Title

Searching for active ingredients in rehabilitation: Applying the taxonomy of Behaviour Change Techniques to a conversation therapy for aphasia

Running Head

Behaviour Change Techniques in conversation therapy for aphasia

Article Category

Research Paper

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Abstract

Purpose: A taxonomy of Behaviour Change Techniques has been developed to help specify the active ingredients of behaviour change interventions. Its potential for rehabilitation research is significant, however reliable use among allied health professionals has not yet been explored. This paper describes the content of a conversation therapy for post-stroke aphasia using the taxonomy and investigates inter-rater reliability among Speech and Language Therapists.

Methods & materials: Two Speech and Language Therapists undertook the same half day, self-led training programme in the behaviour change technique taxonomy and independently coded all materials in the 'Better Conversations with Aphasia' programme. Inter-rater reliability was evaluated using the kappa coefficient and percentage agreement. Reliably-agreed techniques were categorised according to the speaker and type of behaviour they targeted.

Results: 16 behaviour change techniques were reliably agreed to be present. Inter-rater reliability was moderate (K=0.465), and in line with satisfactory percentage agreement (79.8%). More techniques were used to target the adoption of new behaviours (15) than the termination of old ones (3). People with aphasia received fewer behaviour change techniques (10) than their communication partners (16).

Conclusions: Describing the content of conversation therapy with the taxonomy of behaviour change techniques offers clinically useful insights with potential to enhance both research and practice. The intervention is shown to target different types of behaviour in different ways, and offer different speaker groups different content. Non-psychologist users of the taxonomy may encounter challenges working with unfamiliar concepts and terminology, which may impact on reliable use.

Introduction

The traditional focus of evaluation research across disciplines is to define and report on outcomes of intervention. However the high scientific standards applied to outcome reporting are rarely extended to the reporting of intervention content. Consequently, the components of intervention that may be responsible for producing change are often under-reported and poorly defined [1-3]. It is argued that the poor specification and characterisation of intervention content risks undermining the credibility and evidence base for rehabilitation [2,3]. Even where intervention content is detailed, a lack of agreed terminology means that essentially similar processes may be named differently from study to study, whilst, in contrast, generic descriptions such as 'feedback' mask significant variation in the procedures being used [4,5]. Under-reporting and poor specification of intervention content pose a challenge for the accurate implementation of evidence-based interventions in clinical contexts, the replication of interventions' effects, and the useful comparison and accumulation of evidence in systematic reviews [4,6,7]. Finally, they act as a barrier to analysing which components of intervention are most involved in creating change, and examining how these 'active ingredients' work.

The Medical Research Council guidelines for developing and evaluating complex interventions [8] recommend that intervention research offers a full description of intervention components, and a suggested theory of change linking these components to an intervention's intended outcomes. A recently developed taxonomy of Behaviour Change Techniques (BCTs) [4] represents a significant effort to support standardisation in the reporting of behavioural interventions. As part of a wider, theoretically-informed, system for

planning interventions known as the Behaviour Change Wheel [9, 10], the BCT taxonomy can also support intervention designers to make explicit links between an intervention's content, its hypothesised mechanisms of change, and its intended behavioural outcomes.

While the BCT taxonomy has emerged from the field of health psychology and health behaviour change, it is nonetheless intended to provide researchers and practitioners across disciplines with a shared and precisely-defined vocabulary for describing intervention. The relevance and potential for transferring this tool to the planning and evaluation of rehabilitation intervention is significant, as illustrated by Wade's proposition [2,p.812] that "all rehabilitation at its heart, concerns changing behaviour". Indeed, rehabilitation across the allied health professions (AHP) frequently focuses on the development of new compensatory behaviours designed to reduce disability or risk in everyday life. Even when the focus is on changing an underlying physical impairment, rehabilitation requires patients to maintain a high level of adherence to prescribed exercises in order to be effective, which in itself is a behaviour change [11].

Applications of the BCT taxonomy are now emerging within AHP research. A number of studies, across fields, have used it within systematic reviews in order identify behaviourally-focussed intervention content, for example in the context of swallowing rehabilitation in head and neck cancer [12], or self-management of chronic pain [13]. It has also been used within the Behaviour Change Wheel system to plan Physiotherapy intervention for stroke [14] and change caseload management practices among Occupational Therapists [15]. The current study applies the BCT taxonomy to an existing Speech and Language Therapy intervention targeting conversation among people with aphasia following stroke: "Better Conversations with Aphasia". This section will continue by outlining the BCT taxonomy in more depth, as well as summarising the intervention. It will conclude by detailing the aims of the study.

The Taxonomy of Behaviour Change Techniques

BCTs are proposed to represent the simplest procedures in intervention with potential to disrupt and alter the factors that determine the use of a behaviour [4], such as the skills and knowledge needed to carry it out, the underlying reasons for doing so (or not), and the environmental and social factors that promote or constrain it [10]. The taxonomy of BCTs is intended to provide a reliable and consensually-validated tool to support consistency, precision and completeness when reporting the content of behaviour change interventions [4, 6]. In developing the taxonomy [4], techniques used in health behaviour interventions were extracted from text books, published interventions and systematic reviews. Each potential technique was given a label and a definition to cover the minimum criteria that enabled it to be identified within intervention. The validity and conceptual distinctiveness of each technique was then established via a formal consensus process called the Delphi technique. Members of an international group of behaviour change experts with clinical and research backgrounds in psychology-related disciplines were asked to decide whether individual BCTs contained a testable and potentially active ingredient of intervention, and whether they were distinct from other BCTs in the taxonomy. Via this process, a list of 93 conceptually distinct and consensually-validated techniques has been established. For the purposes of illustration, an example BCT - *2.7 Feedback on outcome(s) of behaviour* - is presented below in table 1, as it appears within the taxonomy. It is acknowledged that the core process represented by a BCT may be delivered through a variety of methods. Modes of 'feedback' for example could potentially be verbal, visual, written, instrumental etc. The 'how' of delivery is therefore not specified in the taxonomy, and left to those designing intervention activities to decide.

[Insert table 1]

A good overall level of inter-rater and intra-rater reliability has been established among raters with postgraduate research expertise, who have been trained to use the taxonomy to identify BCTs within descriptions of intervention [4, 16]. However inter-rater reliability (IRR) for individual BCTs appears to be variable. In the original evaluation 21 of the 26 most frequently identified BCTs achieved a good level of IRR [6]. However Abraham et al. [16] found that just 12 of the 22 most-frequently identified BCTs did so. Raters in both studies were drawn from scientific and professional organisations, with a majority holding a doctorate.

The Intervention: Better Conversations with Aphasia

In this investigation the BCT taxonomy will be applied to a socially-focussed therapy for aphasia known as Better Conversations with Aphasia [17]. Materials for this therapy programme are publicly available within an e-learning resource of the same name (available at https://extend.ucl.ac.uk/). Aphasia is a communication disability typically caused by brain injury, including stroke. It affects language processing and impacts written and verbal expression as well as reading and auditory comprehension. Whilst approaches to aphasia therapy have historically focussed on the restoration of language, the last 25 years have seen an increasing emphasis on aphasia's disabling impact on social activities, relationships and identity. Innovative 'social model' interventions to address these issues have subsequently emerged [18]. These include conversation therapies such as Better Conversations with Aphasia, the aim of which is to support efficient, natural and satisfying interactions between people with aphasia and their conversation partners. The programme is delivered jointly to a person with aphasia and their main conversation partner. It aims to support the conversational pair to identify problems within their conversations, and to develop existing or new conversational behaviours that help resolve these problems or that minimise any

conversational effort, disruption or frustration linked to aphasia [19-21]. The conversational changes targeted by intervention therefore include the adoption or extension of helpful behaviours (known as 'facilitators'), and the reduction or termination of unhelpful behaviours (known as 'barriers'). Barriers and facilitators within the conversations of each pair are identified using a technique called Conversation Analysis. Conversation Analysis examines how conversational turns function to organise and co-ordinate interaction between speakers, whilst deliberately avoiding interpretation of individual speaker's motives [22]. It aims to describe how speakers negotiate talk in conversation, manage and develop topics, and 'repair' errors and misunderstandings – making it a useful tool for understanding how speakers manage aphasia's impact on conversation.

The specific process followed by Better Conversations with Aphasia is summarised as follows. During the early stages, the Speech and Language Therapist (SLT) uses pre-prepared handouts and video clips to help the pair reflect on their existing conversational patterns and behaviours. General education on conversation and aphasia is provided. Problematic aspects of conversation are identified, including barrier behaviours. These are typically behaviours used by the non-aphasic partner that function to limit the involvement of the speaker with aphasia, disrupt conversational flow, restrict the naturalness of conversation, or place emphasis on linguistic errors. Barrier behaviours include interrupting, correcting mistakes where the aphasic-speaker's meaning has already been understood, and asking 'test questions' to elicit an answer that is already known (e.g. who did we see yesterday?). Facilitator behaviours are also identified in the early stages of therapy. Facilitators represent behaviours which support the naturalness and effectiveness of conversation between the partners, for example leaving enough space in the conversation for the person with aphasia to contribute, or the use of writing and gesture by someone with aphasia to convey meaning when they can't retrieve a word. Following this initial phase of reflection, each partner then

chooses a set of facilitators to practice, and the rest of the programme is dedicated to developing their strategic use for overcoming problems in conversation. The use of facilitator behaviour in context is targeted by (i) reviewing video clips of problems in conversation and identifying possible strategies for dealing with them, (ii) regular practice, both in open conversation and in more structured activities, and (iii) experimenting with strategies between sessions and reflecting on the experience using a handout. Handouts and video clips are chosen flexibly by the therapist according the specific barrier and facilitator behaviours identified in a couple's conversation. The structure of the eight-session programme and the aims of each session are presented in table 2 below, alongside an indication of the broad types of activities included within sessions. A distinction is made between activities focussing on "Video Feedback" where participants watch videos of their own conversations in order to identify the behaviours in use, and those focussing on "Video Problem Solving" where videos are used to identify problematic conversational sequences, and discuss strategies for managing them.

[Insert table 2]

As part of a larger investigation into *how* Better Conversations for Aphasia works to produce behavioural change, a companion paper to this explores qualitative evidence for the therapy's mechanisms of change [23] and suggests that therapy engages different processes of change for barrier versus facilitator behaviours. Outcomes of intervention also indicate that therapy may be more effective at reducing barriers than at increasing facilitators [21].

Speakers with aphasia are expected to experience increased difficulties accessing and participating in therapy due to their language impairments – and Better Conversations with Aphasia consequently makes use of aphasia-friendly materials and supported conversation techniques in order to support them. However they may also have increased difficulty initiating and flexibly using communication strategies within conversation [24] due to the

higher prevalence of executive functioning impairments among people with aphasia compared with age-matched controls [25]. These speakers may therefore require extra cognitive support to make a change in context [24].

Study Aims

The study's aims are both clinical, and methodological. Firstly, this study seeks to identify clinically-useful information about which components of Better Conversations with Aphasia are most relevant to conversational behaviour change. To further the clinical value of this analysis, BCTs directed at different speaker and behaviour groups will be compared. Barrier and facilitator behaviours are shown to have different outcomes following therapy [21]. The comparison of BCTs delivered to these two groups of behaviour explores whether they are targeted by different therapy content. Meanwhile, the BCTs delivered to people with aphasia versus their conversation partners are compared to explore how the differing needs of these two groups are handled. A second aim is to establish the usefulness of the BCT taxonomy to a new field. Evaluating the IRR of the taxonomy when applied to Better Conversations with Aphasia allows us to check the validity of the BCT taxonomy for describing an intervention for communication, and identify any specific challenges facing the reliable use of the taxonomy among non-psychologist AHP users.

The research questions guiding this analysis are therefore:

(1) (a) What BCTs are reliably agreed to be present in Better Conversations with Aphasia? And (b) How reliable is the BCT taxonomy when applied by SLTs to a conversation therapy for aphasia?

(2) Are there differences in the BCTs used with (a) different types of behaviour and (b) different types of speaker?

Methods

Data

This study was conducted during the pilot phase of Better Conversations with Aphasia and therefore uses pilot versions of the therapy's eight session plans and accompanying handouts. These incorporate 102 activities in total. Post pilot, revised versions of these materials were made publicly available through the free e-learning resource [17]. Any content that was deleted, changed or added to the therapy materials after the pilot phase has been excluded from this analysis. The differences between pilot and published materials typically involved changes to the wording or detail used to describe tasks, rather than substantive changes to the format of therapy tasks. However, as the identification of BCTs relies on closely examining the wording of task descriptions, these changes have potential to impact on the results of coding. Excluding them therefore ensures that the results of BCT coding do not reflect any content that was not delivered to participants during the original therapy evaluation, but also do not reflect any content that is not publicly available to clinicians.

Raters and training

In order to determine IRR when using the BCT taxonomy to code the intervention content, two independent raters coded the data, and their findings were compared. Rater 1 was the lead author of this study, who as well as having experience in conversation therapy research, is a SLT who, at the time of analysis, had over 5 years post-qualification experience of working with people with aphasia. Rater 2 was a newly qualified SLT who had completed undergraduate level research examining the conversation patterns of speakers with communication disabilities. Raters spent half a day jointly following a self-led training programme, which had been developed and evaluated alongside the taxonomy [26]. This included written material, key guidance on coding, common pitfalls, and a range of practice

coding materials [27]. Joint participation in the training enabled raters to discuss and clarify their understanding of the taxonomy and the coding guidelines. Using practice materials, they were able to compare their coding decisions, and also refer to the expert consensus provided in the training.

Coding Procedure

Raters independently coded all therapy activities contained within the eight session plans and accompanying handouts. As per the coding guidelines, raters first judged whether or not each activity had a clear behavioural target, i.e. directly focused on one or more of the barrier and facilitator behaviours being targeted for change. This excluded activities whose focus was more general e.g. provision of education about aphasia. Each rater, having narrowed down intervention content to the activities and handouts they judged to target behaviour, went on to look for correspondences between the descriptions of these therapy components and BCTs from the taxonomy. BCTs whose definition was judged to correspond with the information provided about a therapy component were recorded next to the activity with their number and label. When a rater could not identify a BCT (within an activity judged to target behaviour), they coded 'NO BCT' and made notes on why. Three distinct explanations for coding NO BCT were identified: (i) the behaviour changing component of the activity was not clear from the description; (ii) the activity description contained insufficient detail to be able to map its content to a BCT; or (iii) there was no match on the taxonomy for a well-described activity.

After independent coding was complete, the raters met to discuss discrepancies in their decision-making. This discussion was intended to resolve any 'accidental' disagreements that had occurred due to individual errors and inconsistencies, for example documentation errors, or instances where raters had not applied the taxonomy according to the training criteria. It was also intended to identify consistent areas of disagreement about

how to code the intervention's core activities, and to see if a consensus could be reached. Following this discussion, raters reviewed their own decisions independently before finalising the ratings.

Procedure for calculating IRR

Rater 1 (lead author) compared the coding decisions of the two raters for agreement or disagreement. Agreement in BCT coding represented instances where:

- both raters coded the same BCT for the same activity

- both raters coded NO BCT within an activity that they both agreed contained a target behaviour

Disagreement in BCT coding represented instances where:

- one rater coded a BCT as present in an activity but the other rater coded NO BCT

- raters coded different BCTs for the same activity

Disagreement occurred when raters made different judgements about (i) whether activities had a clear target behaviour; (ii) whether the description of an activity contained enough detail to be sure that a particular BCT was present; and (iii) how well the description of an activity procedure mapped onto the definition of an individual BCT.

Cohen's kappa is the traditional choice for measuring IRR as it adjusts the overall percentage of agreements between raters for the possibility that these are generated by chance [28]. The conventions for interpreting this figure as a measure of strength of agreement are based on Landis and Koch [29], who propose that 0 = poor; 0.01–0.20 = slight; 0.21–0.40 = fair; 0.41–0.60 = moderate; 0.61–0.80 = substantial; and 0.81–1.00 = almost perfect. However, the kappa coefficient has been identified as providing too conservative a measure, which in fact may underestimate the reliability of coding tools [30]. Indeed, in order to apply

the statistical procedure to these data, the process for BCT coding is reduced to a binary yes/no decision about whether a BCT was present or not (i.e. 'BCT' vs. 'NO BCT'). This does not reflect the complex decision making process whereby, in order to register agreement, raters are not only required to identify the presence of a BCT, but also to select the same BCT from the taxonomy. Due to the number of BCTs on the taxonomy, the chance that both raters would randomly select the same BCT is extremely low. Some previous applications of the BCT taxonomy have therefore used simple measures of percentage agreement instead [cf. 31]. On this basis, percentage agreement between raters will also be reported here. The level of percentage agreement conventionally required for a measure to be considered reliable is 80% [32].

Comparing delivery of BCTs to speaker and behaviour groups

The above methods produced measures of IRR and also generated a list of BCTs reliably agreed by both raters to be present within the intervention. The therapy materials were then reviewed, and the reliably agreed BCTs were categorised according to which speaker they targeted (i.e. person with aphasia, conversation partner or both), and whether they targeted a barrier or a facilitator behaviour. This information was logged and used as data for the comparison of BCTs used with barriers versus facilitators and people with aphasia versus their conversation partners.

Results

This section reports on the findings for each of the research questions outlined above.

1) (a) What BCTs are reliably agreed to be present in Better Conversations with Aphasia?

Raters repeatedly and consistently agreed on the presence of a core group of 16 BCTs within Better Conversations with Aphasia. These are presented in table 3, in the order they appear within the taxonomy, with their number, label, and definition.

[Insert table 3]

Of these 16 BCTs, five are associated with handouts linked to Session 5, which focuses on training conversation partners. These include BCTs associated with giving instruction and information (*4.1 Instruction on how to perform a behaviour*, *5.3 Information about social and environmental consequences*, *5.6 Information about emotional consequences*, *6.1 Demonstration of the behaviour*) as well as one directed at regulating change in context *8.2 Behaviour substitution* and a praise BCT *10.4 Social reward*.

Two goal setting BCTs were agreed: *1.1 Goal setting (behaviour)*, *1.8 Behavioural contract*. Three BCTs were associated with the repeated practice conversations that occur during therapy sessions and in homework: *7.1 Prompts/cues*, *8.1 Behavioural practice/rehearsal* and *8.3 Habit formation*. A self-reflection sheet accompanying homework practices incorporated three self-monitoring BCTs: *2.3 Self-monitoring of behaviour, 2.4 Self-monitoring of outcome of behaviour, 5.4 Monitoring of emotional consequences*. Activities using videos of the couples' conversations were mapped to two feedback-oriented BCTs: *2.2 Feedback on behaviour* and one instance of *2.7 Feedback on outcome(s) of behaviour*. In activities where video was used to prompt discussion on alternative ways of dealing with conversational problems, no BCTs were identified.

Before considering the use of these 16 BCTs in more depth, the overall reliability of the BCT taxonomy for coding Better Conversations with Aphasia will be examined.

1(b) How reliable is the taxonomy when applied by SLTs to a conversation therapy for aphasia?

Across the therapy programme a total of 70 activities were identified by one or both raters as potentially targeting behaviour. In many cases, these activities contained multiple procedures. BCT coding of these 70 activities led to the identification of a total of 114 potential BCT procedures by one or both raters. A summary of raters' coding decisions for these 114 possible BCTs is provided in table 4.

[Insert table 4]

Rater 1 identified a total of 81 possible BCTs across the therapy programme, whilst Rater 2 identified 88. Within these, there were 74 agreements between raters about the presence of the same BCT within a particular activity. Raters also agreed in 17 instances that a potentially codable procedure did not contain evidence of a BCT (NO BCT). Table 5 summarises the agreements reached by raters, with examples. The combined total of agreements between raters was 91.

[Insert table 5]

Raters disagreed in 23 instances. Table 6 summarises these disagreements, with examples.

[Insert table 6]

Returning to the data summarised in table 4, the total of 91 rater agreements within 114 decisions represents a percentage agreement of 79.8%, just short of the 80% threshold for satisfactory IRR [31]. Applying the kappa coefficient calculation to these data produces a kappa of 0.465. This represents a moderate level of agreement [28].

Tables 5 and 6 illustrate how the coding challenges encountered by raters included: underspecified therapy activities; making conceptual judgements about how well activity and BCT descriptions matched and, finally, locating individual target behaviours and behaviour

changing procedures within activities that handled collaborative aspects of conversation such as topic development or 'repair'.

2(a) Are there differences in the BCTs used with different types of behaviour?

The literature on Better Conversations with Aphasia suggests that barrier and facilitator behaviours may involve different processes of change, and result in different outcomes post-therapy [21,23]. To explore these findings further, table 7 compares the BCTs used to target barrier behaviours and those used to target facilitator behaviours.

[Insert table 7]

This comparison shows that barriers are targeted by far fewer BCTs (3) than facilitators (15). Barrier change is targeted by *5.3. Information about social and environmental consequences* and *5.6. Information about emotional consequences*, found in handouts which are designed to raise speakers' awareness of the negative impact of these behaviours. The handouts also include *8.2. Behaviour substitution,* which prompts speakers' use of chosen facilitator behaviours in place of identified barriers. In comparison, the larger number of BCTs used with facilitator behaviours represents a more complex, and possibly more variable, process for targeting change. In the initial phases, speaker knowledge about the facilitative strategies they already use is targeted with *2.2. Feedback on behaviour*, delivered via video. Awareness of the favourable impact that these strategies have for conversation is addressed using *2.7. Feedback on outcome(s) of behaviour* (also via video), *5.3. Information about social and environmental consequences* and *10.4. Social reward* (via Session 5 handouts). Speaker intention to purposefully and strategically use facilitators in conversation is then targeted using *1.1. Goal setting (behaviour)* and *1.8. Behavioural contract.* Preparation for how and when to use strategies in conversation is supported via *4.1. Instruction on how to perform a*

behaviour, *6.1. Demonstration of the behaviour* and *8.2. Behavioural substitution* – all delivered via the Session 5 handouts. The specific BCTs used may vary depending on which behaviours are discussed in Session 5, and therefore which handouts are chosen. However, all facilitators are targeted by *8.1. Behavioural practice/rehearsal*, *7.1. Prompts/cues* and *8.3. Habit formation* via repeated practice within sessions and in homework. Homework practices ask speakers to monitor and evaluate their use of facilitators using a handout that contains *2.3. Self-monitoring of behaviour, 2.4. Self-monitoring of outcome(s) of behaviour* and *5.4. Monitoring of emotional consequences*.

Intervention for facilitators therefore includes components aimed at developing speakers' (i) beliefs about strategy use, by targeting awareness of useful strategies and identifying their benefits for conversations; (ii) intention to use strategies, using goal setting techniques (iii) plans for when to use strategies, via behavioural substitution (iv) skills for use – by providing instruction, and opportunities for repeated practice in context, and (v) monitoring and evaluation of the effects of strategies.

2(b) Are there differences in the BCTs used with different types of speaker?

To examine whether therapy treats the process of change differently for people with aphasia versus their conversation partners, table 8 summarises BCTs intended to be delivered to both speakers, as well as those only intended to be delivered to one group.

[Insert table 8]

The key finding here is that conversation partners receive more BCTs (16) than people with aphasia (10) and that people with aphasia do not receive any BCTs that are not also delivered to their partners. Ten BCTs are delivered to both speakers. An extra six BCTs are optionally delivered to conversation partners during Session 5, depending on the specific behaviours being targeted for that speaker. These include the three barrier-focussed BCTs (*5.3*, *5.6*, and

8.2), not typically delivered to people with aphasia whose main focus is facilitators. However they also include further support to develop facilitators, including explicit instruction and modelling of target behaviours prior to the practice phase (*4.1, 6.1.*) and one documented example of formal praise for facilitator use (*10.4*).

Discussion

Rehabilitation often relies on behavioural change to produce its outcomes [2]. The BCT taxonomy has potential to be adopted by AHP researchers and clinicians when describing and planning intervention. However, so far, the reliability of the taxonomy among an AHP audience has not yet been explored. This discussion will first consider issues relating to IRR, before moving onto the clinical implications of this study for conversation therapies and the limitations and future directions of the current work.

This study shows that BCT coding among SLTs who have undergone standard, introductory training for the taxonomy can achieve a moderate level of IRR using the conservative kappa coefficient as a measure, and closely approach the threshold for satisfactory reliability using a measure of percentage agreement. This is lower than the levels of IRR reported in the core taxonomy literature, which is typically measured using a 'prevalence and bias-adjusted' version of the kappa [4,16].

Nonetheless, these findings suggest that the BCT taxonomy holds promise for reliable use among non-psychologist AHP users, and can be a valid tool for describing the behaviour changing components of intervention. To support improved IRR in future applications of the taxonomy, it is worth reviewing some of the challenges encountered by the raters in this study.

Among the coding difficulties identified, some may be considered Speech and Language Therapy specific, whilst the relevance of others is likely to extend to a wider AHP

audience. In the first instance, raters encountered specific challenges handling the social interaction focus of Better Conversations with Aphasia. Activities with an explicit focus on collaborative, rather than individual, conversational activity – e.g. 'turn-taking', 'topic' and conversational 'repair' - proved to be particularly problematic for BCT coding. They accounted for a substantial proportion of the NO BCT ratings agreed by raters (see table 5: NO BCT (i)) as well as for rater disagreements (see table 6: (i)). The possibility of a terminological and conceptual 'culture clash' between behaviour change theory, which prioritises individual behaviour, and Conversation Analysis, which prioritises jointly-produced social activity, should be acknowledged. Similar issues may arise when handling any intervention focusing on communicative success as a two-person achievement. Future research seeking to apply the taxonomy to conversation therapy and other similarly-focussed interventions may wish to consider explicit guidance on identifying individual behaviour within collaborative activity.

Secondly, raters experienced challenges for decision making when applying less tangible or less familiar concepts and terminology from the taxonomy. For example, in order to code *5.2 Salience of consequences* raters are asked to consider whether an activity "Uses methods specifically designed to emphasise the consequences of the behaviour" [4]. This is arguably a more subjective decision than when identifying *4.1 Instruction on how to perform the behaviour*, whose defintion is "Advise or agree on how to perform the behaviour" [4]. In this study, one rater coded the use of video feedback as BCT *5.2*. However the other did not feel it was clear from the information provided that video was intentionally being used in this way. Another example concerns *1.4 Action Planning*, defined as "Detailed planning of performance of the behaviour (must include at least one of context, frequency, duration and intensity)" [4]. Although this term is largely unused in Speech and Language Therapy, it is well known in the psychological literature, and this BCT is among the most frequently

identified in health behaviour change interventions [4,15]. Whilst one rater coded it as present in the planning of homework conversations (see table 6: (iii)) the other did not feel they could make that link in full confidence. A degree of subjectivity will always affect decisions about the level of correspondence between an intervention description and a BCT definition among raters from any discipline; perhaps particularly for BCTs based on less observable concepts such as 'salience'. However discrepancies arising from a lack of knowledge or confidence with behaviour change concepts and terminology are likely to be a particular feature for raters without psychology training – as in the case of *1.4 Action Planning* here.

The issue of raters' experience as a factor affecting IRR has already been touched upon by Abraham et al. [16]. They found that pairs of raters with prior research experience of the taxonomy demonstrated greater IRR than those who had only participated in introductory training. They also highlight that all raters in their cohort were drawn from a pool of researchers likely to use the taxonomy in their work, so that the training needs, and/or IRR results produced by a 'less-informed' group of raters, are likely be different. Whilst AHP researchers and clinicians - who have significant experience designing and evaluating behaviour change interventions - are not necessarily a 'less-informed' audience in this sense, we nonetheless come to the taxonomy with a different set of professional experiences, knowledge and terminology. Furthermore, AHPs are likely to have less consistent background training in psychological theories of behaviour than the cohorts used in previous IRR studies [4,16]. The findings of the current study have certainly suggested that increased coding discrepancies may occur when raters are working with less familiar concepts and terminology. It is therefore likely that reliable application of the taxonomy among AHPs will require added training and support to increase familiarity with the behaviour change concepts and literature on which the taxonomy is based. One option could be a BCT training package

developed specifically for AHPs by a team incorporating health psychologists and AHPs. Another could be to identify and describe AHP-specific examples of BCTs from well known interventions. These examples could sit alongside the taxonomy's existing BCT labels and descriptions and support AHP users to recognise individual BCTS and make links with intervention procedures already familiar to them.

As well as challenges, the process of coding this intervention has also showcased the potential value of the BCT taxonomy for improving intervention reporting in Speech and Language Therapy. During coding, raters found that in some instances the intended therapeutic function and content of an activity agreed to target behaviour was not clear from the description provided. The issue surfaced both in raters' agreements that NO BCT could be coded (see table 5: NO BCT (ii)) but also led to a number of rater disagreements about whether descriptions were sufficient to identify the presence of BCTs (see table 6: (ii)). This issue was particularly apparent in discussion-based activities, where SLTs are instructed to 'review' or 'discuss' practice conversations with participants, but not provided with details about the intended aims of the discussion. This issue illustrates how – even within a well-described intervention like Better Conversations with Aphasia - potentially active content may end up being implied rather than specified. Here, ambiguity about intended therapy content led to coding disagreements. However, for those wishing to replicate intervention, under-specification of content will inevitably lead to different judgments about what to include, with potential consequences for intervention fidelity and effectiveness. Reporting therapy activities alongside their intended BCTs therefore not only offers a standardised vocabulary for intervention content, but also prompts us to describe intervention activities with a greater level of precision and completeness.

Whilst the extension of the BCT taxonomy into rehabilitation research may require further groundwork before achieving its full value to AHPs, its usage by a new audience has

potential to benefit the ongoing development of taxonomy itself. For example, this study identified specific activities – referred to here as "Video Problem Solving" - where a potentially behaviour-changing procedure could not be coded, due to the lack of an appropriate match on the taxonomy (see table 5: NO BCT (iii)). This raises the interesting possibility that Better Conversations with Aphasia contains behaviour changing techniques which are not represented in the current taxonomy. It is noteworthy that the activity in question specifically focuses on identifying the functional consequences of an impairment (i.e. the impact of aphasia on conversation), and brainstorming solutions to compensate for this. Currently, the BCTs in the taxonomy have been developed by reviewing health behaviour change interventions delivered to non-impaired populations. It is therefore possible that broadening the application of the taxonomy to behaviour change interventions seeking to change how people manage the disabling impact of impairments on everyday life could result in the identification of new BCTs to consider for inclusion in future iterations of the taxonomy.

Clinical Implications

This study has yielded a clinically useful list of potentially active ingredients for the Better Conversations with Aphasia intervention. This list offers precise information about the intended behaviour changing components of intervention in a field where there is currently a lack of clinical consensus on what intervention typically includes [33]. Where previously, the nature of the feedback provided during conversation therapy has been underspecified [34], BCT coding offers a greater differentiation between feedback provided on behaviour, feedback provided on the outcome of behaviour, and a range of other BCTs that might otherwise be termed a form of 'feedback' (e.g. provision of information on the emotional, social or health consequences of behaviour).

Comparing the BCTs delivered to different speakers and different groups of behaviours has also yielded clinically valuable insights. It has shown that Better Conversations with Aphasia delivers a small number of barrier-focussed BCTs to conversation partners which primarily target speakers' awareness about the negative impact of using barrier behaviour. It has also shown that the BCTs directed to facilitators are larger in number, more varied in their focus and are either delivered to both speaker groups, or just to conversation partners.

Conversation partners have been shown to receive more BCTs than people with aphasia, including concrete guidance about exactly what they should do (*4.1 Instruction on how to perform the behaviour*, *6.1 Demonstration of the behaviour*) when they should do it (*8.2 Behaviour substitution*), and why (*5.3 Information on social and environmental consequences*, *5.6 Information on emotional consequences*). The lack of equivalent guidance for aphasic speakers is unexpected, given the recognised challenges in understanding new information and flexibly implementing new strategies experienced by this group [24,25]. While it is not possible to draw any conclusions from these data about whether additional BCT content makes the intervention more effective for the non-aphasic speakers, this finding prompts us to consider whether there may be possibilities for reviewing, rebalancing and optimising the intervention content. It is also worth reflecting here that the speakers with aphasia are not routinely asked to consider barrier behaviours during this intervention, on the assumption that the linguistic features associated with aphasia represent their main obstacle to successful conversation. Indeed these linguistic barriers mean that many conversation therapy programmes only target the behaviour of conversation partners, hypothesising that changing the conversational practices of key partners will unlock increased participation and communicative effectiveness from the speaker with aphasia.

Simply identifying the presence of BCTs in Better Conversations with Aphasia does not equate to evidence of their effectiveness or active role in creating conversational behaviour change. However a comparison of this study's findings with the intervention's outcomes [21], and its possible mechanisms of change [23] does provide some interesting indications regarding possible active ingredients. For example, Better Conversations with Aphasia has been shown to produce a statistically significant decrease in the use of barriers in conversation [21]. This provides early evidence that the three BCTs delivered to barrier behaviours - *5.3. Information about social and environmental consequences, 5.6. Information about emotional consequences*, and *8.2. Behaviour substitution* - are effective for supporting change, at least when used in combination. The potentially active role of this package of BCTs is further corroborated by the non-aphasic speakers themselves, who attribute reducing their use of barrier behaviours to a change in beliefs about the impact of barriers on conversation and on their partners, alongside a conscious attempt to replace habitual barrier behaviours with new facilitator behaviours [23]. These accounts taken alongside the identification of the three BCTs, and the therapy outcomes showing significant changes in barrier behaviour suggest that an effective process for reducing pre-existing conversational behaviour involves establishing social and emotional reasons not to use the identified behaviour, and then providing an alternative to use in its place. While it may indeed be possible to create conversational change relying only on this process, it is important to remember that the aims of conversation therapy are not only to reduce unhelpful behaviour, but also to develop new ways of dealing with conversational problems. A therapy process that effectively supports new, or extended, uses of facilitator behaviour is therefore crucial.

Unlike barriers, no significant increase in facilitator behaviours was observed across the group [21]. While some individuals did show a significant increase in facilitator use, others showed no change, and one conversational pair showed a decrease. One explanation is

that adopting new conversational behaviours may be an inherently more complex process than terminating old behaviours, and therefore more vulnerable to failure. Certainly, the comparatively complex package of BCTs used with facilitators, and the inclusion of goal setting, instruction and practice, suggests that the establishment of new behaviours is anticipated to involve more preparation and conscious effort than the termination of old behaviours. Alternatively, it may be that qualitative changes in how and when facilitators are used in conversation are not well represented by measures of frequency. A final possibility is that the current package of BCTs targeting facilitators is not optimised to support successful change.

Should future research aim to review and refine the intervention content in order to optimise its outcomes, a number of starting points are suggested by this study. The first is the lack of equivalence between the BCTs delivered to the two speaker groups. Re-evaluating the content delivered to people with aphasia could include reviewing the full BCT taxonomy to identify additional techniques that may provide increased support about what to do when. The role of focussing on barrier *behaviours* among people with aphasia could also be considered (e.g. giving up when encountering difficulty, turning away, long pauses) - either as targets for change in themselves, or as cues to initiate facilitator behaviour. A second option for reviewing and refining the intervention content directed at facilitators would to be to use the taxonomy in the context of the Behaviour Change Wheel framework [9,10]. In this process, facilitator behaviours would be systematically analysed in terms of the determining factors that support or prevent their use, and BCTs would be chosen in terms of their likelihood to influence change in these behavioural determinants. This would have potential to highlight previously unsuspected barriers to change, and help confirm, refine or reject underlying assumptions about the usefulness of the BCTs currently included in therapy.

Limitations and Future Directions

This study is an initial investigation of IRR among AHP users of the BCT taxonomy, using just one intervention and one pair of raters. A thorough evaluation of IRR could include larger numbers of coding pairs applying the taxonomy to a larger number of therapy programmes. As this study encountered challenges choosing a 'best fit' measure for evaluating the IRR of BCT coding decisions, future studies may wish to consider using the adjusted kappa measure preferred by the developers of the taxonomy [4,16].

In terms of the clinical limitations of this study, it should be acknowledged that therapies such as Better Conversations with Aphasia are anticipated to produce a wide range of inter-connected outcomes, of which conversational behaviour change is just one. Broader social adjustment and quality of life outcomes may include an improved understanding and acceptance of aphasia, more satisfaction with conversations and improved relationships and intimacy between speakers. Furthermore, therapy includes a significant proportion of education-focussed content in addition to the behaviour-targeting intervention content reported here. This could not be coded for BCTs as it did not directly target behaviour. It should therefore be acknowledged that the work done by this study can only offer a partial account of this complex therapy's content and its potential to create change at a number of different levels.

In its identification of therapy's intended BCTs, this work nonetheless provides a novel starting point for investigations that compare the published therapy programme with what is delivered in practice, either as part of a fidelity evaluation, or to further understand how therapists interpret currently underspecified activities. It also offers a basis for exploring which BCTs may indeed function as 'active ingredients' for conversational behaviour change. Understanding this can be furthered by examining the evidence base associated with

individual BCTs, and by drawing links with therapy's hypothesised mechanisms of change and known outcomes [21,23].

Finally, consideration must be given as to how to maximise the value of the BCT taxonomy among audiences who are less familiar with the psychological literature on which it is based. We have already suggested that for the BCT taxonomy to be accessible to SLTs and a wider AHP audience, supplementary training may be required to support users' familiarity with the terminology of the taxonomy, and the psychological theories of behaviour change that forms its backdrop. However it will also be important to critically reflect on how concepts of 'behaviour' and 'behaviour change' fit into existing models of rehabilitation and disability, and consider where the limits of behaviour change frameworks and tools may be when describing rehabilitation interventions that target physical, cognitive and language impairments rather than direct behaviour change.

Conclusion

This study has demonstrated that the BCT taxonomy can be a valuable tool for enhancing the reporting of Speech and Language Therapy interventions. It not only offers a consistent terminology for reporting intervention ingredients, it also provides a resource to ensure active content is fully and precisely described. This enhanced specification is likely to support the fidelity with which treatment is delivered in clinical practice, and in future research implementations. Analysing the content of Better Conversations with Aphasia according to the BCT taxonomy has also yielded new and important conclusions about the design of the intervention, specifically that the intervention process targets change to barriers and facilitators in different ways, and that the content delivered to different speaker groups is not equivalent. Linking the BCTs identified here to a wider investigation of the intervention's change process has suggested preliminary hypotheses about which of Better Conversations

with Aphasia's ingredients are active for behaviour change.

Challenges remain for the consistent and reliable application of the taxonomy, and these may be increased among AHP users with less experience of behaviour change research. A promising level of IRR has been established among SLT users following participation in the standard training programme. Improved reliability among SLTs and other AHPs may rely on the development of additional training to familiarise users with the principles of behaviour change and the evidence and theory associated with BCTs.

Declaration of interest

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Tables

Table 1. Example BCT from Version 1.1 of the BCT Taxonomy [4]

Example BCT		
Label	Definition	Example
2.7 Feedback on outcome(s) of behaviour	Monitor and provide feedback on the outcome of performance of the behaviour	Inform the person of how much weight they have lost following the implementation of a new exercise regime

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Table 2. Structure, Aims and Activities within Better Conversations with Aphasia

Session	Aims	Activity Types
Session 1: Introduction to conversation and aphasia	• Discuss and explore what conversation is and why it is important • Initial exploration of how aphasia can affect conversation	Education
Session 2: Turns, sequences and actions 1	• Discuss and explore turns and sequences, aims of turns • Discuss how aphasia affects turns • Discuss partner's effective turns in response to these	Education Video Feedback
Session 3: Trouble and repair	• Discuss and explore patterns of repair in conversation • Practise identifying repair in own conversation	Education Video Feedback
Session 4: Turns, sequences and actions 2 - Strategies for person with aphasia	• Discuss common problems with turn-taking in aphasia • Person with aphasia to choose three facilitators they wish to practise • Practice strategies during session	Education Video Feedback Video Problem Solving Goal Setting Practice Conversations Homework Practices
Session 5: Turns, sequences and actions 3 - Strategies for conversation partners	• Discuss partner's responses to aphasic turns - explore both facilitators and barriers and why the partner engages in these behaviours • Partner to choose three facilitators they wish to practise • Practice activity during session	Discussion of Homework Practices Education Video Feedback Video Problem Solving Goal Setting Practice Conversations Homework Practices
Session 6: Topic and overall conversation	• Introduce the idea of topic and a balance of contributions • Identify how topics get introduced and developed in their own conversations • Choose and practice some strategies to help topics flow	Discussion of Homework Practices Education Video Feedback Goal Setting Practice Conversations Homework Practices

Session 7: Practising conversation: Putting your strategies to use	• Recap of chosen facilitators • Reflection on usage over the last few weeks • Identify points when they could have used their strategies (using videos) • Practice conversation during session	Discussion of Homework Practices Video Problem Solving Practice Conversations Homework Practices
Session 8: Reviewing and moving forward	• Discuss examples of faciliator use in homework video • Make advice sheet for family and friends • Further practice conversations	Discussion of Homework Practices Practice Conversations

Table 3. Reliably Agreed BCTs Identified in Better Conversations with Aphasia

No.	BCT Label	Definition
1.1	Goal setting (behaviour)	Set or agree a goal defined in terms of the behaviour to be achieved
1.8	Behavioural contract	Create a written specification of the behaviour to be performed, agreed by the person, and witnessed by another
2.2	Feedback on behaviour	Monitor and provide feedback on performance of the behaviour (e.g. form, frequency, duration, intensity)
2.3	Self-monitoring of behaviour	Establish a method for the person to monitor and record the behaviour(s) as part of a behaviour change strategy
2.4	Self-monitoring of outcome of behaviour	Establish a method for the person to monitor and record the outcomes of the behaviour(s) as part of a behaviour change strategy
2.7	Feedback on outcome(s) of behaviour	Monitor and provide feedback on the outcome of performance of the behaviour
4.1	Instruction on how to perform a behaviour	Advise or agree on how to perform the behaviour
5.3	Information about social and environmental consequences	Provide information (e.g. written, verbal, visual) about social and environmental consequences of performing the behaviour
5.4	Monitoring of emotional consequences	Prompt assessment of feelings after attempts at performing the behaviour
5.6	Information about emotional consequences	Provide information (e.g. written, verbal, visual) about emotional consequences of performing the behaviour
6.1	Demonstration of the behaviour	Provide an observable sample of the performance of the behaviour, directly in person or indirectly e.g. via film, pictures, for the person to aspire to or imitate.
7.1	Prompts/cues	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour. The prompt or cue would normally occur at the time or place of performance.
8.1	Behavioural practice/ rehearsal	Prompt practice or rehearsal of the performance of the behaviour one or more times in a context or at a time when the performance may not be necessary, in order to increase habit and skill
8.2	Behaviour substitution	Prompt substitution of the unwanted behaviour with a wanted or neutral behaviour
8.3	Habit formation	Prompt rehearsal and repetition of the behaviour in the same context repeatedly so that the context elicits the behaviour
10.4	Social reward	Arrange verbal or non-verbal reward if and only if there **has been** effort and/or progress in performing the behaviour

All BCT labels and definitions are taken from the BCT Taxonomy Version 1 [4]

Table 4. Agreements and Disagreements in BCT Coding: Totals

	BCT	NO BCT	Total
Rater 1	81	33	**114**
Rater 2	88	26	
Agreements	74	17	**91**
Disagreements			**23**
Coded by Rater 1 only	15	8	
Coded by Rater 2 only	8	15	

Table 5. Coding Agreements

Nature of agreement	Tally	Example
Same BCT located in same activity	74	**Activity Type:** Practice conversations **Intervention Description:** "A practice conversation with SLT (or partner if appropriate). Person with aphasia to put their chosen strategies into practice as needed when turn building becomes difficult" **Agreement:** Presence of *8.1 Behavioural practice/rehearsal*, defined as "Prompt practice or rehearsal of the performance of the behaviour one or more times in a context or at a time when the performance may not be necessary, in order to increase habit and skill"
NO BCT (i): Behaviour changing component of activity unclear	8	**Activity Type:** Education **Intervention Description:** Handout 6.1 "Common problems with topic in agrammatism (aphasia)". Problems outlined include speaker behaviours, speaker feelings, and broader conversational issues (e.g. topic dries up). Pair to identify which apply in their conversations. **Agreement:** Activity provides education on behaviour, but unclear that this is directly targeting behaviour change.
NO BCT (ii): Insufficient detail	5	**Activity Type:** Discussion of Homework Practices

| provided in activity description | | **Intervention Description:** "Review home activity"

Agreement: Activity likely to target behaviour change, but unclear how due to lack of information |
|---|---|---|
| **NO BCT (iii):** **No clear match on taxonomy for well-described activity** | 4 | **Activity Type:** Video Problem Solving

Intervention Description: "Play video clips and discuss what each person could have done differently, i.e. which strategy could they have tried to use when the conversation ran into trouble?"

Agreement: Activity targets behaviour change, and it is clear how – however there is no corresponding BCT on the taxonomy |

Table 6. Coding Disagreements

Nature of disagreement	Tally	Example
(i) Is there a clear target behaviour?	7	**Activity Type:** Education

Intervention Description: Handout C12 "What Happens When Things Go Wrong in Conversation?" Handout outlines common patterns of conversational 'repair' i.e. the turn types speakers use when dealing with problems.

Disagreement: That activity contains clear target behaviour |
| **(iii) Is detail in activity description sufficient to identify a specific BCT?** | 8 | **Activity Type:** Video Feedback

Intervention Description: "After the practice conversation - discuss ease of strategy use. SLT to facilitate this discussion by replaying parts of the task if it has been video recorded"

Disagreement: That 'discussing ease of strategy use' with video clips is enough information to code *2.7 Feedback on outcome(s) of behaviour*, defined as "Monitor and provide feedback on the outcome of performance of the behaviour" |
| **(iii) How well does the activity description map onto the BCT definition?** | 8 | **Activity Type:** Planning for "Homework Practices"

Intervention Description: "Video a practice conversation together this week where the person with aphasia attempts to put strategies into practice".

Disagreement: That agreeing to video a conversation represents *1.4 Action planning,* defined as "detailed planning of performance of the behaviour (must include at least one of context, frequency, duration and |

		intensity)"

Table 7. Comparison of Better Conversations with Aphasia's BCTs Targeted at Barriers and Facilitators

	BCT Label*	Barriers	Facilitators
1.1	Goal setting (behaviour)		✔
1.8	Behavioural contract		✔
2.2	Feedback on behaviour		✔
2.3	Self-monitoring of behaviour		✔
2.4	Self-monitoring of outcome(s) of behaviour		✔
2.7	Feedback on outcome(s) of behaviour		✔
4.1	Instruction on how to perform a behaviour		✔
5.3	Information about social and environmental consequences	✔	✔
5.4	Monitoring of emotional consequences		✔
5.6	Information about emotional consequences	✔	
6.1	Demonstration of the behaviour		✔
7.1	Prompts/cues		✔
8.1	Behavioural practice/ rehearsal		✔
8.2	Behaviour substitution	✔	✔
8.3	Habit formation		✔
10.4	Social reward		✔

* Definitions for all BCTs can be found in Table 2

Table 8. Comparison of Better Conversations with Aphasia's BCTs Targeted at Conversation Partners versus People with Aphasia

Both Speakers	Conversation Partners only	People with Aphasia only
1.1 Goal setting (behaviour) 1.8 Behavioural contract 2.2 Feedback on behaviour 2.3 Self-monitoring of behaviour 2.4 Self-monitoring of outcome(s) of behaviour 2.7 Feedback on outcome(s) of behaviour 5.4 Monitoring of emotional consequences 7.1 Prompts/cues 8.1 Behavioural practice/ rehearsal 8.3 Habit formation	4.1 Instruction on how to perform behaviour 5.3 Information on social and environmental consequences 5.6 Information on emotional consequences 6.1 Demonstration of the behaviour 8.2 Behaviour substitution 10.4 Social Reward	