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RESEARCH REPORT

# Lidcombe Program translation to community clinics in Australia and England

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## Abstract

**Background:** Early intervention is essential healthcare for stuttering, and the translation of research findings to community settings is a potential roadblock to it.

**Aims:** This study was designed to replicate and extend the Lidcombe Program community translation findings of O'Brian et al. (2013) but with larger participant numbers, incorporating clinicians (speech pathologists/speech anlanguage therapists) and their clients from Australia and England.

**Methods & Procedures:** Participants were 51 clinicians working in public and private clinics across Australia ($n = 36$) and England ($n = 15$), and 121 of their young stuttering clients and their families. Outcome measures were percentage of syllables stuttered (%SS), parent severity ratings at 9 months post-recruitment, number of clinic visits to complete Stage 1 of the Lidcombe Program, and therapist drift.

**Outcomes & Results:** Community clinicians in both countries achieved similar outcomes to those from randomized controlled trials. Therapist drift emerged as an issue with community translation. Speech and language therapists in England attained outcomes 1.0%SS above the speech pathologists in Australia, although their scores were within the range attained in randomized trials.

**Conclusions & Implications:** Community clinicians from Australia and England can attain Lidcombe Program outcome benchmarks established in randomized trials. This finding is reassuring in light of the controlled conditions in clinical trials of the Lidcombe Program compared with its conduct in community practice. The long-term impact of therapist drift in community clinical practice with the Lidcombe Program has yet to be determined.

KEYWORDS
early stuttering, effectiveness, Lidcombe Program, translation

**WHAT THIS PAPER ADDS**

*What is already known on the subject*

The Lidcombe Program is an efficacious early stuttering intervention. Translation to clinical communities has been studied with one Australian cohort.

*What this paper adds to existing knowledge*

A larger translation cohort is studied, comprising community clinicians and children in Australia and England.

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

Community clinicians from Australia and England can attain Lidcombe Program outcome benchmarks established in randomized trials. This finding is reassuring in light of the controlled conditions in clinical trials of the Lidcombe Program compared with its conduct in community practice.

## INTRODUCTION: BACKGROUND AND AIMS

### Early stuttering

Persistent stuttering during childhood, adolescence and adulthood has potential adverse effects. These span the domains of mental health (Blumgart et al., 2010; Craig & Tran, 2014; Iverach et al., 2016, 2017; Stein et al., 1996), quality of life (Beilby et al., 2012; Franic et al., 2012; Koedoot et al., 2011) and education and vocational attainment (Blumgart et al., 2010; Bricker-Katz et al., 2013; Klein & Hood, 2004; Klompas & Ross, 2004; McAllister et al., 2012; O'Brian et al., 2011). Cumulative incidence estimates of early stuttering from large cohorts recruited prior to onset are 5.0% (Månsson, 2000) and 8.5% (Reilly et al., 2009) at 3 years of age, and 11.2% at 4 years of age (Reilly et al., 2009). Longitudinal reports of natural recovery in large cohorts suggest that two-thirds of children will recover during childhood, either naturally, with treatment or with a combination of both: 74% at 4 years post-onset (Yairi & Ambrose, 2004), 67% at 4–5 years post-onset (Ambrose et al., 2015), 71% at 5 years of age (Månsson, 2000) and 65% at 7 years of age (Kefalianos et al., 2017).

There is evidence that during the school-age years mental health issues associated with stuttering have begun to develop (Iverach et al., 2016; Lau et al., 2012; McAllister, 2016; Tığrak et al., 2021). Iverach et al. (2016) found that 24% of children aged 7–12 years were diagnosed with social anxiety disorder. Additionally, there is evidence of the emergence of educational problems at that time of life (Boyle et al., 1994; Williams et al., 1969), which is consistent with a body of evidence for that age that indicates social isolation, fear and avoidance in classroom situations (Barbara, 1956; Daniels et al., 2012; Klompas & Ross, 2004; Peters & Starkweather, 1989).

Potentially, then the emerging childhood risks of mental health, educational and vocational impairment can be minimized with effective early stuttering intervention during the pre-school years. While the efficacy of such intervention is determined in clinical trials, it is critical to determine its effectiveness in real-world community clinics where there are many parameters that influence how treatment is implemented but which are normally not taken account of in the controlled clinical environment of randomized trials.

One such parameter is the variation in basic clinical training for early intervention during professional qualification and subsequent workplace training. Such training is likely to be less extensive than the training of clinicians who feature in randomized trials. Another parameter is the well-known comorbidity of early stuttering with speech and language disorders (Arndt & Healy, 2001; Blood et al., 2003; Nippold, 1990, 2001; Unicomb et al., 2013; Yaruss et al., 1998); clinical trials often exclude such comorbidities. Workplace restrictions and treating early stuttering can also be an issue and has been reported in the United States (US Department of Education, n.d.), the UK (Millard et al., 2008) and Australia (Rousseau et al., 2002). Rousseau et al. (2002) point out the connection between workplace restrictions and issues related to therapist drift. Therapist drift is when a treatment is not delivered as intended by its developers. This is a well-recognized issue with stuttering treatment (Ingham & Riley, 1998; Thomas & Howell, 2001) and has been identified as such in research reports about the Lidcombe Program of early stuttering intervention (Carr Swift et al., 2011; O'Brian et al., 2013; Swift et al., 2015). Additionally, participant motivation for treatment, and commitment to it, may be higher in clinical trials than community settings.

In summary, early intervention is essential healthcare for stuttering, and community translation is a potential

roadblock to it. Despite this, there has been only one study of how the results of randomized clinical trials translate to community clinics. This was a study of the Lidcombe Program by O'Brian et al. (2013). The Lidcombe Program (Onslow, 2022) is an operant intervention for young children who stutter, based on parent verbal contingencies during conversations between children and parents. The target of Stage 1 of the Lidcombe Program is to achieve no stuttering or nearly no stuttering, and Stage 2 is designed to maintain that outcome. The Lidcombe Program evidence base includes children from 10 countries, and there have been nine randomized controlled trials of the treatment (Arnott et al., 2014; Bridgman et al., 2016; De Sonneville-Koedoot et al., 2015; Donaghy et al., 2020; Jones et al., 2005; Latterman et al., 2008; Lewis et al., 2008; Onslow et al., 1994; Trajkovski et al., 2019). Independent reviews of clinical research consistently conclude the Lidcombe Program evidence base to be the most comprehensive for early stuttering treatments (Baxter et al., 2015; Blomgren, 2013; Brignell et al., 2021; Nye & Hahs-Vaughn, 2011; Nye et al., 2013; Sjøstrand et al., 2021; Wallace et al., 2015). Sjøstrand et al. (2021) note that it is the only early intervention treatment that has been compared with a no-treatment control group.

O'Brian et al. (2013) studied the Lidcombe Program in Australia with 31 speech pathologists in general community clinic settings and 57 children with stuttering. There were 50 boys and seven girls, ranging in age from 2 years 7 months to 6 years 4 months at the start of treatment. Nine months post-recruitment, mean percentage of syllables stuttered (%SS) was 1.7. The most significant predictor of %SS was workplace training from the Lidcombe Program Trainers Consortium (https://www.lidcombeprogram.org). The consortium-trained clinicians had less therapist drift, better adherence to the Lidcombe Program Treatment Guide (Onslow et al., 2021), and the children treated by the trained clinicians had 54% lower %SS scores at 9 months post-recruitment compared with those treated by untrained clinicians.

## The present study

The present study was designed to replicate and extend the O'Brian et al. (2013) findings with larger participant numbers and incorporating clinicians from a different country. The Lidcombe Program was developed originally in Australia, and the UK also has featured prominently in its development. Subsequent to its introduction to UK in the 1990s, a number of clinical issues were identified about potential psychological risks of such a behavioural treatment (Cook, 1996; Cook & Rustin, 1997; Stewart, 1996). In response, Woods et al. (2002) published the first data showing that the Lidcombe Program was psychologically safe. With increasing acceptance of the treatment across the UK, publications occurred with participants located in England (Harrison et al., 1999; Hayhow, 2009; Hayhow et al., 1998; Kingston et al., 2003). Subsequently, speech and language therapists[1] in England have been prominent in the Lidcombe Program Trainers Consortium. Consequently, the present study was conducted with speech pathologists, children and parents in Australia as well as speech and language therapists and their clients in England.

We designed the study to answer four research questions:

- Do clinicians from Australia and England attain Lidcombe Program outcomes within the range of those reported in randomized trials?
- Are outcomes influenced by training?
- Are outcomes influenced by therapist drift?
- Are outcomes similar for clinicians from Australia and England?

The benefits of clinical trials for early intervention cannot reach the intended recipients—pre-school children who stutter—without being administered by community clinicians. Considering the prominence of speech and language therapists in England developing and providing clinical training for the treatment, this translation research is designed to guide those clinicians in their use of the Lidcombe Program. More broadly, the research will inform clinicians in other countries about how well the treatment may be used to provide benefit to their clinical communities.

# METHODS AND PROCEDURES

## Participant recruitment

Participants were 51 clinicians working in public and private clinics across Australia ($n = 36$) and England ($n = 15$), and 121 of their young stuttering clients. Each recruited clinician requested participation in the research study from eligible families who attended their clinics for assessment. Participants from the original O'Brian et al. (2013) study were not included as participants in this study. Clinicians were eligible for inclusion in the study if they used the Lidcombe Program to treat young children who stutter. Eligibility criteria for the young children with stuttering were: (1) younger than 7 years of age at the beginning of treatment; (2) diagnosis of stuttering confirmed by consensus between a clinician and parent; (3) observation of

stuttering in the clinic by a clinician; and (4) about to begin Lidcombe Program treatment.

Speech pathologists from Australia were recruited through Speech Pathology Australia, the clinical networks of the Australian Stuttering Research Centre, and the Australian Speak Easy Association. Speech and language therapists from England were recruited through a network of those who had received training through the Lidcombe Program Trainers Consortium. For participating clinicians in England, that approach was necessary because, during the recruitment period of 2009–12, the Lidcombe Program was not routinely taught in professional preparation programmes in England. During that period, speech and language therapists needed to seek consortium workshop training in order to acquire the knowledge and skills to implement the Lidcombe Progra with their pre-school clients. Therefore, sourcing clinicians in England for the trial necessarily involved using those who had this training. The novel status of the treatment in England compared with Australia is shown in Table 2; half of the clinicians from Australia reported that they had treated more than 30 children with the Lidcombe Program, but only a quarter of the clinicians from England reported having done so.

For speech pathologists from Australia, the project initially received ethical approval from the University of Sydney Human Research Ethics Committee. Approval was then gained from individual relevant Australian area health service ethics committees for participating speech pathologists. For speech and language therapists from England, ethics approval was initially obtained from the North Bristol National Health Service Trust and then site-specific approval was obtained for each participating therapist.

## Participants

### Clinicians (speech pathologists/speech and language therapists)

The 36 speech pathologists from Australia were drawn from community health centres, hospitals and private practices across seven states and territories of Australia. The 15 speech and language therapists from England were drawn exclusively from community health services across England.

### Children

2 Participating children were 100 boys (82.6%) and 21 girls (17.4%) ranging in age from 2.7 to 6.8 years (mean of 4.4 years) at the start of treatment. A total of 35 of the children (28.9%) also had a clinician-diagnosed speech or language disorder comorbid with stuttering. The mean pre-treatment within-clinic %SS score for the entire group of children from Australia and England was 4.7. Using a 10-point stuttering severity scale (SR) where 1 = no stuttering, 2 = extremely mild stuttering and 10 = extremely severe stuttering, the group mean parent-reported pre-treatment typical stuttering severity was 4.9, with a group mean parent-reported highest stuttering severity of 6.6. The latter two scores were measured for the week prior to the assessment. The characteristics of the 121 children were similar across both countries and also when compared with the children in the O'Brian et al. (2013) s. Table 1 presents the pre-treatment characteristics of the children from Australia and England in the present study, and the children from Australia in the O'Brian et al. study.

## Procedure

### Pre-treatment

After recruitment, clinicians were interviewed to obtain information about their Lidcombe Program training and experience, their place of employment, and any restrictions on their service delivery. They were sent an information pack containing (1) ethically approved parent information and consent forms for signing; (2) an audio recorder and instructions for recording the child's speech with the parent and/or the clinician for 10 min in the clinic during their first session; (3) a child demographic data form for completion; and (4) a parent form for documenting the child's typical and highest stuttering severity ratings for the previous week. The clinician was responsible for collecting each child's demographic data and stuttering severity ratings from the parent and returning these to the researchers. Clinicians were instructed to implement treatment with participating parents and children in their usual manner.

Once the child began treatment, the clinician was asked to contact the researchers as soon as the child either completed Stage 1 of the Lidcombe Program or withdrew from treatment. A monthly email was sent to all participating clinicians requesting confirmation of the status of participating families: still in Stage 1, in Stage 2 or withdrawn from treatment.

### Completion of Stage 1

When a child completed Stage 1 of the Lidcombe Program, the researchers conducted a second interview with the clinician to obtain information about the child's

**TABLE 1** Pre-treatment characteristics of the children from Australia and England compared with those of O'Brian et al. (2013)

| | Australia (present study) ($n = 78$) | England (present study) ($n = 43$) | Total (present study) ($n = 121$) | O'Brian et al. (2013) ($n = 57$) |
|---|---|---|---|---|
| Mean age (years) (range) | 4.3 (2.7–6.8) | 4.6 (2.9–5.9) | 4.4 (2.7–6.8) | 4.4 (2.7–6.3) |
| Gender (% male) | 79.4% | 88.3% | 82.6% | 87.7% |
| Comorbid speech or language disorder (*n*) | 25 (32) | 10 (23) | 35 (29) | 20 (35) |
| Mean pre-treatment %SS (*SD*) | 4.8 (10.4) | 4.5 (3.4) | 4.7 (8.6) | 3.5 (3.0) |
| Mean pre-treatment typical SR (*SD*) | 4.7 (1.6) | 5.2 (1.8) | 4.9 (1.7) | 5.2 (1.8) |
| Mean pre-treatment highest SR (*SD*) | 6.4 (1.9) | 6.6 (2.0) | 6.5 (2.0) | 7.1 (2.0) |

clinical progress: number of weeks and clinic visits to complete Stage 1. At this time, the clinician was asked about new diagnoses of any speech or language problems. The clinician also completed a 13-item checklist to assess therapist drift in terms of adherence to the Lidcombe Program Treatment Guide (Onslow et al., 2021). Each item assessed how frequently a treatment procedure specified in the guide was used with the child: never, sometimes, usually, always. The clinician's responses were scored on a four-point (0–3) scale. Examples of some items are as follows: collected parent SR scores for each day of the previous week and entered them into the child's chart, parent demonstrated treatment procedures used during the previous week, and treatment procedures used during the previous week were discussed in-depth with the parent. The maximum score achievable for adherence to the Lidcombe Program Treatment Guide was 39. The checklist is presented in Appendix A.

## Nine months post-recruitment

Nine months post-recruitment, the researchers contacted the clinician of any child who was still in Stage 1 of the Lidcombe Program. At this time, the child's clinical progress details—number of weeks and clinic visits to date—were documented, along with the diagnosis of any additional speech or language disorders. The clinician also completed the 13-item treatment guide adherence checklist described above.

At this time, the researchers also contacted the parent to obtain two 9-month post-recruitment, 10-min audio recordings of their child's speech and to document the typical and highest previous week severity rating outcomes. The 9-month post-recruitment assessment was chosen to allow comparison of outcomes with previously published research data by O'Brian et al. (2013). Parents were contacted regardless of whether the child was still in Stage 1, had completed Stage 1 or had withdrawn from treatment. Parents of the children from Australia were sent an audio recorder and instructions for making two recordings of their child's speech, preferably talking with two different people, in everyday speaking situations. Recordings of the children from England were made by a slightly different method. A researcher phoned the parent on two separate occasions, and on each occasion, made a live recording of the parent and child, or another adult and the child, over the phone. This method has been reported in a previous study (O'Brian et al., 2010).[2] The O'Brian et al. (2010) method affords several advantages, including reduced bias from parent-selected recording situations, and elimination of the need to lend recording equipment to parents. Additionally, all parents from both countries were also asked to document their child's typical and highest stuttering severity ratings for the previous week using the 10-point scale outlined above. Figure 1 shows an overview of the study procedure.

## Outcome measures

Outcome assessment occurred 9 months post-recruitment. This enabled comparison with data collected at an equivalent time in the O'Brian et al. (2013) study and with the standard arm of randomized clinical trials of the Lidcombe Program (Arnott et al., 2014; Bridgman et al., 2016; Jones et al., 2005; Koushik et al., 2019; Lewis et al., 2008; Trajkovski et al., 2019). The primary outcome was the mean %SS score from the two beyond-clinic, post-recruitment audio-recordings.

The two post-recruitment recordings, together with the one pre-treatment, within-clinic, clinician-collected audio-recording, were presented in random order with no identifying information to an independent observer–a

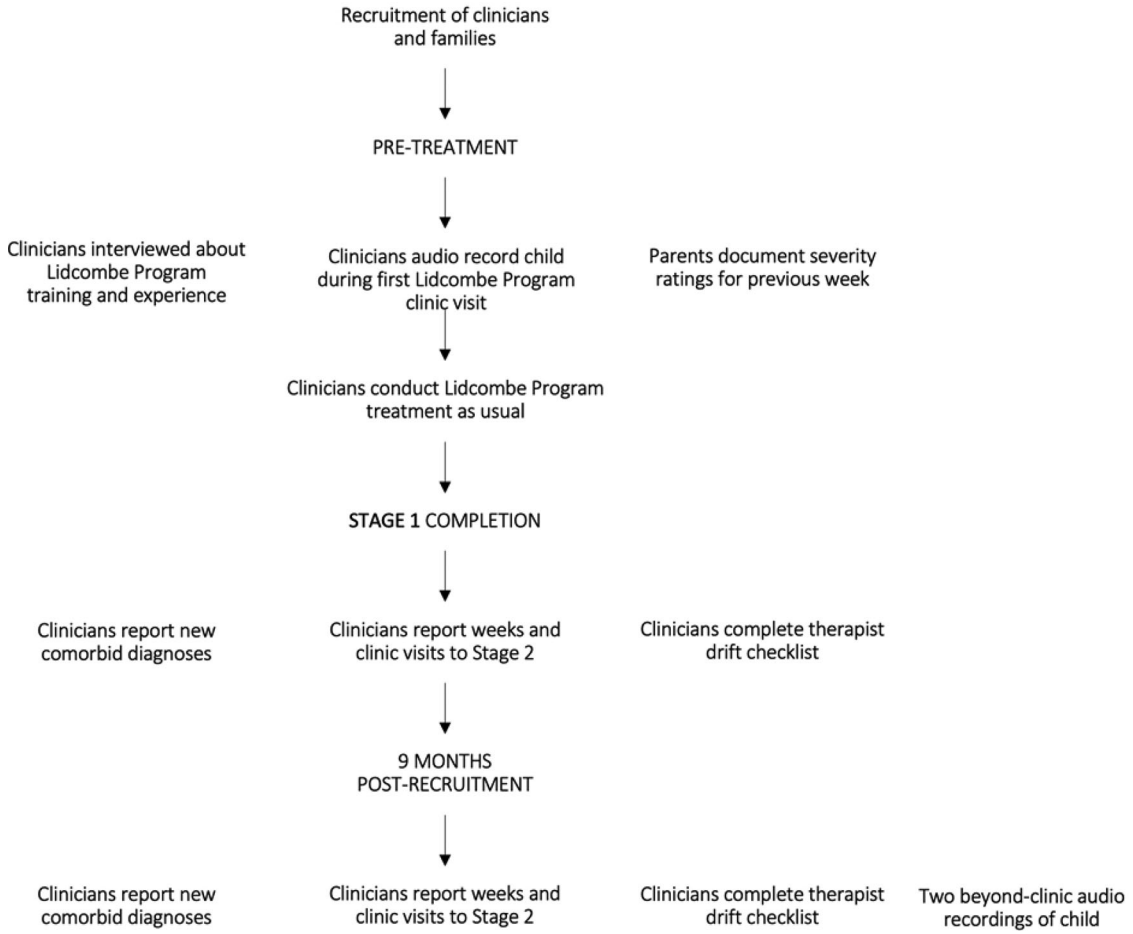


**FIGURE 1** Overview of the study procedure.

clinician experienced in the treatment and measurement of stuttering but independent of the study and blinded to the research questions. This observer listened to the audio-recordings and made real-time measurements of %SS using a button-press timing and counting device. In total, 320 recordings were presented to the observer (117 pre-treatment and 203 post-recruitment recordings). A total of 10% of these recordings were randomly chosen for the purposes of establishing intra- and inter-judge agreement. The independent observer re-measured %SS in these recordings approximately 3 months later, and another experienced clinician who was independent of the study and blinded to its research questions also measured %SS in the same manner. Intra-judge agreement was $r = 0.97$. The mean difference between scores was 0.5. Inter-judge agreement was $r = 0.93$. Mean difference between ratings was 1.0.

Additional outcomes collected 9 months post-recruitment were (1) the child's stuttering severity reported by the parent for the previous week, using the 10-point scale; and (2) the child's highest stuttering severity reported by the parent for the previous week, using the 10-point scale. Also collected were (3) the number of clinic visits for completion of Stage 1 for those children who had completed treatment by 9 months and (4) the number of weeks to completion of Stage 1 for those children who had completed treatment by 9 months.

## Data analyses

Mixed regression models were used to model %SS at 9 months post-recruitment, and treatment guide adherence scores. Mixed models were used to adjust for the clustering effect of multiple children being treated by the same clinician. For %SS at 9 months post-recruitment, we adjusted for baseline %SS.

All speech and language therapists from England were consortium trained (Table 2). Therefore, their data could not contribute to any comparisons between consortium trained and non-consortium trained clinicians. To determine whether the mean %SS differed for consortium

trained clinicians compared with non-consortium-trained clinicians, only data from the clinicians from Australia could be used.

## OUTCOMES AND RESULTS

### Lidcombe Program training, experience and therapist drift scores for clinicians from Australia and England

Table 2 presents information for the clinicians from Australia and England about experience with the Lidcombe Program and treatment guide adherence scores.

### Participant attrition

Table 3 shows the progress of the 121 children. The percentage of children in each group of the English cohort is similar to that in O'Brian et al. (2013). However, a markedly lower proportion of Australian cohort children completed Stage 1 than English cohort children. Also, a markedly greater percentage of the children from the Australian cohort withdrew from treatment before completing Stage 1, around double the percentage of the English cohort. The reasons for withdrawal were not documented, as parents often did not respond to follow-up contact.

### Treatment outcomes

Percentage of syllables stuttered, typical stuttering severity, and highest stuttering severity scores for the children in this study compared with O'Brian et al. (2013) are shown in Table 4. For parent-reported typical and highest stuttering severity scores, regardless of clinical progression, the outcomes at 9 months post-recruitment were almost identical across the current Australian and English cohorts and the O'Brian et al. (2013) cohorts. However, the %SS scores differed by as much as 1.0%.

Table 5 shows the relevant 9-month post-recruitment outcomes from the present community translation study and the O'Brian et al. (2013) community translation study compared with the standard Lidcombe Program arm outcomes from previously published randomized controlled clinical trials of the Lidcombe Program. Research outcomes at 9 months post-recruitment in those randomized controlled trials ranged from 1.0 to 2.0%SS, and typical SR scores ranged from 1.5 to 2.3. Hence, both the present and the O'Brian et al. community trials are within this range.

### Treatment duration

We were unable to calculate the mean or median number of sessions or weeks to complete Stage 1 for the entire present cohort because data on children who failed to complete Stage 1 were incomplete. However, for the 64 who

**TABLE 2** Lidcombe Program training, experience and therapist drift (Lidcombe Program Treatment Guide adherence) scores for clinicians from Australia and England

| | **Australia ($n = 36$)** | **England ($n = 15$)** |
|---|---|---|
| Clinicians with training from the Lidcombe Program Trainers Consortium (*n*) | 14 (38.9%) | 15 (100%)(1 |
| Mean number of children treated with the Lidcombe Program (*SD*) | 51 (89) | 21 (17) |
| Clinicians who have treated 30 or more children with the Lidcombe Program (*n*) | 17 (47.2 %) | 4 (26.7%) |
| Lidcombe Program Treatment Guide adherence score (*SD*) | 31.4 (5.7) | 35.9 (3.5) |

**TABLE 3** Clinical progress of all children 9 months post-recruitment

| | **Australia (present study)** | **England (present study)** | **Total (present study)** | **O'Brian et al. (2013)** |
|---|---|---|---|---|
| Completed Stage 1 (*n*) | 35 (44.9%)( | 29 (67.4%) | 64 (52.9%) | 37 (64.9%) |
| Still in Stage 1 (*n*) | 15 (19.2%) | 6 (14.0%) | 21 (17.4%) | 8 (14.0%) |
| Withdrew from treatment before completing Stage 1 (*n*) | 28 (35.9%) | 8 (18.6%) | 36 (29.8%) | 12 (21.0%) |

**TABLE 4** Treatment outcomes 9 months post-recruitment for the children from Australia and England compared with O'Brian et al. (2013)

| | | Australia (present study) | England (present study) | Total (present study) | O'Brian et al. (2013) |
|---|---|---|---|---|---|
| | Typical SR (SD) | 1.9 (1.1) | 2 (1.8) | 1.9 (1.5) | 1.8 (0.9) |
| Completed Stage 1 ($n = 64$) | Highest SR (SD) | 2.7 (1.4) | 2.8 (2.0) | 2.8 (1.7) | 2.8 (1.8) |
| | %SS (SD) | 0.8 (0.6) | 1.8 (1.5) | 1.3 (1.2) | 1.3 (1.2) |
| | Typical SR (SD) | 3.3 (1.6) | 2.4 (0.7) | 3.0 (1.4) | 3 (1.2) |
| Still in Stage 1 ($n = 21$) | Highest SR (SD) | 4.5 (2.1) | 4 (2.1) | 4.4 (2.0) | 4.8 (1.8) |
| | %SS (SD) | 1.4 (1.4) | 1.6 (1.3) | 1.5 (1.3) | 2.3 (2.0) |
| | Typical SR (SD) | 2.4 (1.5) | 3.4 (1.4) | 2.6 (1.5) | 2.5 (1.7) |
| Withdrew from treatment before completing Stage 1 ($n = 37$) | Highest SR (SD) | 3.6 (2.2) | 4.6 (1.3) | 3.9 (2.0) | 3.7 (2.3) |
| | %SS (SD) | 1.2 (1.0) | 3.7 (2.0) | 1.7 (1.6) | 2.6 (3.6) |
| | Typical SR (SD) | 2.3 (1.4) | 2.3(1.7) | 2.3 (1.5) | 2.1 (1.2) |
| All children ($n = 121$) | Highest SR (SD) | 3.3 (1.9) | 3.3 (2.0) | 3.3 (2.0) | 3.3 (2.0) |
| | %SS (SD) | 1.0 (0.9) | 2.0 (1.7) | 1.4 (1.4) | 1.7 (2.1) |

remained in the study, the median time to complete Stage 1 was 20 weeks. For these 64 children, the mean number of visits was 10.0 over a mean of 18.7 weeks. However, a further 21 children were still in Stage 1 at the 9-month post-recruitment assessment, so this mean would necessarily increase. The mean time between clinic visits was 14.9 days, with the children in the Australian cohort being seen slightly less frequently (mean of 15.7 days) than the children in the English cohort (13.5 days). These results were similar to the 15.4 mean days between clinic visits reported by O'Brian et al. (2013). However, the median of 10.0 clinic visits is around half the reported medians in the standard Lidcombe Program arms of the Australian randomized clinical trials: Arnott et al. (2014), median = 18; Bridgman et al. (2016), median = 23; Donaghy et al. (2020), median = 17; and Trajkovski et al. (2019), median = 30.

## Statistical analysis

Mixed-model analysis of the Australian data revealed no evidence that mean %SS differed for consortium-trained speech pathologists compared with non-consortium-trained speech pathologists, mean difference = −0.1%SS, 95% CI [−0.6, 0.3], $p = 0.55$. However, there was weak evidence that consortium trained speech pathologists had lower therapist drift scores than non-consortium-trained speech pathologists by 2.5 units, 95% CI [−5.4, 0.4], $p = 0.084$.

Mixed-model analysis of the combined Australian and English data showed strong evidence that %SS at 9 months post-recruitment was lower for the children in the Australian cohort by 1.0%SS, 95% CI [0.5, 1.5], $p = 0.0002$, compared with the children in the English cohort. At 9 months post-recruitment, the mean %SS was 1.0 for the children from Australia compared with 2.0 for the children from England. A limitation of this comparison is that the percentage of missing %SS data at 9 months post-recruitment was much higher for children in the Australian cohort than for children in the English cohort (18% versus 7%). There was also evidence that clinicians in the English cohort had less therapist drift than clinicians in the Australian cohort by 3.5 units, 95% CI [0.9, 6.2], $p = 0.01$, even after adjusting for consortium training. Appendix A contains scores by clinicians from Australia and England for individual items on the 13-item therapist drift checklist. It shows elevated scores (better treatment guide adherence) for all items for clinicians from England, particularly items 4 and 7: 'Collected parent's SR scores for each day of the previous week and entered them into the child's chart' and 'Parent demonstrated treatment procedures used during the previous week'.

In additional mixed-model analysis of parent-reported typical and highest stuttering severity at 9 months post-recruitment, findings showed no evidence of a difference between countries for either of these: typical severity mean difference 0.0%SS 95% CI [−0.6, 0.6], $p = 0.97$, and highest stuttering severity 0.0%SS, 95% CI [−0.8, 0.8], $p = 0.97$.

**TABLE 5** Comparative mean %SS and parent-reported typical SR scores from the present study, and the standard Lidcombe Program arm of previously reported randomized trials of the Lidcombe Program 9 months post-recruitment

| | O'Brian et al. (present study) | O'Brian et al. (2013) | Arnott et al. (2014) | Bridgman et al. (2016) | Jones et al. (2005) | Koushik et al. (2019) | Lewis et al. (2008) | Trajkovski et al. (2019) |
|---|---|---|---|---|---|---|---|---|
| %SS | 1.4 | 1.7 | 1.1 | 1.0 | 1.5 | 2.0[a] | 1.1 | 1.4 |
| Typical SR | 2.3 | 2.1 | 1.8[b] | 1.8 | | 2.3[a] | | 1.5 |

*Notes*: [a]Median reported.
[b]Not reported in the publication.

## DISCUSSION

The purpose of this study was to replicate and extend the findings of the first Australian translation study of the Lidcombe Program by O'Brian et al. (2013). That preliminary study suggested that community clinicians could achieve similar outcomes with their young children who stutter to those in randomized controlled trials, with consortium training being the most significant predictor of outcome.

This study successfully replicated the key finding of O'Brian et al. (2013), demonstrating that community clinicians in Australia and England can attain Lidcombe Program outcome benchmarks established in randomized trials. The community group mean score for clinicians from Australia and England of 1.4%SS at 9 months post-recruitment fell roughly in the middle of the range of scores from randomized controlled trials. Mean parent-reported typical stuttering severity scores of 2.3 also fell within the range of clinical trial outcomes (1.5–2.3), although towards the higher end. This finding is reassuring, given that (1) clinicians in research trials are usually highly trained and supervised, (2) the participant cohort is usually restricted in terms of comorbidity of early stuttering with speech and language disorders, (3) there are no workplace restrictions in clinical trials, (4) therapist drift in clinical trials is less likely than in community settings and (5) participant motivation for treatment, and commitment to it, may be higher in clinical trials than in community settings.

O'Brian et al. (2013) indicated that their major finding—that consortium training predicted outcome—required replication. For the present cohort from two countries, studied a decade later than the O'Brian et al. (2013) study, and with double the number of children, the finding was not replicated. We can only speculate about the reason for this. Possibly, during the intervening decade, with the accumulation of independently replicated randomized trials of the Lidcombe Program, professional standards for administering the treatment may have increased accordingly. Perhaps during professional practice, the intervening decade may have incorporated more attention to the Lidcombe Program Treatment Guide and published treatment benchmarks (for an overview, see Onslow et al. 2021) during treatment administration. Regardless, it can only be considered a positive finding that, regardless of formal training, clinicians in two countries matched the results of randomized trials.

The entire cohort of community clinicians took around half the number of clinic sessions to complete Stage 1 of the Lidcombe Program than have been reported in randomized clinical trials. A plausible explanation for this result is therapist drift. Research clinicians are compelled to avoid

therapist drift and conform to manualized procedures, which specify treatment procedures, but community clinicians are not. In the case of the Onslow et al. (2021) Lidcombe Program Treatment Guide, the target stuttering severity criteria for moving to Stage 2 (severity rating scores of 0–1) must be attained for three consecutive clinic visits. However, community speech pathologists may be inclined to move children to Stage 2 more quickly due to the pressures of health service delivery. Such pressures may include treatment waitlists and limits placed on the number of clinic visits allowed for each family. In the private sector, the cost of treatment sessions may also be restrictive for many parents. It is necessary to note that the apparent overall therapist drift in the present cohort did not have an effect on treatment outcome in the short term or at 9 months post-recruitment. Importantly, though, the long-term effect of this is a critical issue about which nothing is known at present.

Comparative outcomes of children from the Australian and English cohorts at 9 months post-recruitment showed differences according to how stuttering severity was measured. There was a statistically and clinically significant difference between %SS outcomes, with children from the Australian cohort having on average 1.0%SS lower scores at 9 months post-recruitment than children from the English cohort. However, this result was not supported by parent-reported SR scores. In fact, the typical and highest SR scores were not only identical across the two groups but also almost identical to those reported in O'Brian et al. (2013). This result is inconsistent with the Onslow et al. (2018) finding that %SS and parent-reported stuttering severity scores are functionally interchangeable for measuring treatment effect sizes.

There are a number of possible explanations for this result, one of which is simply sampling error with %SS. Parents of the children in the Australian cohort were instructed to make home recordings, themselves, from which %SS measures were obtained; however, there was supervision by an experienced researcher for recordings of children in the English cohorts. With the former method, there was little to no control over what sort of conversation was recorded by the parent, the duration of the recording, the content of the speech, or the representativeness of the sample. Therefore, it is likely that the recordings made in England were more valid assessments of the children's speech.

Another reason for the discrepant %SS scores could be related to the significant drop-out rate with the Australian cohort: 36% of children for the Australian cohort versus 19% of children in for the English cohort. We have no information about those who withdrew from treatment. From the present data, it was not possible to determine whether they withdrew because they were doing well or not doing well, or whether their withdrawal was unrelated to outcomes at all. Another possible explanation for the different %SS scores between the children in the Australian and English cohorts might relate to clinical translation. Conceivably, the Lidcombe Program does not translate optimally to the clinical communities of countries where it was not developed. Speech pathology students in Australia are exposed to Lidcombe Program treatment and its procedures right from the early days of their professional preparation as clinicians. They practice the procedures in classes and clinical placements, and after graduating, have almost unlimited availability to support and mentoring from Australian colleagues. Perhaps there is less opportunity for such collegial support outside of the country where the Lidcombe Program was developed and its research trials conducted.

Finally, although all the clinicians from England were consortium trained, as a group they appear to have had much less experience using the Lidcombe Program with children than the clinicians from Australia (Table 2). In fact, for several of the speech and language therapists from England, this was the first child they had treated with the Lidcombe Program. By contrast, some of the speech pathologists from Australia reported having treated more than 500 children with the Lidcombe Program. It would not be surprising that experience alone could influence outcomes. We initially explored this prospect in our analyses, but findings were uninterpretable, possibly due to the basic nature of the information we acquired about clinician experience, which was mostly based on recall. Ultimately, however, clinician experience may be the most compelling explanation for the discrepancy of %SS scores between the two groups.

An intriguing finding was that the clinicians from England had significantly less therapist drift than the clinicians from Australia. This could be related to the fact that all clinicians from England were consortium trained, but less than half of the clinicians from Australia received that training. Possibly, when the clinicians from Australia initially learned the Lidcombe Program Treatment Guide procedures, they did not learn them comprehensively. Additionally, the clinicians from England may have had less therapist drift because they had less experience with the treatment than the clinicians from Australia (Table 2). Perhaps that lesser experience was associated with a greater willingness to make clinical judgements that depart from manualized procedures in the best interest of the clients. Regardless, despite their better adherence to the Lidcombe Program Treatment Guide, the clinicians from England did not have superior outcomes.

This highlights a recurring issue with the Lidcombe Program; its mechanisms of action are currently unknown. Post-treatment changes in child or parent language seem not to be responsible (Bonelli et al., 2000; Imeson et al., 2018). Additionally, the treatment is built around parent

verbal contingencies, yet attempts to verify the clinical value of those verbal contingencies have been either unsuccessful (Carr Swift et al., 2011, 2016; Donaghy et al., 2015) or only partially successful (Donaghy et al., 2020; Harrison et al., 2004). The current finding that clinician drift did not influence outcomes highlights this important issue with the Lidcombe Program. The 13-item checklist of compliance with Lidcombe Program procedures may not have captured the Lidcombe Program mechanisms of action.

## CONCLUSIONS

The overriding conclusion to this research is a positive one, that Lidcombe Program clinical trials translate to Australian and English clinical communities, and that this occurs when formal training is provided at either undergraduate level or through a postgraduate consortium course. With the Lidcombe Program Trainers Consortium currently active in 12 countries, this result may be generalizable to other clinical communities. Therapist drift emerged as a key issue in these findings, and it was probably related to community pressures of healthcare delivery that do not exist in clinical trials. For the medium term, at 9 months post-recruitment, therapist drift did not have a negative effect on clinical outcomes. However, whether the same applies to long-term outcome is a critical issue about which nothing is currently known. Additionally, the present results about therapist drift highlight the current absence of knowledge about the mechanisms of action of the Lidcombe Program.

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## NOTES

[1] 'Speech and language therapist' is the term used in England, and 'speech pathologist' is the term used in Australia. These terms are used throughout the manuscript.

[2] The different methods for collecting beyond-clinic recordings of the children in the Australian and English cohorts were brought about by methodological changes introduced by O'Brian et al. (2010). This methodological change occurred after we began the project in Australia, before we began recruiting participants in England.

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## CONFLICT OF INTEREST

All authors certify the absence of any conflicts of interest, including specific financial interests and relationships and affiliations relevant to the subject of this paper.

## DATA AVAILABILITY STATEMENT

Data are only available on request due to privacy/ethical restrictions.

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## APPENDIX A

### Appendix A

**TABLE A1** Thirteen-item checklist to assess Lidcombe Program therapist drift, with Australian and English clinician mean scores for each item

| | Australian clinician mean scores | English clinician mean scores |
|---|---|---|
| 1. Typical length of each treatment session was 45–60 min | 2.4 | 2.8 |
| 2. Measured %SS while the parent and/or speech pathologist talked to the child | 2.4 | 2.5 |
| 3. Checked parent's use of the SR scale by asking what SR score would be given to the speech during the above conversation | 2.5 | 2.6 |
| 4. Collected the parent's SR scores for each day of the previous week and entered them into the child's chart | 2.1 | 2.9 |
| 5. Compared the parent's SR scores for the previous week with the clinic sample | 2.2 | 2.7 |
| 6. Used %SS and SR scores as a focus for in-depth discussion of the child's clinical progress during the previous week | 2.5 | 2.8 |
| 7. Parent demonstrated the treatment procedures used during the previous week | 1.9 | 2.6 |
| 8. Treatment procedures used during the previous week are discussed in-depth with the parent | 2.6 | 2.9 |
| 9. Changes to procedures for the coming week are discussed with the parent | 2.8 | 3.0 |
| 10. Demonstrated changes to procedures to the parent | 2.4 | 2.9 |
| 11. Taught the parent to do the changed procedures | 2.5 | 2.8 |
| 12. Summarised what is expected for the coming week | 2.8 | 2.9 |
| 13. Invited questions for further discussion from the parent | 2.6 | 2.9 |