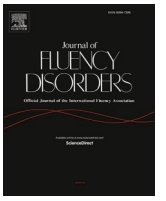
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Two-year follow-up of school-age children after Lidcombe Program treatment for stuttering

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ABSTRACT

Background: The Lidcombe Program was developed for children younger than 6 years, but evidence suggests it can reduce stuttering and psychosocial impacts in children aged 6–12 years.
Purpose: This study investigated whether improvements observed in a Phase II trial of the Lidcombe Program with school-age children were maintained 2 years after treatment completion.
Method: Of 37 children in the original Phase II trial, 22 (59%), now aged 8–14 years, participated in the follow-up. Outcomes included clinician-rated stuttering severity and child-reported measures of stuttering impact, communication attitudes, and anxiety symptoms. Parents also reported stuttering severity during follow-up. Outcomes at 2 years were compared with pre-treatment and 12-month post-treatment assessments.
Results: Following the initial trial, results were categorised by responsiveness (i.e. Full responders met Stage 2 criteria, partial responder showed greater than 2-point severity rating decrease, and non-responders showed less than 2-point severity rating change). Those categorisations were retained for the present research. Full responders demonstrated significant improvements from pre- to post-treatment across all outcomes and maintained improvements at the 2-year follow-up. Partial responders maintained reduced stuttering severity at 2-years and reduced anxiety symptoms, communication attitude and stuttering impact below pre-treatment levels but were not significant. Non-responders showed short-term psychosocial improvements that were not consistently sustained after 2 years.
Conclusions: The Lidcombe Program can provide sustained reductions in stuttering and psychosocial improvements for some school-age children, particularly those who respond well to treatment. Variability in longer-term outcomes highlights the importance of ongoing monitoring and individualised treatment planning.

1. Introduction

1.1. The school age group

Around one in 10 children start stuttering by four years of age (Reilly et al., 2013). Although many children may stop stuttering naturally or because of early intervention, those who continue stuttering into the school years represent a particularly critical group. At

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this age, stuttering becomes less tractable and natural recovery is less likely (Bothe et al., 2006; Ingham & Cordes, 1999; Koushik et al., 2009; O'Brian & Onslow, 2011). School-age children are entering a developmental stage of increased autonomy and evolving self-identity. As their social awareness develops, they become more attuned to peer responses and how they are perceived at school and in the community. For school-age children who stutter, growing awareness of how they communicate relative to their peers may shape their attitudes towards speaking, their emotional responses to communication, and their willingness to participate in speaking situations (Guttormsen et al., 2015; Vanryckeghem et al., 2001). Concurrently, the risks of bullying and social rejection from peers are higher compared to children who do not stutter (Blood & Blood, 2004, 2007; Davis et al., 2002; Langevin, 2015) and negative communication attitudes worsen as children who stutter become older (Guttormsen et al., 2015). These experiences may increase vulnerability to adverse mental health outcomes during the school years. Anxiety represents an important psychosocial concern, with children who stutter showing heightened social anxiety prevalence compared with children who do not stutter. Almost a quarter of school-age children who stutter seeking treatment meet diagnostic criteria for social anxiety disorder (Iverach et al., 2016). Children who stutter may withdraw from or avoid speaking situations, experience heightened fear of being judged by others, or limit their engagement in social activities within and beyond school. This can profoundly impact participation and enjoyment at school, academic performance, and social functioning, with long-term implications into adulthood if unaddressed (Blood & Blood, 2016; Briley et al., 2021; Briley & Jacobs, 2022; O'Brian et al., 2011).

Two studies explored the perspectives of young people who stutter in terms of the therapy outcomes they value (Berquez et al., 2015; Cooke & Millard, 2018). Across the two qualitative studies, 16 school-age children were included. Cooke and Millard (2018) reported that school-age participants want therapy to help them speak more fluently, feel more confident and comfortable communicating, and enable them to participate more fully in school and social interactions. Berquez et al. (2015) explored therapy expectations in a small sample of seven 6–12-year-old children. Similarly, they found that school-age children hope therapy leads to greater fluency, increased confidence and emotional comfort, and improved participation in communication at school and with peers. Together, these findings emphasise the need for speech-language pathologists to provide therapy options that can address both the observable features of stuttering and its psychosocial impact.

1.2. The Lidcombe program as an approach for school-age children

One approach that can reduce stuttering and improve psychosocial outcomes for a wide age range of children is the Lidcombe Program (Johnson et al., 2024). A Cochrane Review identified the Lidcombe Program as the most extensively evaluated childhood stuttering treatment with randomised controlled trial evidence for reducing stuttering in preschool children, based on four trials comparing the program with a waitlist control condition (Sjøstrand et al., 2021). Children who receive the program engage in daily talking activities with their parents to practise speaking without stuttering as part of Stage 1. During this stage, parents are supportedto provide feedback to their child and plan engaging activities for their child to optimise opportunity for stutter-free speech. Stage 2 is the maintenance stage of the Lidcombe Program, during which parents are supported to maintain their child's clinical gains over time. During Stage 2, treatment is gradually withdrawn through progressively spaced clinic visits contingent on the child maintaining treatment gains, while parents continue to monitor and provide treatment as needed with ongoing clinician guidance. An additional aim of Stage 2 is to support parents to identify and manage any signs of relapse.

Since the development of the Lidcombe Program—initially for preschool children younger than 6 years—there has been growing evidence demonstrating benefits for school-age children as well (Bakhtiar & Packman, 2009; Hewat et al., 2020; Lincoln et al., 1996; Shenker & Koushik, 2012; Yandeau et al., 2021). A Phase II telehealth trial with 37 children, aged 6–12 years, is the largest to assess efficacy of the Lidcombe Program for this older age group. Children and families were recruited from Australia, New Zealand, Hong Kong and Singapore (Johnson et al., 2024). Twelve months after commencing treatment, 70% of children achieved a clinically significant reduction in stuttering. Of the 37 participants, 32% reached Stage 2 criteria of no stuttering or nearly no stuttering, 38% showed a partial response of more than two severity rating scale point reductions, and 30% showed no response (Johnson et al., 2025a, 2025b).

When comparing outcomes of the school-age children to preschool clinical trial data (Park et al., 2021), school-age children appeared to show a slower initial response to the Lidcombe Program. However, they ultimately reached Stage 2 criteria of minimal or no stuttering within a similar timeframe to pre-schoolers, requiring a median of 18.5 clinical consultation compared with 17 for pre-school children. From the school-age sample, younger children (aged 6–8 years) with lower pre-treatment stuttering severity appeared more likely than older children (aged 9–12 years) to reach Stage 2 criteria. These relationships did not reach statistical significance, so a larger powered study would be needed to establish predictors of clinical outcomes for this age group (Johnson et al., 2025a, 2025b).

In addition to stuttering reductions, the Phase II trial (Johnson et al., 2024) demonstrated statistically and clinically significant improvements in communication attitudes, stuttering impact, and anxiety symptoms (Johnson et al., 2026). These psychosocial improvements were observed across the sample, including for children whose stuttering did not reduce. For children whose stuttering did not reduce, clinically significant improvements were reported for approximately 45% on the Overall Assessment of the Speaker's Experience of Stuttering, 30% on the Communication Attitude Test, and 10% on the Spence Children's Anxiety Scale. There is evidence, then, to suggest that the Lidcombe Program may confer psychosocial benefits for school-age children irrespective of how their stuttering responds. This likely reflects aspects of the Lidcombe Program's design which promotes supportive therapeutic alliance and opportunities for open discussion about stuttering between clinicians, children, and families (Johnson et al., 2026). This includes collaborative treatment decision-making with parents and children, individualisation of treatment according to the child's needs and preferences, and consideration of the child's experiences and reactions to stuttering.

1.3. The present study

Considering the clinical value of reducing stuttering during the school years, the present study followed participants from the Johnson et al. trial 2 years after post-treatment data collection in the original Phase II trial (Johnson et al., 2024). In the original trial, one speech-language pathologist with experience in stuttering management treated 37 children aged 6–12 years over webcam with a parent or guardian present. Establishing the longer-term outcomes of treatment is essential for informing clinicians and families about whether improvements achieved during treatment are sustained and may continue to support children's communication, participation, and wellbeing beyond the treatment period. Accordingly, the present study answered the following research question: Are reductions in stuttering and improvements in psychosocial outcomes maintained 2 years after Lidcombe Program treatment? This study was approved by the University of Melbourne Human Ethics Committee (project ID: 29269).

2. Methods

2.1. Participants

All 37 families who participated in the Phase II trial were contacted by email 2 years after completing post-treatment data collection and invited to participate in the present follow-up study. Families who responded to the initial email were provided with further study information and consent was requested for additional data collection from their child. Families who did not respond to the initial email received two reminder emails at 2 and 4 weeks following the initial contact. If no response was received after 6 weeks, families were contacted by phone. Families were considered lost to follow-up if no contact was established within 6 months of the initial invitation.

Of the 37 children and families in the original trial, 22 parents (59%) consented for their child to participate. From the original sample, five families (14%) declined to participate due to competing family commitments or lack of interest, and 10 families (27%) did not respond to phone or email invitations.

As shown in Table 1, the age range of participating children in the follow-up study was 8–14 years. Four children (18.2%) in the sample had received additional stuttering intervention following the Phase II trial. Of these four children, three (13.6%) had not responded to the Lidcombe Program in the original trial. The Phase II trial included two female participants but neither of their families responded to invitations to the follow-up study.

In Fig. 1, school-age children who participated in the follow-up study are presented according to their response to the Lidcombe Program in the Phase II trial (i.e., full responder, partial responder or non-responder). Of the 22 participants, 11 (50%) reached Stage 2 criteria of no stuttering or nearly no stuttering, 8 (36.4%) partially responded to the Lidcombe Program and 3 (13.6%) did not respond. Full responders in this study (n = 11) attended a median of 10 Stage 2 sessions over approximately 6 months. Participants classified as partial or non-responders did not enter Stage 2 as they did not meet the criteria for that progression.

2.2. Lidcombe program delivery

The Lidcombe Program was delivered to participants of the Phase II trial by one treating clinician via video telehealth. The program was implemented according to the freely accessible Treatment Guide available at the time of the Phase II trial (ver. 1.6). Treatment fidelity was supported through fortnightly meetings with a senior member of the Lidcombe Program Trainers Consortium, during which video recordings of treatment sessions were reviewed and treatment implementation discussed. Given that the Lidcombe Program was originally designed for pre-school children, it was adapted as necessary according to children's developmental and individual needs. Further details and examples of how the Lidcombe Program was adapted and delivered with participants in the Phase II

Table 1
Demographic information of the 22 children who participated in the follow-up study.

	n	%
Response group distribution		
Full responders	11	50.0
Partial responders	8	36.4
Non-responders	3	13.6
Age range at follow-up		
8–10 years	11	50.0
11–14 years	11	50.0
Sex ratio at follow-up		
Male	22	100.0
Female	0	0
Additional stuttering treatment received		
Lidcombe	1	4.5
Oakville	2	9.1
Camperdown	1	4.5
Supports received since treatment		
Psychology	1	4.5
School tutor	1	4.5



Fig. 1. Distribution of children who participated in the follow-up study of the 22 returning children and categorisation of their response to the Lidcombe Program from the Phase II trial.

trial are reported in Johnson et al. (2025).

The Lidcombe Program is a parent-implemented intervention to support children to achieve effortless, stutter-free speech. The program has two stages and involves regular measurement of stuttering to track progress, parent-delivered verbal feedback for stutter-free speech and stuttering, and practice sessions during which parents engage one to one with their child using enjoyable books and simple games to optimise opportunity for stutter-free speech. During Stage 1, the clinician works collaboratively with parents and children to individuase these treatment components to suit the child and family. Parents are taught how to effectively provide verbal feedback during practice sessions and natural conversations with their child, and how to select enjoyable activities during practice sessions to maximise stutter-free speech. Stage 1 continues with the aim of achieving no stuttering or extremely mild stuttering, followed by Stage 2, during which treatment components are gradually withdrawn contingent on treatment gains remaining stable (Onslow et al., 2025).

Consistent with the Treatment Guide, clinicians established a therapeutic alliance with the child and parent to support a responsive and collaborative approach to treatment. Treatment considered the child's communication strengths, individual needs and interests, environmental factors, and reactions to stuttering.

2.3. Outcomes measures

As part of a broader program of research investigating school-age children's response to the Lidcombe Program, outcome measures have been collected before starting treatment, 12 months after starting treatment, and now 3 years since starting treatment (i.e., 2 years after post-treatment data collection). This enables investigation of both treatment effects and longer-term maintenance of clinical outcomes.

2.3.1. Stuttering severity

Stuttering severity ratings are a clinically useful measure of stuttering and change over time (O'Brian et al., 2020). Two years after participation in the Phase II trial, families submitted three 10-minute audio recordings of their child conversing with a parent. A consistent parent–child conversational context was used to provide a feasible and relatively standardised speech-sampling procedure across participants. To account for temporal variability in stuttering, recordings were collected at monthly intervals across three months. Parents were instructed to converse about a topic of interest to the child to elicit a sample they considered representative of their child's typical speech. Parents were asked to record these conversations using a digital device such as a mobile phone. An independent speech-language pathologist, blinded to the study aims, rated the audio recordings using the stuttering severity rating scale from the Lidcombe Program Treatment Guide (ver. 1.7c) (Onslow et al., 2025). The numerical range of the severity rating scale changed between the original Phase II trial and the present follow-up study, from 0 to 9; to 0 to 10; however, the severity anchors and their definitions remain unchanged. To enable longitudinal comparison, follow-up ratings were linearly rescaled to the original 0–9 metric using the formula: transformed SR = follow-up SR × 9/10. This transformation preserved the relative position of ratings on the severity scale while providing a common numerical metric across assessment timepoints.

For the purposes of the present study, a change of ≥ 2 points on the severity rating scale was defined a priori as clinically meaningful. Accordingly, a reduction of ≥ 2 points represented clinically meaningful improvement, whereas an increase of ≥ 2 points represented clinically meaningful increase in stuttering.

Two years after participation in the Lidcombe Program, parents completed a short, online survey capturing information about their child's current presentation and any additional supports accessed since participation in the trial. Parents were asked to indicate their perception of their child's stuttering severity since their final Lidcombe Program consultation, and to report any stuttering treatment or other relevant supports received, including psychological or school-based services, during the follow-up period.

2.3.1.1. Inter- and intra-rater reliability for clinician ratings. One independent rater, a speech-language pathologist with experience assessing and managing childhood stuttering, assigned a stuttering severity rating to each of the three 10-minute audio recordings for each participant (n = 66). Inter- and intra-rater reliability were assessed using Pearson correlations to examine relative reliability and two-way mixed-effects, absolute-agreement, single-measures intraclass correlation coefficients (ICCs) to assess absolute agreement. To determine inter-rater reliability, a second independent speech-language pathologist with experience working with children who stutter, who was also blinded to the study, rated 14 (21%) randomly selected audio samples. Relative reliability was high (Pearson's r = .91), and absolute agreement was excellent (ICC = .902, 95% CI [.716, .968]). Identical severity ratings were assigned to 8 of 14 samples (57.1%), with all ratings (100%) agreeing within one severity scale point. The mean between-rater difference was 0.29 scale

points (SD = 0.61), indicating that the primary rater assigned slightly higher severity ratings on average. To determine intra-rater reliability, 14 audio samples (21%) were re-presented to the primary rater, who was blinded to their sample identifiers. Relative reliability was high (Pearson's r = .89), and absolute agreement was good (ICC = .868). Identical severity ratings were assigned to 11 of 14 samples (78.6%), with all ratings (100%) agreeing within one severity scale point. The mean difference between rating occasions was −0.21 scale points (SD = 0.43), indicating slightly higher ratings on the second occasion.

2.3.2. Psychosocial outcomes

The Overall Assessment of the Speaker's Experience of Stuttering (OASES) is a self-report instrument that assesses the impact of stuttering (Yaruss & Quesal, 2016). Participants respond to items using a Likert scale across four domains: general perspectives about stuttering, affective and behavioural reactions to stuttering, functional communication in daily situations, and the impact of stuttering on quality of life. Depending on the child's age, participants completed either the OASES-S (school age version for 7–12-year-olds) or the OASES-T (teenage version for 13–17-year-olds). As participants aged during the follow-up period, some transitioned from the OASES-S during the trial to OASES-T at follow-up. Longitudinal analyses were therefore restricted to the Overall Impact Score. Both versions assess the same construct of adverse impact using a 1–5 scoring metric, with total scores calculated as averages across completed items. Previous research has similarly combined OASES-S and OASES-T scores for analysis on this basis (Walsh et al., 2023).

The Spence Children's Anxiety Scale (SCAS) was used to measure anxiety symptoms. This 44-item questionnaire was completed by the child. Participants respond by rating the frequency of anxiety-related behaviours on a 4-point Likert scale. Total scores provide an overall measure of anxiety symptoms experienced by the child.

The Communication Attitude Test (CAT) was used to assess children's perceptions of their speech. This instrument contains 35 statements about speaking situations to which children respond "true" or "false". Scores are summed to produce a total score, with higher scores indicating more negative communication attitudes.

2.4. Data analyses

For the 22 participants from the original trial, we analysed outcomes from the three response groups: full, partial, and non-responders. As this study examined a subset of participants from the original trial, we report on data comparing pre-treatment to post-treatment, and post-treatment to follow-up for the 22 returning participants. Given the small sample sizes within responder groups and the nature of the stuttering severity ratings representing ordinal data, non-parametric analyses were selected a priori. We conducted a Friedman test to establish whether a significant difference between assessments existed for partial (n = 8) and full responders (n = 11), as well as Kendall's W to report on effect sizes of these comparisons (where 0 = no agreement in ranks across time points and 1.00 = complete agreement in ranks across time points, with larger values indicating a stronger effect). We then used post-hoc Wilcoxon Signed-Rank tests with Bonferroni correction (α =.025) for multiple comparisons to indicate whether such changes were significant between pre-treatment, post-treatment and follow-up. Matched-pairs rank-biserial correlations (r_{rb}) were calculated as effect-size estimates for all Wilcoxon signed-rank tests (where −1.00 = all observed changes were in the direction of lower scores, 0 = an equal balance of ranked change in both directions, and +1.00 = all observed changes were in the direction of increased scores). The number of returning participants from the non-responder group was small (n = 3) and their results heterogeneous. Therefore, we analysed their data descriptively.

Table 2
Median (IQR) stuttering and psychosocial outcomes across assessment time points for full and partial responders, with statistically significant post-hoc comparisons.

	Pre	Post	Follow-up	Sig. change Pre- to post-	Sig. change Post- to Follow-up
Full responders n= 11					
Severity rating	2.8 (1.4)	0 (0.6)	0 (0.9)	<.01*	.31
OASES	2.1 (0.8)	1.6 (0.4)	1.6 (0.7)	.01*	.86
SCAS	19.5 (13.3)	12.0 (13.0)	13.0 (25.3)	.01*	.20
CAT	13.5 (16.8)	2.0 (5.3)	2.0 (5.0)	<.01*	.75
Partial responders n= 8					
Severity rating	4.5 (2.1)	0 (2.1)	1.8 (2.1)	.01*	.05
OASES	2.4 (1.1)	2.0 (1.2)	2.0 (0.9)	-	-
SCAS	25.0 (20.)	20.5 (16.5)	20.5 (21.0)	-	-
CAT	8.0 (17.8)	4.0 (8.5)	3.0 (33.8)	-	-

- Not applicable as omnibus Friedman test was statistically significant so post-hoc Wilcoxon signed-rank tests were not conducted.

Note: OASES scores above 3.75 reflect severe stuttering impact, scores between 3.00 – 3.75 reflect moderate–severe impact, 2.25 – 2.99 reflect moderate, 1.50 – 2.24 reflect mild—moderate impact, and below 1.49 reflect mild stuttering impact; $n = 1$ participant did not complete OASES assessment; CAT score of 35 reflects the highest possible score if the child responded negatively to all 35 statements presented to them on the test, and the mean score for children who stutter is 16.83 (SD=7.47); SCAS scores are presented as raw totals for comparison with the Phase II dataset. Clinical interpretation is based on age- and gender-normed T-scores (T ≥ 60 = elevated; T ≥ 65–70 = clinical range).

* Statistical significance reached with Bonferroni correction (α <.025).

3. Results

Table 2 summarises outcomes for the full and partial responder groups for stuttering severity, OASES Overall Impact Score, CAT Total Score and SCAS Total score.

Table 3 summarises individual participant scores for the three children who did not respond to the Lidcombe Program: inferential statistics are not suitable for this sample size.

3.1. Full responders

Eleven children in the follow up study (50%) had met Stage 2 criteria of minimal or no stuttering within 12 months of starting the Lidcombe Program in the original clinical trial (Johnson et al., 2025a, 2025b). A Friedman test indicated significant changes over time for stuttering severity ($\chi^2(2) = 18.6$, $p < .001$, Kendall's $W = .85$), OASES Overall Impact Score ($\chi^2(2) = 12.6$, $p = .002$, Kendall's $W = .63$), CAT Total Score ($\chi^2(2) = 18.6$, $p < .001$, Kendall's $W = .85$), and SCAS Total Score ($\chi^2(2) = 7.0$, $p = .03$, Kendall's $W = .32$). Post-hoc Wilcoxon signed-rank tests with Bonferroni correction ($\alpha = .025$) showed that improvements occurred between pre- and post-treatment for stuttering severity ($Z = -2.90$, $p = <.01$, $r_{rb} = -1.0$), OASES ($Z = -2.8$, $p = .01$, $r_{rb} = -1.0$), CAT ($Z = -2.9$, $p < .01$, $r_{rb} = -1.00$), and SCAS ($Z = -2.6$, $p = .01$, $r_{rb} = -.88$) assessments. As reported in Table 2, there were no significant changes between post-treatment and follow-up for stuttering severity ($Z = -1.02$, $p = .31$, $r_{rb} = .43$), OASES ($Z = -0.18$, $p = .86$, $r_{rb} = -.06$), CAT ($Z = -0.32$, $p = .75$, $r_{rb} = -.14$), or SCAS ($Z = -1.28$, $p = .201$, $r_{rb} = .45$), indicating maintenance of group-level clinical gains. SCAS scores showed considerable variability at follow-up (M dn = 13.0, IQR = 25.25), with greater dispersion than at pre-treatment ($IQR = 13.25$) and post-treatment ($IQR = 13.00$).

According to our clinical data, the group median stuttering severity remained below 1 on the severity rating scale at follow-up. Research comparing the speech of children who do and do not stutter indicates that a stuttering severity rating of 1 is unlikely to be detected by an unfamiliar listener (Lincoln et al., 1997). One child in the full responder group had an increase in stuttering severity of 2 scale points at follow-up. This child had a higher pre-treatment severity rating (SR = 4) compared to the group pre-treatment median (2.8) and was the oldest participant in the group (11 years at the time of treatment).

According to parent report, six (55%) children reportedly showed no change in stuttering severity since completing the clinical trial, three children's stuttering had decreased further (27%), one child's stuttering had increased (9%), and one parent did not respond to this survey question (9%).

At a group level, the median OASES score improved from moderate (2.1) pre-treatment, to mild–moderate impact (1.6) post-treatment. The mild-to-moderate impact score was sustained at follow-up (1.6). The median CAT score was sustained between post-treatment and follow-up (Mdn = 2.0) and was lower than normative data for children who stutter ($M = 16.83$, $SD = 7.47$) and those who do not stutter ($M = 6.38$, $SD = 5.21$) (Vanryckeghem et al., 2001). The mean SCAS score was also maintained within the normal range (standard scores < 60) between post-treatment and follow-up, indicating no clinically meaningful change in anxiety symptoms.

3.2. Partial responders

Eight children (36%) in the follow-up study had not met Stage 2 criteria within 12 months of starting the Lidcombe Program but demonstrated clinically meaningful reductions in stuttering (>2 scale points) during treatment. One child in this group continued to receive Lidcombe Program treatment with a community-based speech-language pathologist following participation in the Phase II trial. This child's stuttering severity rating decreased from 6.0 at pre-treatment to 2.0 at post-treatment and remained similar at follow-up (1.8).

Median assessment scores showed a reduction but Friedman tests indicated a significant change over time for stuttering severity ($\chi^2(2) = 14.25$, $p < .01$, Kendall's $W = .89$), but not for SCAS Total Score ($\chi^2(2) = 5.4$, $p = .07$, Kendall's $W = .34$), CAT Total Score ($\chi^2(2) = 2.30$, $p = .317$, Kendall's $W = .16$), or OASES Overall Impact Score ($\chi^2(2) = 1.65$, $p = .44$, Kendall's $W = .14$). Post-hoc Wilcoxon signed-rank tests with Bonferroni correction ($\alpha = .025$) showed that stuttering severity reduced significantly from pre- to post-treatment ($Z = -2.5$, $p = .01$, $r_{rb} = -1.0$), with no significant change from post-treatment to follow-up using Bonferroni correction ($Z = -2.3$, $p = .05$).

The partial responders showed a 4.5 scale point decrease in stuttering severity rating between pre-treatment and post-treatment. However, as shown in Table 2, the group median severity rating increased by 1.8 scale points during the follow-up period, though this increase did not reach statistical significance. Despite this increase, median stuttering severity at follow-up remained lower than at pre-treatment. Two children's (25%) stuttering increased more than 2 scale points during the follow-up period (Child 1: pre-treatment SR= 7.5; post-treatment SR=0.5, follow-up SR=2.7; Child 2: pre-treatment SR= 4.0; post-treatment SR=0.5, follow-up SR=2.7). Parent report indicated that, between post-treatment and follow-up, stuttering appeared to remain the same for four children (50%), decreased for two (25%), and increased for two (25%).

Median OASES Overall Impact Score decreased from 2.37 ($IQR = 1.14$) at pre-treatment to 2.02 ($IQR = 1.16$) at post-treatment and remained at 2.02 ($IQR = 0.91$) at follow-up. Median CAT Total Score decreased from 8.00 (IQR = 17.75) at pre-treatment to 4.00 (IQR = 8.50) at post-treatment and remained lower at follow-up (Mdn = 3.00, IQR = 33.75). CAT scores showed considerable variability at follow-up (Mdn = 3.00, $IQR = 33.75$), influenced by one participant whose CAT score increased from 6 at post-treatment to 54 at follow-up; all other participants had substantially lower follow-up scores (range: 0–28). For the partial responders, their mean CAT total score remained lower than norms reported for children who stutter ($M = 16.83$) but approximately one standard deviation above

non-stuttering peers ($M = 6.38$, $SD = 5.21$) (Vanryckeghem et al., 2001). SCAS Total Scores remained within the normal range (standard score < 60), indicating no clinically meaningful change in anxiety symptoms during the follow-up period.

3.3. Non-responders

Three children from the non-responder group returned for the follow-up study (14%). All three children had received additional stuttering treatment after the trial but no changes in stuttering severity ratings were observed in clinician-reported ratings nor from parent report collected for this follow-up study. Table 3 summarises the individual participant outcomes for each of the three psychosocial measures collected for the three non-responders in this study. Psychosocial outcomes were varied for each child, with a trend in improvements reported during the treatment period but not sustained at follow-up.

Individual outcomes (see Table 3) demonstrated considerable variability within and between participants. Across individual cases, OASES Overall Impact Scores did not change between pre-treatment, post-treatment, and follow-up except for one child (child 1 in Table 3) whose impact rating increased from moderate to moderate-to-severe after 2 years. Improvements in CAT Total Scores were consistently observed between pre-treatment and post-treatment for the three non-responders, but these changes were not maintained after 2 years and CAT Total Scores returned to pre-treatment levels. Two children (child 2 and 3 in Table 3) showed a reduction in SCAS Total Scores between pre-treatment and post-treatment, one of whom (child 2) indicated a shift from clinically elevated anxiety symptoms to a typical range compared to normative data. This change was maintained after 2 years. Child 1 showed no clinically meaningful change in anxiety during the treatment period but their anxiety score increased substantially from 8 to 24 by the 2-year follow-up.

4. Discussion

The purpose of this study was to investigate changes in stuttering and psychosocial outcomes for school-age children two years after participation in a Phase II Lidcombe Program trial. School-age children who stutter have a desire to speak more fluently and to increase their confidence and participation in everyday communication (Berquez et al., 2015; Cooke & Millard, 2018). The findings from the present study indicate that school-age children who meet Stage 2 criteria of the Lidcombe Program within 12 months can sustain improvements in both stuttering severity and psychosocial outcomes after 2 years. Children who do not meet Stage 2 criteria but achieve clinically meaningful reductions in stuttering (i.e., partial responders) may still experience longer-term treatment benefits, with stuttering severity remaining lower than pre-treatment at follow-up. Psychosocial improvements are also possible for this group, although the maintenance of both stuttering and psychosocial outcomes appears more variable over time as indicated by the follow-up outcomes. Though there were only a small number of non-responders included in this follow-up study, their individual results show improvements in communication attitudes and anxiety symptoms during the Lidcombe Program, but these were not consistently sustained after 2 years.

The maintenance of reduced stuttering observed in the present study is consistent with longer-term outcomes reported for a small number of other treatment approaches for school-age children who stutter. However, long-term evidence for this age group remains limited. A systematic review (Johnson et al., 2023) identified that only 13 of 67 included treatment studies reported outcomes beyond 12 months, despite identifying five therapy approaches showing clinical effectiveness in reducing stuttering in school-age children. These approaches include, for example, earlier versions of Lidcombe Program procedures (Lincoln & Onslow, 1997), Gradual Increased Length and Complexity of Utterance (GILCU) (Ryan & Ryan, 1995), machine-driven interventions (Ryan & Van Kirk Ryan, 1983), and speech restructuring approaches (Runyan & Runyan, 1986; Wagaman et al., 1995; Wood & Ryan, 2000). Two additional studies, which were not included in the review because they either did not meet the inclusion criteria or had not yet been published, provided further evidence of longer-term treatment benefits for school-age children who stutter. Euler et al. (2021) reported significant reductions in stuttering and stuttering impact following an intensive fluency-shaping intervention for 6–9-year-old children in Germany, with clinical gains reported at 12-month follow-up. Similarly, Kohmäscher et al. (2023) reported reductions in stuttering impact, severity, and frequency following the KIDS stuttering modification intervention for children aged 7–11 years, with improvements observed over a 12-month assessment period. Direct comparison between these outcomes and the present findings is difficult because the interventions differ substantially in their therapeutic targets, intensity and delivery, as well as outcome measures. However, despite differences in their proposed mechanisms of action, treatments showing longer-term benefits for school-age children share several features. Across the present study and other speech restructuring, and stuttering modification approaches, treatment commonly involves active participation of the child and family, practice beyond the clinic, and continued support or maintenance

Table 3
Individual psychosocial outcome data for non-responders collected pre-treatment, 12 months after starting treatment, and 2 years following post-treatment data collection.

Child	Age (follow-up)	OASES			CAT			SCAS		
		Pre	Post	Follow-up	Pre	Post	Follow-up	Pre	Post	Follow-up
1	11	1.7	1.8	1.8	5	2	5	7	8	24
2	11	2.7	2.7	3.2	28	19	27	48	39	38
3	13	2.8	2.6	2.6	19	8	21	18	10	17

following initial treatment gains (Johnson et al., 2023; Euler et al., 2021; Kohmäscher et al., 2023). These common factors may contribute to the transfer and maintenance of treatment gains in everyday communication, although their relative contribution to treatment outcomes has not yet been established.

Variability in treatment response is also a consistent feature of the school-age treatment literature and is not specific to the Lidcombe Program. Across treatment approaches, substantial variability has been reported in the magnitude and maintenance of stuttering reduction (Johnson et al., 2023). School-age children represent a clinically heterogeneous group, differing in age, stuttering severity, time since onset, previous treatment experience, and potentially the tractability of their stuttering. These factors may influence both the magnitude and rate of treatment response. In the present study, for example, six of the eight partial responders commenced treatment with severity ratings greater than 4. Given that higher pre-treatment stuttering severity has been associated with longer treatment duration (Koushik et al., 2009), some children classified as partial responders may have required a longer period of treatment to reach Stage 2 criteria rather than representing children for whom the treatment was ineffective. However, variability is also evident within other treatment approaches, including speech restructuring and combined interventions, suggesting that no single child or treatment characteristic is currently sufficient to explain responsiveness in this age group. Identifying which children are likely to respond to specific treatment approaches, and the treatment dose they require, remains an important direction for school-age stuttering research.

These findings have valuable clinical implications for speech-language pathologists who use the Lidcombe Program with a school-age child. First, the sustained outcomes observed for full responders may reflect the importance of Stage 2 of the treatment, during which parents receive ongoing coaching and clinician support to maintain gains as treatment is gradually withdrawn. Significant differences between groups were not statistically tested. However, comparing group outcomes, children in the partial responder group did not meet Stage 2 criteria during the trial and therefore did not receive structured maintenance support in the same way, which may have contributed to the observed variability and deterioration of outcomes over time of the partial responder group. One full responder showed a clinically significant increase in stuttering severity at follow-up which may also mean that maintenance is not guaranteed, even for children who meet Stage 2 criteria. This child was 11 years and therefore in the upper age range of the participant sample. This may provide preliminary information about how clinical gains for older school-age children are possible with the Lidcombe Program but may require specific attention longer-term. Close monitoring during the maintenance phase is therefore warranted for all school-age children, including those who meet Stage 2 criteria. This may involve more frequent maintenance consultations or phone calls with parents for a longer period than the 12 months stipulated in the Lidcombe Program treatment guide to ensure proactive support is tailored to the needs of the child and family.

The partial responder group may require close clinician attention during Stage 2 of the Lidcombe Program. These children demonstrated clinically significant reductions in stuttering during treatment but did not meet the criteria required to progress to Stage 2 within the timeframe of the clinical trial. This group likely includes two subgroups: children who respond more slowly to treatment and those whose progress plateaus—patterns observed by Koushik et al. (2009) in an earlier school-age study. Six children (75%) in this group had pre-treatment stuttering severity ratings greater than 4 which is higher than the group mean of the original sample (M=3.57) (Johnson et al., 2024). As higher pre-treatment severity is associated with longer treatment duration (Johnson et al., 2026; Park et al., 2021), some children may have reached Stage 2 criteria if treatment had continued beyond the trial period. One child in the partial responder group did continue Lidcombe Program treatment with a community speech-language pathologist following the trial; therefore, this child's follow-up outcome cannot be attributed solely to treatment received during the trial. We recommend that for children whose stuttering is responsive to the Lidcombe Program but does not meet Stage 2 criteria, a well-supported and structured maintenance phase for parents is still crucial to give children the best chance of sustaining stuttering and psychosocial gains long-term. Together, these findings for full and partial responders highlight that Stage 2 of the Lidcombe Program may be even more crucial for school-age children than for pre-school children to ensure clinical gains are maintained longer-term.

Although children in the non-responder group did not demonstrate reductions in stuttering severity during the clinical trial, some experienced psychosocial improvements during their treatment. However, the absence of a consistent pattern of sustained benefit at follow-up suggests that these gains may not be maintained without ongoing support. One child in the non-responder group showed no clinically meaningful change in anxiety symptoms during the treatment period but their anxiety score increased substantially after the study within the 2-year follow-up, during which time they were no longer receiving any healthcare intervention. While the reason for this increase cannot be determined, it highlights the importance of continued monitoring and need for alternative or adjunctive intervention approaches for children whose stuttering is not responsive to behavioural treatment. In particular, more tailored psychosocial support may be required to support communication confidence, participation, and emotional wellbeing for this group over time. This program of research investigating the Lidcombe Program for school-age children demonstrates that there does not appear to be a psychological cost with trialling the Lidcombe Program (Johnson et al., 2026), and even some transient benefits for children during treatment. As with any child who does not benefit from an initial therapy plan, collaboration with the child and family about other treatment options is the next clinical step.

For non-responders, the psychosocial improvements observed during the trial were not consistently evident at follow-up. However, all three non-responding children received additional stuttering treatment from other providers at some point during the follow-up period. Consequently, their follow-up outcomes cannot be attributed solely to the Lidcombe Program delivered during the trial and may reflect the combined influence of the trial intervention, subsequent treatment, and other factors occurring over the follow-up period. Notably, improvements were not consistently observed at follow-up, despite these children having accessed further intervention.

4.1. Limitations

Several limitations should be considered when interpreting these findings. This follow-up study included a subset of participants from the original trial, and while the findings provide clinical insights, generalisability is limited by the small sample size and variability across groups. A greater proportion of participants who returned for follow-up were full responders (50%), with fewer partial responders (36%) and non-responders (14%), limiting the strength of conclusions that can be drawn for these latter groups.

Interpretation of these findings should also consider the inherent variability of stuttering (Jokar et al., 2025; Tichenor & Yaruss, 2021). Parents were provided with instructions to collect a representative conversation sample of their child talking. However, we acknowledge that it remains possible that the 30 min of speech we obtained for each child conversing with a parent may have elicited lower stuttering given that they were in a comfortable and familiar context when recorded. Clinicians should therefore consider this when choosing to use the Lidcombe Program with a school-age child. We recommend that clinicians support parents to record and document stuttering severity ratings across a diverse range of speaking scenarios, with different communication partners, and use such information to confirm treatment responsiveness and progress tracking.

Finally, the present study did not include any female participants. Although stuttering is more prevalent among boys than girls (Craig et al., 2002; Yairi & Ambrose, 2013), the absence of female participants at follow-up should be considered in the generalisability of these findings to all school-age children. Given that only two girls participated in the original Phase II trial, further research with greater female representation is needed to show comparable responsiveness to the Lidcombe Program and maintenance of treatment outcomes.

4.2. Future directions

This study confirms and extends the evidence from previous follow-up studies of up to 7 years after Lidcombe Program treatment (Yandeau et al., 2021) showing that speech and psychosocial benefits can be maintained over longer periods. A future direction for this research is to follow the children from the present trial into adolescence. This could provide valuable insight into how treatment outcomes evolve as communication demands increase and new social and developmental challenges emerge. Incorporating participant perspectives during this period may inform more person-centred and developmentally responsive approaches to long-term stuttering management.

There remains a paucity of longer-term treatment outcome research for school-age children who stutter. Future studies might therefore examine maintenance beyond 12 months across a range of intervention approaches, rather than focusing on any single treatment. Beyond establishing whether a particular treatment program is effective, attention should be on understanding which treatments work best for whom, under what circumstances, and which components contribute to sustained change. This is particularly relevant given the substantial variability in treatment response observed both in the present study and across the school-age treatment literature (Johnson et al., 2023). Longer-term studies with sufficiently large samples to examine predictors and trajectories of treatment response may ultimately support more individualised clinical decision-making.

An important related direction is to investigate the mechanisms and active components underlying treatment outcomes. The Lidcombe Program incorporates multiple components, including parent involvement, stuttering severity monitoring, parent-clinician supportive conversations, verbal contingencies, individualisation of treatment and a structured maintenance phase. The present study cannot determine which of these components, individually or in combination, contributed to the observed long-term speech and psychosocial outcomes. Rather than focusing solely on comparisons between complete treatment programs, future research could examine common therapeutic factors across interventions for school-age children, including therapeutic alliance, child and family engagement, opportunities to discuss stuttering, practice within everyday communication, and ongoing maintenance support. Identifying the components associated with change in stuttering and psychosocial outcomes may help to refine existing interventions and inform the development of more individualised approaches for this heterogeneous population of children.

5. Conclusion

The present follow-up study demonstrates that, for school-age children who respond to the Lidcombe Program, reductions in stuttering severity and associated psychosocial benefits can be sustained 2 years following treatment completion. Variability in outcomes for partial and non-responders highlight that structured maintenance support and individualised, ongoing management is crucial for optimising the chance that these children will maintain treatment benefits longer-term.

CRediT authorship contribution statement

Georgina Johnson: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Mark Onslow:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Conceptualization. **Brenda Carey:** Writing – review & editing, Supervision, Methodology, Investigation, Formal analysis, Conceptualization. **Elaina Kefalianos:** Writing – review & editing, Supervision, Methodology, Investigation, Conceptualization.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The authors GJ and EK certify the absence of any conflicts of interest, including specific financial interests and relationships and affiliations relevant to the subject of this paper. MO and BC are affiliated with the Lidcombe Program as authors of the Lidcombe Program Treatment Guide and members of the Lidcombe Program Trainers' consortium. BC is paid to present Lidcombe Program workshops.

If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

Data availability

Data will be made available on request.

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