both of them verb naming improved with therapy and this improvement was maintained for 10 weeks.

One participant, JC, showed a different pattern of performance from the others, in that his naming of objects rather than verbs improved. The percentage of objects that were accurately named was 46% pre-therapy, 44% post-therapy and 64% at maintenance, Q(2)=7.655, p = .022. Pairwise comparisons revealed that significantly more objects were named correctly at maintenance than post-treatment Q(1) = 5.762, p = .016. The difference between pre-therapy and maintenance was not significant when using the more stringent Bonferroni correction, Q(1) = 4.545, p = .033.

Narrative tasks

The measures of narrative did not show statistically significant changes. The number of events, different verbs produced and percentage of thematically complete utterances are presented in table 3. Although four of the five participants used a numerically greater variety of verbs post therapy in the narrative tasks, a one-way ANOVA indicated that performance post-therapy and at maintenance was not significantly better than before therapy, F(2,12) = .076, p = .927. Furthermore, one of the participants (YC) produced markedly fewer different types of verbs post therapy. There was negligible change in the production of events in narrative, F(2,12) = .013, p = .987. For four participants the percentage of thematically complete utterances reduced immediately following therapy, however neither this reduction, nor changes at maintenance, were statistically significant F(2,12) = .156, p = .858. In contrast to the other participants, RT produced markedly more

thematically complete utterances immediately after therapy, but this was reduced at
maintenance.

Table 3. Collated responses for the two narrative tasks: number of events, different verbs
and percentage of utterances that were thematically complete (TC) for each participant at
pre- and post-therapy and at maintenance.

Participant		Pre 1	Post	Maintenance
JC	no. of events	35	36	36
	no. of verbs	4	2	5
	% TC	30	10	41
TC	no. of events	35	33	35
	no. of verbs	3	5	6
	% TC	22	0	18
YC	no. of events	40	43	41
	no. of verbs	11	12	5
	% TC	59	44	31
RT	no. of events	57	66	63
	no. of verbs	17	19	20
	% TC	58	90	63
MT	no. of events	41	33	39
	no. of verbs	9	10	16
	% TC	71	64	41

Control task: The Wide Range Achievement Test-3

The performance on the control task (WRAT 3) of four of the five participants stayed stable over the course of the study, moving up or down by only one point. In comparison, MT's score on the test declined from 21 to 12 from pre- to post-treatment. The score was 14 at ten weeks post-treatment. Cochran's Q test determined that there was a statistically significant difference in the scores over time, $\chi^2(2) = 6.933$, $p = .03$. Follow up McNemar tests showed that there was a significant difference ($p < .005$) only between the scores on the pre-therapy and post-therapy tests. Thus, it would appear that the treatment occurred in the context of an overall deterioration in cognitive function for this individual.

Questionnaires

All participants selected the words 'valuable', 'useful', 'communicative', 'teamwork' and 'supported' to describe their experience of the programmes, with four of them also selecting 'easy', 'informative' and 'fun', with the latter word being only associated with cooking therapy (see figure 4). One participant (MT) selected words with a negative connotation for the cooking therapy: he selected 'confusing'.
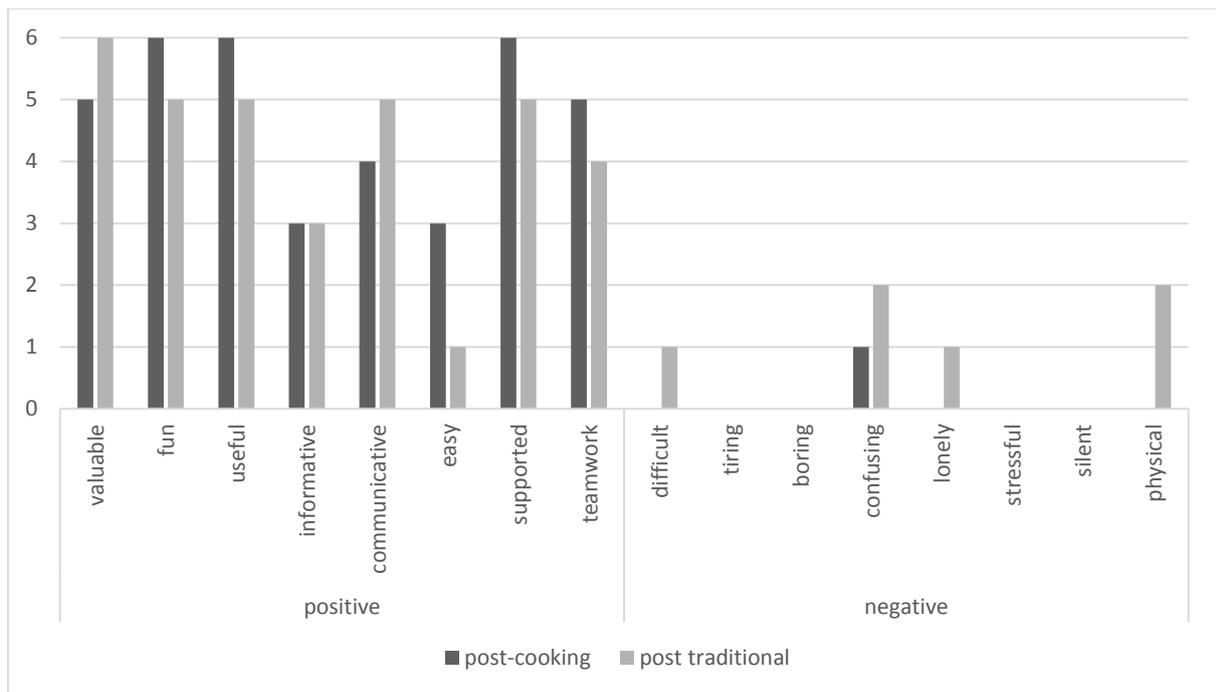
Figure 4. Items from the word selection questionnaire reflecting participants' perceptions of the two therapy programmes following the completion each therapy block.

Four participants felt that both programmes were equally helpful, although two of them (YC and RT) preferred the cooking therapy programme. The other participant (MT) preferred the table-top therapy and felt that it helped him more. With further questioning, MT revealed that he had found some recipes in the cookery therapy too difficult. He thought this might have been because he performed less well after a severe seizure in the second week which caused him to miss two sessions. The answers from the participants were more varied in response to which condition they found they had to work harder in, some finding the cooking therapy harder and some the table-top therapy.

Discussion

This exploratory study provides preliminary evidence that activity-based therapy can be delivered in a community setting and is accepted by participants and clinicians. However, it is not possible to say whether cooking therapy alone is effective. Although the findings show that naming improves after both cooking and table-top therapy, it is not until the completion of both therapy programmes and in the maintenance phase that gains reached statistical significance. Consequently, it is difficult to disentangle what has contributed to these changes. For the three participants who showed significant improvement in their verb naming, it is possible that the second intervention (table-top therapy) was crucial. However, cooking therapy may have "kick-started" the naming gains found after the second intervention; participants' naming was numerically higher at post-therapy 1. It is also possible that time was the crucial factor and that participants needed more exposure to the stimuli for verb naming to improve.

Thus, although it was hypothesized that more successful picture naming and greater generalisation to narrative would arise from being involved in active tasks such as cooking, this was not the case. Both types of therapy were found to be beneficial for some participants, particularly those who had scored more poorly on verb naming before intervention (JC and MT), and these gains persisted ten weeks following the end of therapy. Differences in scores pre and post-therapy were found to be statistically significant and/or clinically important. For those who benefited from the therapy programmes, naming of treated and untreated verbs increased in picture naming tasks, but there was no statistically significant change in narrative accounts. The number of events, number of different verbs and completeness of utterances did not improve. More time and more targeted therapy

may be necessary if this is to happen. Importantly, there was no improvement in performance on the WRAT our control measure. Thus, all of the gains post therapy appear to be due to the treatment protocol itself rather than to general cognitive enhancement.

Effects of treatment on narrative

All of the participants regardless of their type of aphasia showed better naming skills when picture naming than in the narrative tasks. This is unsurprising as producing narrative is inherently more demanding than picture naming in terms of cognitive resources. In the present study, the pictures appeared to help individuals focus on the event and gave them time to retrieve the correct word. When retelling the video narrative, they tended to lose their train of thought often omitting or only partly describing an event. Similar findings have been reported in other naming therapy studies (Marshall and Cairns 2005).

The lack of improvement in sentence and narrative production in our study suggests that our participants had syntactic and/or narrative structure deficits in addition to their lexical impairment, and that these difficulties would also need to be addressed if more generalised gains were to be made. It is possible that individuals with primarily lexical impairments would benefit from the current intervention, as improved lexical retrieval would improve their ability to produce well-formed sentences (Andreeta and Marini 2015). However, individuals with more extensive impairments, as would seem to be the case in this study (e.g., JC), would also need to complete activities that engage syntactic information and narrative structure, either as homework or as a subsequent block of therapy.

Our non-significant findings in the narrative tasks may also be due in part to insufficient data as our sample size was small. Added to this was our difficulty in collecting repeated narrative data. In this study, participants repeated the picture-naming task multiple times without commenting on it. However, all participants, and in particular YC, were reluctant to retell a story or describe a procedure more than twice. By the third occasion, YC decreased the time spent doing each task and produced an abridged version of all the narratives, even though he was telling the story to a new assessor. Published studies involving both participants with and without aphasia have not reported similar difficulties; they have either reported improved performance or no change. For example, some studies of neurotypical adults have found that even without feedback there are improvements in fluency and complexity on the second performance, possibly because familiarity with the topic means speakers can spend more time attending to word choice and grammatical features than content planning (e.g., Birjandi and Ahangori 2008). In contrast, Linebarger et al. (2007) found no significant changes in language structure and content of either the neurotypical adults or those with aphasia, when they were asked to retell a narrative about a silent video presented several weeks apart. In all of these studies, the participants have only had to retell the narratives twice. It is possible that retelling a narrative becomes less interesting and the task becomes less meaningful to the participants with multiple repetitions. This is particularly an issue for research design that requires multiple pre-therapy baselines, showing stability in performance, to be collected prior to starting an intervention. In these circumstances, researchers may need to select carefully the types of narrative tasks that can be repeated and/or provide a clear purpose for the activity if it is to remain meaningful.

Effects of treatment on verb naming

As has been found in numerous other studies, both therapy programmes improved picture naming accuracy of treated items. In addition, for some participants (TC and YC) there was generalization to untrained action pictures on the OANB. This result is generally in line with studies where verb naming has been targeted within a sentence context (Thompson et al. 2013). It has been suggested that sentence level treatment may be more effective at encouraging generalization, because in addition to rebuilding specific knowledge of lexemes it trains the semantic and syntactic features associated with the verb (de Aguiar, et al. 2016). However, unlike other sentence level treatments (e.g., Thompson et al., 2013), our therapy did not involve direct training of argument structure or morphology. This suggests that if processing morpho-syntactic features is important, then TC and YC were able to extract this grammatical information from the conversational context. For JC, who showed improved naming accuracy of treated verbs but no generalization, either he was not able to do this or he did not have a grammatical impairment. More detailed investigation of this level of processing needs be conducted in future studies. RT and MT both showed a trend towards improved naming of trained items although this change was not statistically significant. For MT gains may have been restricted by health issues, which had a negative effect on his general cognitive functioning.

An unexpected but encouraging finding in this study was that naming performance continued to improve during the 10 weeks post-therapy for some individuals. This suggests that language learning is cumulative and is not only consolidated but may be extended by being used outside the clinic. The fact that the target language in both programmes related to daily life tasks may have meant that there were opportunities to use this language at

home (e.g., when cooking or talking about cooking with other members of the family) and so gains continued into the maintenance phase. Other studies, such as Wright et al. (2008), which examined the effects of written cues on verb naming in two participants four weeks after therapy, have also found that naming performance for treated items can continue to improve after treatment. The findings of the current study indicate the importance of monitoring an individual's performance over an extended period of time in order to identify the full impact of an intervention.

The continued gains in naming occurred after both therapy programmes had been completed and it is not possible in the current pilot study to establish which of them was most beneficial either in improving naming immediately post-therapy or in the longer term. It is likely that both programmes contributed useful and complimentary support to verb naming. In the cooking therapy, participants used language for social and functional purposes and were not required to produce particular verbs or grammatically well-formed utterances, although the tasks were designed to predispose them to choose specific words, in particular verbs associated with cooking. When appropriate, utterances were expanded or recast by the therapist to provide grammatically well-formed sentences, which included the verb. The tasks mainly engaged oral skills, although the recipes were provided as written instructions, which they read aloud at the start of the session. This contrasted with the table-top sessions, in which both oral and written tasks were completed. The interactions in the cooking sessions more closely resembled the way language might be used in daily life than the more traditional table-top therapy, which focused on the accurate understanding and use of lexical items in isolation and within sentences. In the cooking therapy the SLT

modelled the language she hoped the participants might use, but if they were able to get their message across during the tasks it didn't matter whether they used the correct form.

Limitations and future directions

A larger study where participants are randomly allocated into two experimental groups, each of which receives a different therapy would be a better way of establishing which approach is more effective in improving spoken output. However, this may not be necessary as researchers in second language learning suggest that a combination of both learning via communication and traditional pedagogy may be the most advantageous (Swan 2005). With careful planning SLTs can integrate both approaches into a single treatment protocol. One way this could be done would be to include homework that requires revision of lexical and grammatical terms outside of clinic time. This would also help individuals to think about using this language at home.

Active task-based therapies such as the one described here provide an opportunity for useful multidisciplinary work; for example, working with occupational therapists who have an important role in helping people develop independence in carrying out daily tasks such as cooking. However, if language gains are to be made it is important that this is the focus of the intervention rather than how the individuals carry out the actions to complete the task. There are already potential problems using a task-based approach to foster oral language. Researchers in second language acquisition have found that the language produced in these tasks can be minimal and is often limited to only what is necessary to complete the task (Seedhouse 1999). Thus, as in this study, the SLT will need to ensure that

individuals with aphasia are continually encouraged to participate verbally in social communication.

Conclusions

Overall, the results are encouraging and point to a potentially positive role for activity-based therapies as part of the rehabilitation of people with aphasia. However, given some of the limitations of the present study, in particular the relatively small number of participants and the limited effectiveness of the narrative tasks for measuring change, the results can be seen as preliminary but do warrant further investigation in a larger, more tightly controlled study. Cooking therapy is an example of a multilevel intervention that focuses on word, sentence, and connected speech in the context of targeting a daily life task. Other activities, such as gardening, DIY and sewing could be the focus of the therapy. This study showed that focusing therapy on a specific activity can be beneficial whether the treatment involves doing the activity or completing spoken and written exercises. Preferences of the individuals with aphasia and the rehabilitation environment may determine which of these approaches is used.

express our gratitude to the individuals with aphasia who participated in our study and were willing to share their experiences of the programme. ***Declaration of interest:*** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Appendix A: Examples of therapy tasks

1. Recipe for ham and cheese omelette (used in both table-top and cooking therapy)

Ham and cheese omelette		5. Melt the butter in a frying pan until foaming.	
1. Grate the cheese onto a plate.		6. Pour the eggs into the frying pan and cook until the omelette is firm.	
2. Chop the ham finely.		7. Sprinkle the cheese and the ham onto the omelette and cook until the cheese has melted.	
3. Break the eggs into a bowl and add a pinch of salt and pepper.		8. Fold the omelette in half, using a spatula	
4. Beat the eggs with a fork		9. Remove the pan from the heat and slide the omelette on to a plate	

2. Picture supported spoken narrative accounts (used in table-top therapy)
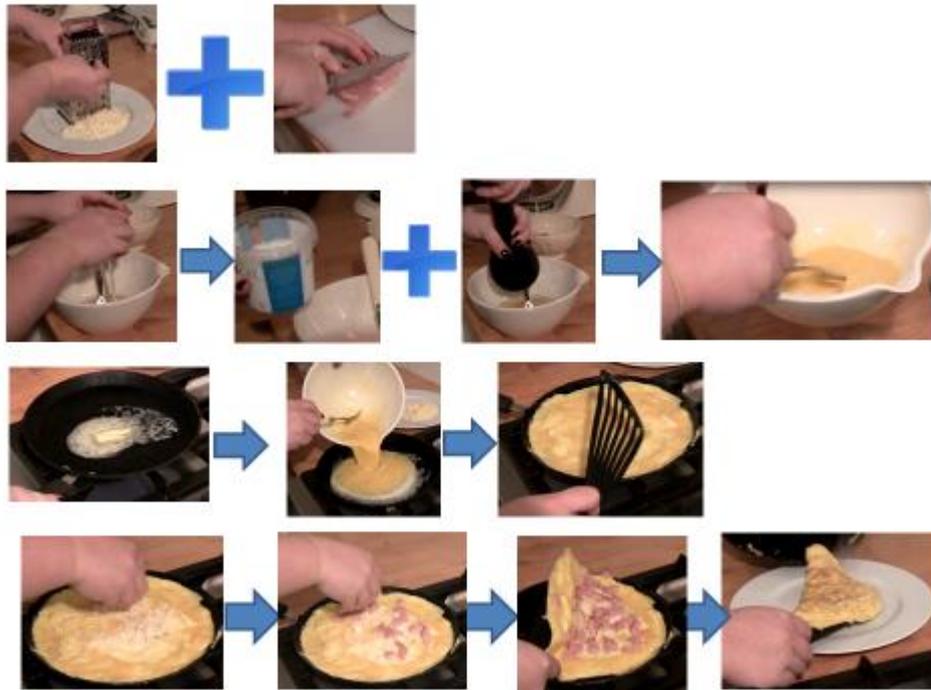
3. Problem solving exercise (used in table-top therapy)

Problem page

Jane was in a hurry so she decide to make an omelette for supper. She broke three eggs into a bowl and whisked them quickly before pouring the mixture into a greased frying pan. When it was cooked, she slid it onto a plate and ate it.

Jane thought the omelette was tasteless. What had she forgotten?