Metacognitive Strategy Training is Feasible for People with Aphasia

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Metacognitive strategy training shows promise for reducing disability following stroke, but previous trials have excluded people with aphasia. Considering the high incidence of poststroke aphasia, it is important to determine whether people with aphasia can benefit from strategy training. The purpose of this study was to determine the feasibility of an adapted strategy training protocol for people with aphasia. We recruited 16 adults with mild-moderate aphasia from inpatient stroke rehabilitation. We examined recruitment and retention, intervention delivery and fidelity, participant engagement and communication, participant strategy mastery, and change in disability. Therapists demonstrated good fidelity to intervention elements. Participants demonstrated good engagement and fair communication. The sample achieved a mean Functional Independence Measure change of 21.8 (SD = 16.2, Cohen's d = .95), similar to matched controls without aphasia from previous trials. An adapted strategy training protocol appears feasible for people with aphasia in inpatient stroke rehabilitation. Future studies should examine the efficacy of this approach in larger samples.

Keywords: stroke; intervention; rehabilitation

Introduction

Metacognitive strategy training is an intervention that may minimize disability when delivered in inpatient rehabilitation after stroke (Skidmore et al., 2017; Skidmore et al., 2015). Strategy training is a task-specific intervention that teaches clients to evaluate their performance of meaningful daily activities and develop strategies to address barriers to performance of those activities. Strategy training uses an iterative process of planning, executing, and assessing performance with graded, non-directive instruction and feedback provided by a rehabilitation practitioner (Rouch & Skidmore, 2018; Skidmore et al., 2017).

While strategy training has been associated with greater independence after stroke, previous trials have excluded people with aphasia (Skidmore et al., 2017; Skidmore et al., 2015). In fact, many stroke rehabilitation studies exclude people with aphasia (Ali et al., 2014; Wray et al., 2018), often due to concerns that these individuals may be unable to understand intervention activities or communicate effectively. However, approximately one in three strokes culminate in aphasia (Flowers et al., 2016), raising questions about the inclusivity of these trials and generalization of the findings to people with aphasia. Furthermore, aphasia is associated with high rates of long-term disability and high health care and caregiving costs (Ellis et al., 2012). The exclusion of this important and prevalent sub-population does little to inform efforts to address these poor outcomes.

Strategy training is a verbally mediated intervention, requiring active communication between the participant and the therapist. Strategy training is traditionally dependent

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on verbal planning and problem-solving to facilitate therapist-client collaboration. Thus, there may be barriers to use of strategy training for people with aphasia. However, it may be possible to optimize strategy training to address the needs of these individuals. Supported conversation is an evidence-based approach to facilitating communication with people with aphasia. Supported conversation has been associated with improved communication, participation in conversation, psychosocial adjustment, and improved self-confidence in people with aphasia (Jensen et al., 2015; Kagan et al., 2001; Mc Menamin et al., 2015; McVicker et al., 2009). We posited that strategy training could be adapted to include supported conversation principles. The purpose of this study was to examine the feasibility of this adapted strategy training intervention in a sample of adults with aphasia following stroke.

Methods

Study Design

We conducted a case series study examining an adapted strategy training intervention that incorporated supported conversation principles as described by Kagan and colleagues (Jensen et al., 2015; Kagan, 1995; Kagan, 1998a, 1998b). Participants provided informed consent prior to initiating research activities; subjects were informed of the risks and benefits of participation, that their participation was voluntary, and that their confidentiality would be maintained. In some cases, we obtained informed consent from a proxy due to cognitive or communication impairments. In these cases, we obtained voluntary assent from participants. All procedures were approved by the university's institutional review board and met ethical standards consistent with the revised Helsinki Declaration.

Participants

Participants were recruited from inpatient rehabilitation facilities within an academic health center. Inclusion criteria were: 1) acute stroke and 2) aphasia, indicated by a) a National Institutes of Health Stroke Scale item 9 (Best Language) score of 1 or 2 (indicates presence of aphasia) (Brott et al., 1989); and b) Boston Diagnostic Aphasia Examination Severity Scale score of 1 or greater (excludes only people with no functional expression or comprehension) (Goodglass et al., 2001). Participants with any type of expressive, receptive, or global aphasia were included, if the above criteria were met. Participants were excluded if they had major depressive disorder, bipolar disorder, psychotic disorder, or dementia. A trained research assistant approached participants who appeared eligible based on medical record screening, then obtained informed consent and completed screening assessments for those who expressed interest.

Intervention

This study built on a previously published strategy training protocol (Skidmore et al., 2017; Skidmore et al., 2015), which was enhanced with supported conversation principles (Kagan et al., 2001). The core elements of strategy training are 1) participant-selected activities; 2) participant-directed self-evaluation of performance of these activities; 3) participant application of a global strategy (Goal-Plan-Do-Check) to improve performance; 4) therapist use of guiding instruction to assist participants in self-evaluation; and 5) participant-directed application of learned skills to other daily activities (Skidmore et al., 2017; Skidmore et al., 2015). Strategy training uses a participant workbook to guide application of the strategy, and to support continuity across sessions.

Supported conversation is an approach that places the burden for effective communication on the conversation partner, not the person with aphasia (Kagan, 1995; Kagan, 1998a, 1998b; Kagan et al., 2001). This is done by intentionally working to acknowledge and reveal the competence of the person with aphasia and by providing supportive methods to allow them to successfully communicate their ideas (Simmons-mackie, 1998). In this study, the adapted protocol incorporated white boards, letter boards, picture boards, and iPad technology, combined with simple verbal and visual cues for communication support. Multi-modal communication, or the use of multiple methods of communication simultaneously, was used to communicate key ideas. These tools and practices enabled the participant to communicate the ideas they wished to convey by the means that were most useful to them in the moment. Additionally, the first intervention session was dedicated to trialing communication techniques to determine which were most effective for each participant. Thus, occupational therapists established a method of communication that could be efficiently used throughout the remaining sessions.

Supported conversation was especially critical during the therapists' use of guiding cues. In the previous strategy training protocol, guided cues were provided on a continuum from least directive to more directive, according to the participants' abilities. In this study, key words, simple phrases, multi-modal communication, and choices made the guiding cues simpler and more effective. While this approach may have limited the range of cues available along the continuum, supported conversation principles still allowed for a distinction between direct cues (therapist-led instruction) and guided cues (client-led problem-solving).

Our team of occupational therapists and speech language pathologists also developed a simplified participant workbook to optimize the delivery of strategy training for people with aphasia. The workbook was simplified to limit the amount of text, increase the amount of white space, replace text with pictures or color gradients, emphasize key words or phrases, and allow space for drawings or pictures instead of written plans.

The goal-setting process was also adapted. Strategy training relies on client-selected, activity-based goals. The second intervention session focused on setting activity-based goals for use in subsequent sessions. To aid in goal setting, we used the Activity Card Sort (Hartman-Maeir et al., 2007), which uses large cards with both text and images to illustrate specific activities. Occupational therapists asked clients to identify whether each activity in the card deck was important to them by placing each card in a "yes" or "no" pile. Therapists then asked participants to select their top 10 activity-based goals from the "yes" pile.

The adapted strategy training protocol was developed by experts in strategy training (JK, KM, ES) and experts in speech-language pathology intervention (WE, WH, MWD, SW). The strategy training experts are occupational therapists with 2-15 years of experience delivering strategy training in clinical trials. The speech-language pathology specialists have experience developing and implementing interventions for adults with aphasia, particularly supported conversation. The adapted protocol was administered in inpatient rehabilitation by occupational therapists (JK, KM) who are proficient in strategy training, under the supervision of the primary investigator (ES) and speech-language pathologists (WE, AA, RC). Occupational therapists were previously trained in strategy training and delivered the intervention in previous clinical trials (NCT01934621, NCT03253601). The therapists were part of the research team and led team discussions after each case that led to the refinement of the intervention.

Occupational therapists administered one intervention session per day, in addition to usual rehabilitation, for a total of 10-15 sessions. The initial strategy training protocol included a maximum of 10 intervention sessions. For this study, we increased the maximum number of sessions to 15 to accommodate the extra session to establish communications strategies, and to allow for more time for participants to comprehend and apply the strategy. Table 1 lists the adaptations made to the original strategy training protocol. Intervention sessions were video recorded to allow for later review and scoring of fidelity.

Assessment

After informed consent and determination of eligibility, a trained, independent team of assessors administered baseline assessments, supervised by a neuropsychologist with expertise in the assessments. Demographic information, medical history, stroke severity (National Institutes of Health Stroke Scale)(Brott et al., 1989), cognitive functions (Cognitive Linguistic Quick Test)(Helm-Estabrooks, 2001), depressive symptoms (Patient Health Questionnaire-9)(Kroenke et al., 2001), and participant-reported outcomes (Stroke Impact Scale)(Duncan et al., 2003) were collected. Assessors then administered the Comprehensive Aphasia Test (Swinburn et al., 2004) to characterize language and cognitive skills. These data were used to characterize the sample and compare with samples in previous trials (Skidmore et al., 2017; Skidmore et al., 2015)(NCT01934621) using an independent samples t-test.

The focus in this study was the feasibility of the adapted strategy training intervention protocol. We first described participant recruitment and retention. We then assessed feasibility by examining: a) intervention delivery and fidelity; b) participant communication and engagement; and c) participant mastery of strategy use and d) change in disability. We compared change in disability scores to matched cases without aphasia from previous trials who received and did not receive strategy training (Skidmore et al., 2014)(NCT01934621).

Intervention fidelity was assessed using two measures. First, fidelity to strategy training was assessed with a validated checklist used in previous trials (Skidmore et al., 2017; Skidmore et al., 2015; Skidmore et al., 2014). This checklist was applied to two randomly selected intervention sessions for each participant. Videos were selected using a random number table and were selected from sessions 3-15 to ensure that participants had received some strategy training exposure. Participants who did not receive at least 3 intervention sessions were excluded from this portion of the analysis. Adherence (percentage of active ingredients and procedures included) and competence (percentage of active ingredients and procedures delivered with adequate competence) were scored for each video. Second, fidelity to the supported conversation principles using the Measure of Supported Conversation (Kagan et al., 2004) was assessed in each intervention session for each participant. This measure assesses the degree of therapist skill in supporting the participant's communication. Scores reflect how well the therapist acknowledges and reveals the competence of the participant using supported conversation techniques, using two subscales ranging from 0 to 4 (higher scores indicate greater fidelity). The measure was administered upon video review by an experienced speech language pathologist (AA, RC) who was independent of the strategy training intervention team but familiar with the study aims. We established a priori that a mean adherence to strategy training of 80% or higher and a mean on the Measure of Supported Conversation of two or greater would indicate feasibility. This would reflect the level of adherence from previous strategy training trials (Skidmore et al., 2017; Skidmore et al., 2015) and no major concerns with the use of supported conversation (Kagan et al.,

Table 1. Adaptations to the Study Protocol

	Original Strategy Training Protocol	Adapted Strategy Training Protocol
Testing Battery		
Cognition	Delis Kaplan Executive Function System Repeatable Battery for the Assessment of Neuropsychological Status	Cognitive Linguistic Quick Test
Language		Comprehensive Aphasia Test
Intervention		
Strategies for Supported Communication	(not applicable)	Supported conversation technique trials using daily schedule (Session 1)
Goal Setting	Goal setting using Canadian Occupational Performance Measure (Session 1)	Goal setting using Activity Card Sort with supported conversation techniques (Session 2)
Strategy Application	Strategy application (Sessions 2-10)	Strategy application with supported conversation techniques (Sessions 3-10+)

2004).

The Measure of Participation in Conversation (Kagan et al., 2004) was used to assess participant communication during the strategy training sessions. This measure assesses the degree to which the participant attempts to communicate (interaction) and the depth of information conveyed (transaction). Interaction and transaction are each scored on a scale of 0-4, with higher scores indicating greater participation in communication. Each treatment session was video recorded and later scored by an experienced speech-language pathologist (AA, RC). The reviewing therapists were independent of the strategy training intervention team but were familiar with the study aims. We established a priori that a mean of 2 or greater would indicate feasibility. This would suggest no major concerns with the amount of information the participant is able to convey to direct the use of the strategy (Kagan et al., 2004). The Pittsburgh Rehabilitation Participation Scale (Lenze et al., 2004) assessed participant engagement in the intervention sessions (range 1-6, with higher scores indicating greater engagement). The scale was administered each session by the intervention therapist.

We examined mastery of strategy use (i.e., the ability to understand and execute core skills taught by strategy training) to determine whether people with aphasia could engage in intervention procedures. Two raters who were occupational therapists with expertise in strategy training adjudicated each participant as demonstrating "mastery" or "non-mastery" of strategy use based on the ability to consistently execute 4 of 5 identified skills across intervention sessions: 1) ability to identify a problem; 2) ability to develop a plan to address the problem; 3) ability to reflect on performance; 4) ability to apply the global strategy (Goal, Plan, Do, Check); and 5) ability to recall the global strategy. Both raters reviewed videos of each participant's intervention sessions and classified mastery status independently. We calculated percent agreement between raters. Discrepancies were resolved by group discussion.

To assess change in disability, we compared change on the Functional Independence Measure (FIM) (Stineman et al., 1996) from baseline and inpatient rehabilitation discharge. We established a priori that a Cohen's drm effect size of 0.5 or greater would indicate feasibility and would warrant further investigation. A moderate effect size of 0.5 would be smaller than the effect sizes seen in a previous strategy training trial (d=1.06) (Skidmore et al., 2015) but would still suggest meaningful improvement in outcomes.

Data Analysis

We calculated descriptive statistics (means and standard deviations; medians and interquartile ranges; frequencies and percentages) for participant recruitment and retention, participant communication and engagement, intervention delivery and fidelity, participant mastery of strategy use, and change in disability. To determine whether baseline communication abilities influenced mastery of strategy use, we examined box and whisker plots to see whether participants with "mastery" or "non-mastery" differed with respect to baseline scores on selected Comprehensive Aphasia Test subtests. To characterize changes in disability, we examined change in FIM scores and Cohen's drm effect sizes using the repeated measures method described by Lakens (Lakens, 2013). We then compared cases from the current sample with matched cases who did not have aphasia (Boston Diagnostic Aphasia Examination Severity Scale=4 or 5) from previous trials (Skidmore et al., 2014)(NCT01934621) to assess whether people with aphasia in this study experienced similar trajectories of disability reduction. Cases were matched on baseline FIM scores within the standard error of measurement (SEM=4.70)(Ottenbacher et al., 1996) and baseline National Institutes of Health Stroke Scale scores within the standard error of measurement (SEM=0.94; calculated as SEM=SD*sqrt(1-r), where standard deviation, SD=4.2; and inter-rater reliability, r=0.95)(Goldstein & Samsa, 1997). We plotted the trajectories of disability scores for both groups of cases to compare groups descriptively. This allowed us to compare whether people with aphasia achieved similar improvement from strategy training as those without aphasia. We then matched cases from the current sample with matched cases who did not receive strategy training, but rather a control intervention from previous trials (Skidmore et al., 2014)(NCT01934621) using the same matching criteria. This allowed us to examine the effect of spontaneous recovery during inpatient rehabilitation. Because the first two intervention sessions were dedicated to establishing communication strategies and goal setting, the strategy training framework was not introduced until the third session. Therefore, only participants who received greater than two intervention sessions were included in the analyses.

Results

Participant Recruitment, Retention, and Characteristics

Participants were recruited from August 2018 to December 2019. Twenty-five participants consented; nine were ineligible (four did not have aphasia, and five had no functional communication). Table 2 presents participant characteristics. The sample was comprised of White (87.5%) and Black (12.5%) participants with a mean age of 71.5 years (SD=9.9) and mean of 14.0 years of education (SD=3.3). Participants had experienced their stroke an average of 25.6 days prior to baseline testing (SD=27.6, range=6-90). Most participants experienced ischemic (63%) left hemisphere (81%) stroke. On average, the sample had moderately severe stroke (NIHSS; M=8.6, SD=5.2) and moderate to severe disability (FIM; M=52.4, SD=21.0).

Compared to the samples in previous strategy training trials, this sample had a longer time from stroke to inpatient rehabilitation admission (M=25.6 days, SD=27.6 days) (t(235)=1.0, p=.07), and longer length of stay in inpatient rehabilitation (M=22.5 days, SD=9.6 days)(t(248)=1.29, p=.20), though these differences did not reach statistical significance (NCT01934621). Baseline FIM scores were lower than in our previous strategy training trial (t(234)=-3.83, p.001) and also appear lower than in other studies of adults with stroke (Balaban et al., 2011; Mutai et al., 2012).

Figure 1 presents recruitment and retention information. Of the 16 enrolled participants, one withdrew during baseline testing and one was discharged home prior to initiating the intervention. The remaining 14 started the intervention and 13 completed greater than two sessions and were therefore exposed to the strategy training framework. Low exposure to intervention was due to early discharge to acute care, skilled nursing facilities, or home. Table 3 provides feasibility data for the full sample (n=16), and for those who were exposed to greater than two sessions of the intervention (n=13).

Intervention Delivery and Fidelity

Of those who received intervention, the average number of sessions was 7.8 (SD=2.1) and the average session length was 34.0 minutes (SD=7.4). These results are similar to our previous studies, but below our target of 10-15 sessions. Four participants (25%) hit the target of 10-15 sessions. Therapists demonstrated a mean adherence of 84% to the strategy training protocol, meeting the criterion for feasibility; therapists demonstrated adequate or excellent competence 70% of the time on average. Therapists demonstrated strong fidelity to supported conversation principles (Acknowledges: M=3.6, SD=0.7; Reveals: M=3.4, SD=0.5), again meeting the criteria for feasibility.

Participant Communication and Engagement

Participants had good interaction skills (Interaction: Median=3.0, IQR=1.0) and were able to communicate a moderate amount of information (Transaction: Median=2.0, IQR=1.0), meeting the criteria for feasibility. Participants demonstrated good engagement in the intervention (Pittsburgh Rehabilitation and Participation Scale: Median=5.0, IQR=2.0).

Participant Response to Intervention

Twelve participants had enough intervention videos to score mastery of strategy use. Independent rater agreement was 83.3% and discrepancies (n=2) were successfully adjudicated. Six participants (50%) met criteria for mastery and six participants (50%) did not (non-mastery).

Mann-Whitney U tests revealed no significant differences in communication abilities between participants with mastery and non-mastery on any subtest of the Comprehensive Aphasia Test (p.05; Supplemental Figures). However, visual inspection of box and whisker plots revealed a trend toward meaningful differences in semantic memory, comprehension of written words, and comprehension of written sentences.

Change in Disability Scores

The sample achieved a mean FIM change score of 21.8 (SD=16.2) with a large effect size (Cohen's drm=.95), meeting the criterion for feasibility. The sample mean change was similar to the minimum clinically important difference of 22 points (Beninato, 2006). We were able to match 14 of the 16 participants on baseline disability and stroke severity. Two participants had low baseline disability scores (FIM=19, 22) and no matches were available from previous strategy training trials (lowest FIM=28). These participants were excluded from the comparisons.

Details about participants with aphasia, their matched controls without aphasia who received strategy training, and matched controls who did not receive strategy training are in Supplemental Table 1. Figure 2 presents the baseline and discharge disability scores for these groups. This figure suggests that participants with aphasia may have achieved similar gains in disability scores (FIM

Table 2. Participant Characteristics

	Study Admission (n=16)	
	M(SD) or % (n)	Missing *% (n)*
Age, years, *M (SD)*	71.5 (9.9)	0 (0)
Male, *M (SD)*	56 (9)	0 (0)
Education, years, *M (SD)*	14.0 (3.3)	6 (1)
Race, Black, % (n)	12.5 (2)	0 (0)
Comorbidity, CCI, *M (SD)*	2.3 (1.7)	0 (0)
Days since stroke, *M (SD)*	25.6 (27.6)	0 (0)
Ischemic, % (n)	63 (10)	0 (0)
Left hemisphere, % (n)	81 (13)	0 (0)
Cortical, % (n)	88 (14)	0 (0)
Days in inpatient rehabilitation, *M (SD)*	22.5 (9.6)	0 (0)
Aphasia severity, BDAE, *M (SD)*	1.9 (1.1)	0 (0)
Stroke severity NIHSS,* *M (SD)*	8.6 (5.2)	13 (2)
Stroke impact scale, participation, *M (SD)*	25.3 (6.9)	13 (2)
Stroke recovery, *M (SD), Range 0-100*	51.5 (20.1)	13 (2)
Depressive symptoms PHQ,* *M (SD)*	6.6 (5.3)	13 (2)
Cognitive Linguistic Quick Test		
Personal facts, *M (SD), Range 0-8*	4.2 (3.3)	6 (1)
Symbol cancellation, *M (SD), Range 0-12*	7.2 (4.8)	6 (1)
Confrontation naming, *M (SD), Range 0-10*	5.9 (3.9)	0 (0)
Clock drawing, *M (SD), Range 0-13*	6.6 (3.8)	6 (1)
Story retelling, *M (SD), Range 0-10*	2.5 (1.8)	0 (0)
Symbol trials, *M (SD), Range 0-10*	4.2 (3.3)	6 (1)
Generative naming, *M (SD), Range 0-9*	1.6 (1.5)	6 (1)
Design memory, *M (SD), Range 0-6*	3.2 (2.1)	6 (1)
Mazes, *M (SD), Range 0-8*	3.0 (2.8)	6 (1)
Design generation, *M (SD), Range 0-13*	3.1 (3.0)	6 (1)
Comprehensive Aphasia Test		
Cognition, Raw Score, *M (SD), Range 0-20*	8.1 (3.9)	0 (0)
Comprehension, spoken, T-score, *M (SD)*	44.6 (9.1)	0 (0)
Comprehension, written, T-Score, *M (SD)*	45.8 (7.8)	0 (0)
Repetition, T-score, *M (SD)*	48.6 (9.3)	19 (3)
Naming, T-score, *M (SD)*	51.4 (8.6)	19 (3)
Reading T-score, *M (SD)*	50.2 (9.0)	19 (3)
Writing T-score, *M (SD)*	49.9 (5.9)	19 (3)

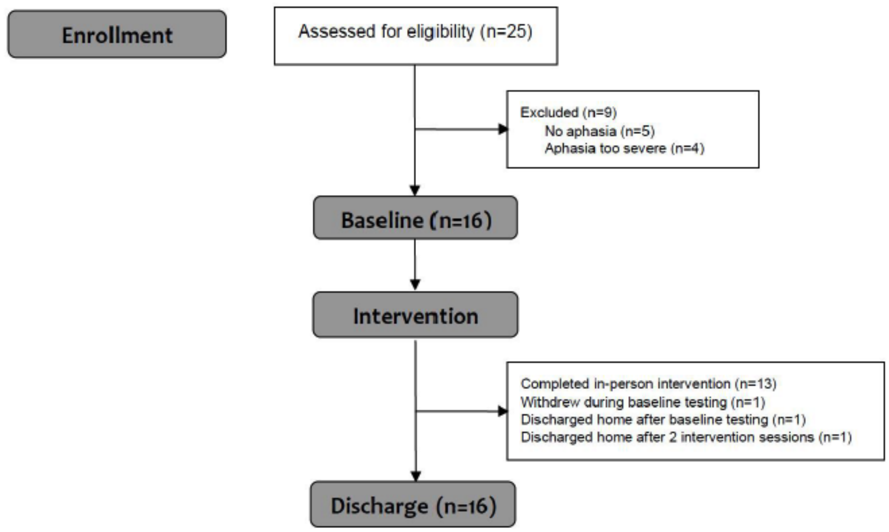
*Higher scores indicate better performance for all measures
CCI: Charlson Comorbidity Index; BDAE: Boston Diagnostic Aphasia Examination Severity Score; NIHSS: National Institutes of Health Stroke Scale; PHQ: Patient Health Questionnaire-9

change M=21.8, SD=16.2, drm=.95) as participants without aphasia from previous trials (FIM change M=18.8, SD=16.1, drm=.96)(t(26)=-.46, p=.65). Of the 14 case- control pairs in this analysis, six participants with aphasia and five participants without aphasia achieved the minimally clinically important difference of 22 points change. This figure also suggests that participants with aphasia demonstrated greater improvements than matched controls from a previous study who did not receive strategy training (M=12.9, SD=6.6, drm=.69)(t(26)=2.0, p=.06). This difference did not reach statistical significance but may have achieved significance with a larger sample size. Still, there is a signal to suggest that participants who received strategy training achieved greater FIM change than what may be expected from usual inpatient rehabilitation care. This is supported by data from previous studies (Skidmore et al., 2017; Skidmore et al., 2015).

Discussion

This pilot study provides evidence that an adapted strategy training intervention for people with aphasia may be feasible in inpatient rehabilitation. Therapists were able to maintain fidelity to strategy training principles while also implementing supported conversation principles. Participants demonstrated good engagement and sufficient communication to participate in the protocol, with 50% of participants achieving mastery of strategy use. Furthermore, participants were able to achieve similar reductions in disability relative to matched participants

Figure 1. Study Enrollment and Retention



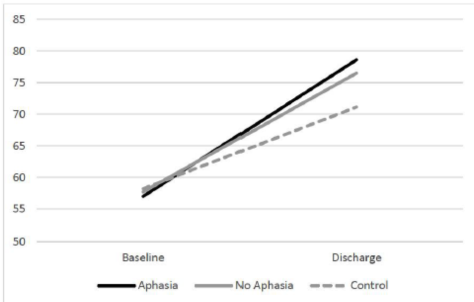
Note. This figure illustrates enrollment and retention throughout the course of the study.

Table 3. Summary of Feasibility Measures

Feasibility Measure	Full Recruited Sample (n=16) *Mean (SD) or n (%)*	Received >2 Sessions (n=13) *Mean (SD) or n (%)*
Eligible participants	16	-
Participants exposed to intervention	15	13
Communication and Engagement		
Participant Interaction (MPC, 0-4) Median (IQR)	-	3.0 (1.0)
Participant Transaction (MPC, 0-4) Median (IQR)	-	2.0 (1.0)
Participant Engagement (PRPS, 1-6) Median (IQR)	-	5.0 (2.0)
Intervention Delivery and Fidelity		
Number of sessions	6.6 (3.2)	7.8 (2.1)
Length of sessions, minutes	34.7 (9.2)	34.0 (7.4)
Strategy training, adherence (%)	-	83.9 (14.1)
Strategy training, competence (% adequate or exceptional)	-	70.0 (20.0)
Supported conversation, acknowledges competence (MSC, 0-4) Median (IQR)	-	4.0 (1.0)
Supported conversation, reveals competence (MSC, 0-4) Median (IQR)	-	3.3 (0.8)
Intervention Response		
Responders, n(%)	-	6.0 (50)
Disability Change		
Baseline disability (FIM, 18-126)	52.4 (21.0)	52.8 (19.8)
Discharge disability (FIM, 18-126)	74.3 (23.2)	74.6 (24.2)
Mean change in disability (FIM, 18-126)	21.8 (16.2)	21.8 (16.1)

Note. MPC=Measure of Participation in Communication; PRPS=Pittsburgh Rehabilitation Participation Scale; MSC=Measure of Supported Communication; FIM=Functional Independence Measure.

Figure 2. Functional Independence Measure Scores by time point and group



Note: Black line represents the mean of the aphasia group, enrolled in this study. The solid gray line represents the mean of the matched controls who received strategy training. The dashed gray line represents the mean of the matched controls who did not receive strategy training.

who did not have aphasia, and greater change than would be expected from usual inpatient rehabilitation. Together, this evidence suggests that the adapted intervention bears further exploration, though adjustments are necessary for larger future trials. This finding provides encouraging evidence that therapists may be able to provide adapted versions of communication-intensive interventions to stroke survivors with aphasia with adaptations to intervention protocols.

Two items bear refinement: 1) the recruitment of participants; and 2) the dose of the intervention. Regarding recruitment, we still excluded 4 of 25 (16%) potential participants due to aphasia severity. Alternate intervention approaches may be needed for those with severe aphasia. Regarding dose, two participants had short lengths of stay in inpatient rehabilitation (7 days or less, 12.5%). The remaining participants fell short of the intended 10 – 15 sessions. This caused us to question whether inpatient rehabilitation is the optimal setting for strategy training in this population. Given the complexity of disability and rehabilitation for people with aphasia, home health or outpatient rehabilitation may provide a more stable environment. In addition, as many people with aphasia spontaneously recover some language function shortly after stroke (Kertesz, 1984; Pedersen et al., 1995), waiting to administer strategy training may allow a larger proportion of people with aphasia to participate in this intervention. Still, participants in this study participated in approximately 8 intervention sessions and appeared to achieve greater improvements in FIM scores than would be expected from usual care. Additional research on the timing, setting, and dosing of strategy training for people with aphasia is needed.

Only 50% of the sample met criteria for mastery of strategy use. Considering that participants with aphasia were able to achieve similar improvements as those without aphasia, it is possible that our criteria for classifying mastery was too restrictive. Still, even among those without aphasia, not all people are able to achieve mastery of all critical components of strategy training. More exploration of moderators of treatment response is warranted to help better determine who benefits from strategy training and who does not.

In this small sample, we were unable to identify specific communication or cognitive deficits that discriminated between people who did and did not master strategy training. This may indicate that people with a variety of abilities can participate in the intervention. However, it may indicate that the sample was too small and heterogeneous to detect trends. A better understanding of characteristics predicting treatment response is needed to optimize the implementation of strategy training.

Future studies should also examine long-term outcomes following strategy training. Previous studies have revealed that participants who receive strategy training demonstrate sustained improvements following discharge up to 3- and 6-months post-stroke compared to those who did not receive strategy training (Skidmore et al., 2017; Skidmore et al., 2015). Future studies should examine whether this effect is also seen in participants with aphasia.

Conclusion

This pilot study examined the feasibility of an adapted strategy training intervention for people with aphasia. Therapists were able to deliver the adapted intervention with fidelity to strategy training elements and supported conversation principles. Participants demonstrated good engagement and fair communication during intervention sessions. From inpatient rehabilitation admission to inpatient rehabilitation discharge, participants achieved similar gain on the FIM compared to similar participants from previous strategy training trials without aphasia. While the findings are promising, additional consideration of recruitment, retention, timing, and delivery of the intervention is warranted when designing future studies examining efficacy and intervention response variability.

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References

Ali, M., Bath, P. M., Lyden, P. D., Bernhardt, J., Brady, M., & Collaboration, V. (2014). Representation of people with aphasia in randomized controlled trials of acute stroke interventions. Int J Stroke, 9(2), 174-182. https://doi.org/10.1111/ijs.12043

Balaban, B., Tok, F., Yavuz, F., Yasar, E., & Alaca, R. (2011). Early rehabilitation outcome in patients with middle cerebral artery stroke. Neurosci Lett, 498(3), 204-207. https://doi.org/10.1016/j.neulet.2011.05.009

Brott, T., Adams, H., Olinger, C. P., Marler, J. R., Barsan, W. G., Biller, J., Spilker, J., Holleran, R., Eberle, R., Hertzberg, V., Rorick, M., Moomaw, C. J., & Walker, M. (1989). Measurements of acute cerebral infarction: a clinical examination scale. Stroke, 20, 864-870.

Duncan, P. W., Bode, R. K., Min Lai, S., Perera, S., & Glycine Antagonist in Neuroprotection Americans, I. (2003). Rasch analysis of a new stroke-specific outcome scale: the Stroke Impact Scale. Arch Phys Med Rehabil, 84(7), 950-963. https://doi.org/10.1016/s0003-9993(03)00035-2

Ellis, C., Simpson, A. N., Bonilha, H., Mauldin, P. D., & Simpson, K. N. (2012). The one-year attributable cost of poststroke aphasia. Stroke, 43(5), 1429-1431. https://doi.org/10.1161/strokeaha.111.647339

Flowers, H. L., Skoretz, S. A., Silver, F. L., Rochon, E., Fang, J., Flamand-Roze, C., & Martino, R. (2016). Poststroke Aphasia Frequency, Recovery, and Outcomes: A Systematic Review and Meta- Analysis. Arch Phys Med Rehabil, 97(12), 2188-2201 e2188. https://doi.org/10.1016/j.apmr.2016.03.006

Goldstein, L. B., & Samsa, G. P. (1997). Reliability of the National Institutes of Health Stroke Scale. Extension to non-neurologists in the context of a clinical trial. Stroke, 28(2), 307-310. https://doi.org/10.1161/01.str.28.2.307

Goodglass, H., Kaplan, E., & Barressi, B. (2001). The assessment of aphasia and related disorders (3 ed.). Lippincott Williams & Wilkins. Hartman-Maeir, A., Eliad, Y., Kizoni, R., Nahaloni, I., Kelberman, H., & Katz, N. (2007). Evaluation of a long-term community based rehabilitation program for adult stroke survivors. NeuroRehabilitation, 22(4), 295-301.

Helm-Estabrooks, N. (2001). Cognitive Linguistic Quick Test (CLQT): Examiner's Manual. The Psychological Corporation.

Jensen, L. R., Løvholt, A. P., Sørensen, I. R., Blüdnikow, A. M., Iversen, H. K., Hougaard, A., Mathiesen, L. L., & Forchhammer, H. B. (2015). Implementation of supported conversation for communication between nursing staff and in-hospital patients with aphasia. Aphasiology, 29(1), 57-80. https://doi.org/10.1080/02687038.2014.955708

Kagan, A. (1995). Revealing the competence of aphasic adults through conversation: A challenge to health professionals. Top Stroke Rehabil, 2(1), 15-28. https://doi.org/10.1080/10749357.1995.11754051

Kagan, A. (1998a). Reply: Philosophical, practical and evaluative issues associated with 'Supported conversation for adults with aphasia'. Aphasiology, 12(9), 851-864. https://doi.org/10.1080/02687039808249580

Kagan, A. (1998b). Supported conversation for adults with aphasia: methods and resources for training conversation partners. Aphasiology, 12(9), 816-830. https://doi.org/10.1080/02687039808249575

Kagan, A., Black, S. E., Duchan, F. J., Simmons-Mackie, N., & Square, P. (2001). Training volunteers as conversation partners using "Supported Conversation for Adults with Aphasia" (SCA): a controlled trial. J Speech Lang Hear Res, 44(3), 624-638. https://doi.org/10.1044/1092-4388(2001/051)

Kagan, A., Winckel, J., Black, S., Duchan, J. F., Simmons-Mackie, N., & Square, P. (2004). A set of observational measures for rating support and participation in conversation between adults with aphasia and their conversation partners. Top Stroke Rehabil, 11(1), 67-83. https://doi.org/10.1310/CL3V-A94A-DE5C-CVBE Kertesz, A. (1984). Recovery from aphasia. Adv Neurol, 42, 23-39. https://www.ncbi.nlm.nih.gov/pubmed/6209949

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med, 16(9), 606-613. https://doi.org/10.1046/j.1525- 1497.2001.016009606.x

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs [Review]. Frontiers in Psychology, 4(863). https://doi.org/10.3389/fpsyg.2013.00863

Lenze, E. J., Munin, M. C., Quear, T., Dew, M. A., Rogers, J. C., Begley, A. E., & Reynolds, C. F., 3rd. (2004). The Pittsburgh Rehabilitation Participation Scale: reliability and validity of a clinician-rated measure of participation in acute rehabilitation. Arch Phys Med Rehabil, 85(3), 380-384. https://doi.org/10.1016/j.apmr.2003.06.001

Mc Menamin, R., Tierney, E., & Mac Farlane, A. (2015). Addressing the long-term impacts of aphasia: how far does the Conversation Partner Programme go? Aphasiology, 29(8), 889-913. https://doi.org/10.1080/02687038.2015.1004155

McVicker, S., Parr, S., Pound, C., & Duchan, J. (2009). The Communication Partner Scheme: A project to develop long-term, low-cost access to conversation for people living with aphasia. Aphasiology, 23(1), 52-71. https://doi.org/10.1080/02687030701688783

Mutai, H., Furukawa, T., Araki, K., Misawa, K., & Hanihara, T. (2012). Factors associated with functional recovery and home discharge in stroke patients admitted to a convalescent rehabilitation ward. Geriatr Gerontol Int, 12(2), 215-222. https://doi.org/10.1111/j.1447-0594.2011.00747.x

Ottenbacher, K. J., Hsu, Y., Granger, C. V., & Fiedler, R. C. (1996). The reliability of the functional independence measure: a quantitative review. Arch Phys Med Rehabil, 77(12), 1226-1232. https://doi.org/10.1016/s0003-9993(96)90184-7

Pedersen, P. M., Jorgensen, H. S., Nakayama, H., Raaschou, H. O., & Olsen, T. S. (1995). Aphasia in acute stroke: incidence, determinants, and recovery. Ann Neurol, 38(4), 659-666. https://doi.org/10.1002/ana.410380416

Rouch, S., & Skidmore, E. R. (2018). Examining Guided and Directed Cues in Strategy Training and Usual Rehabilitation. OTJR (Thorofare N J), 38(3), 151-156. https://doi.org/10.1177/1539449218758618

Simmons-mackie, N. (1998). In support of supported conversation for adults with aphasia. Aphasiology, 12(9), 831-838. https://doi.org/10.1080/02687039808249576 Skidmore, E. R., Butters, M., Whyte, E., Grattan, E., Shen, J., & Terhorst, L. (2017). Guided Training Relative to Direct Skill Training for Individuals With Cognitive Impairments After Stroke: A Pilot Randomized Trial. Arch Phys Med Rehabil, 98(4), 673-680. https://doi.org/10.1016/j.apmr.2016.10.004

Skidmore, E. R., Dawson, D. R., Butters, M. A., Grattan, E. S., Juengst, S. B., Whyte, E. M., Begley, A., Holm, M. B., & Becker, J. T. (2015). Strategy Training Shows Promise for Addressing Disability in the First 6 Months After Stroke. Neurorehabil Neural Repair, 29(7), 668-676. https://doi.org/10.1177/1545968314562113

Skidmore, E. R., Dawson, D. R., Whyte, E. M., Butters, M. A., Dew, M. A., Grattan, E. S., Becker, J. T., & Holm, M. B. (2014). Developing complex interventions: lessons learned from a pilot study examining strategy training in acute stroke rehabilitation. Clin Rehabil, 28(4), 378-387. https://doi.org/10.1177/0269215513502799

Stineman, M. G., Shea, J. A., Jette, A., Tassoni, C. J., Ottenbacher, K. J., Fiedler, R., & Granger, C. V. (1996). The Functional Independence Measure: tests of scaling assumptions, structure, and reliability across 20 diverse impairment categories. Arch Phys Med Rehabil, 77(11), 1101-1108. https://doi.org/10.1016/s0003-9993(96)90130-6

Swinburn, K., Porter, G., & Howard, D. (2004). Comprehensive Aphasia Test. Psychology Press. Wray, F., Clarke, D., & Forster, A. (2018). Post-stroke self-management interventions: a systematic review of effectiveness and investigation of the inclusion of stroke survivors with aphasia. Disabil Rehabil, 40(11), 1237-1251. https://doi.org/10.1080/09638288.2017.1294206