Title: Speech and language therapy for adolescents in youth justice: A series of empirical single case studies

Running Head: SLT for adolescents in youth justice

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Declaration of Interest

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Abstract

Background: Adolescents in contact with youth justice are a vulnerable and marginalized group at high risk of developmental language disorder (DLD), and other communication difficulties. Though preliminary studies have demonstrated the benefits of Speech and Language Therapy (SLT) services in youth justice, limited research has empirically tested the efficacy of intervention in these settings.

Aims: We aimed to evaluate the extent to which intensive, one-to-one language intervention improved the communication skills of incarcerated adolescents with below average (>1 SD below mean) language and/or literacy skills.

Methods & Procedures: A series of four empirical single case studies were conducted, using multiple baseline intervention design. Individualized intervention programs were administered, and progress on outcome measures (probes) was evaluated throughout the baseline, intervention, and maintenance phases using Tau-U, a non-parametric distribution-free statistic. Additional measures were used as secondary outcomes of the intervention, including standardized language subtests, subjective rating tools by participants and their teachers collected pre- and post-intervention, and a brief structured participant interview, independently administered by youth justice staff.

Outcomes & Results: Medium-to-large effect sizes, the majority of which were statistically significant, were detected on the primary outcome measure across the four cases, indicating improvements in the targeted communication skills. Positive results were also evident in comparisons of pre- and post-measures on standardized language subtests, subjective self- and teacher-ratings of communication, and the participants' impressions of

the interventions. For those participants who could be followed up, gains in language skills were generally maintained at one-month post-intervention.

Conclusions & Implications: This study provides further evidence of the efficacy of one-to-one SLT intervention for adolescents in youth justice, to address language and literacy difficulties. These findings inform future SLT service provision for adolescents in these settings, with clear policy and practice implications. Future research should investigate wider benefits to individuals' engagement in youth justice intervention and recidivism, as well as assessing maintenance of gains over a longer period.

What this paper adds

What is already known on this subject

The high rates of DLD in youth justice is well-known, with difficulties spanning multiple areas of language and literacy. Speech and language therapists are increasingly working in community and custodial youth justice settings, and a few preliminary studies have demonstrated the effectiveness of such work.

What this study adds

This study extends the evidence-base of the efficacy of speech and language therapy for language and literacy difficulties in youth justice, using a series of four empirical single case studies. We also argue that SLT should be more actively considered in planning multidisciplinary interventions for young people in custody.

Clinical implications of this study

The results of this research support current moves to include SLT services in youth justice systems, and illustrate for clinicians currently working in this sector a way of structuring and measuring the impact of intervention services.

Introduction

Young people in contact with youth justice are a vulnerable and marginalized group, in which neurodisabilites (e.g. autism spectrum, intellectual, attentional, and learning

disorders) and mental health/psychiatric disorders are over-represented (The Civil Rights Project 2000; Wald and Losen 2003). International research has indicated that developmental language disorder (DLD) is also highly prevalent in this population, estimated to be present in 37-67% of young male offenders (see Anderson, Hawes and Snow 2016 for review). DLD refer to "cases of language disorder with no known differentiating condition" (Bishop et al., 2017, p. 4)— such as biomedical conditions where language difficulties form a part of a complex pattern of impairments—but which can co-occur with other disorders such as attentional, motor, reading and spelling, speech, emotional/or behavioural disorders (Bishop *et al.* 2017). In the vast majority of these reviewed studies, the participants' DLDs were previously undiagnosed, highlighting the issue of poor identification of this disorder in youth justice populations, and indeed in schools. Anderson *et al.*'s review of communication needs also showed that potential confounding factors (e.g. diverse language backgrounds, acute mental illness) did not appear to account for high rates of DLD in youth justice samples, given the exclusion criteria of the reviewed studies. Participants with other potential causes of communication difficulties tended to be excluded or under-represented (though not consistently for all studies), including: a language background other than English, known impairments in intellectual functioning, hearing loss (usually self-reported), acute mental illness, and acquired brain injury, or other neurological illness (Anderson *et al.* 2016).

The communication difficulties of young male offenders span expressive and receptive domains; areas of vocabulary, syntax, and narrative discourse; as well as structural and figurative uses of language. Though available research provides some preliminary insights into particular domains or areas of weakness (e.g. receptive skills being weaker than expressive), there is altogether insufficient evidence from which to draw conclusions regarding particularly affected areas of language (Anderson *et al.* 2016; Snow and Powell, 2004a, 2008, 2011; Snow and Woodward, 2017).

The inverse of DLD, oral language competence is an important construct for youth justice service providers due to its strong links with educational success and socio-emotional wellbeing, especially in vulnerable young people (Snow, Woodward, Mathis and Powell, 2016). Oral language competence is defined as "… the ability to engage successfully with a range of communication partners via the spoken word, in order to conduct a wide variety of personal, social, educational, commercial and professional relationships" (Snow 2009, p. 102). Oral language competence is vital for the acquisition of literacy skills (Snow, 2016), while disorders in oral language are associated with social, emotional, and behavioural problems in children (e.g. McKean *et al.* 2017), detected as early as the preschool years (Prior *et al.* 2011).

Language and concomitant behavioural problems further militate against progress in education, and contribute to the so-called "school-to-prison pipeline" (The Civil Rights Project 2000; Wald and Losen, 2003), whereby behaviours of concern are punished through recurring school suspensions and exclusions, contributing to students' educational disengagement and exclusion (Mallett, 2015). It is unsurprising, then, that adolescents with histories of DLD have significantly poorer educational outcomes (Conti-Ramsden and Durkin, 2012) than their typically developing peers. Young people involved in youth justice are also more likely than demographically similar peers to exhibit social skills deficits (Snow and Powell, 2008), consistent with the fact that their language skills are also closely related to competencies in social cognition and executive functioning (Brownlie *et al.* 2004; Noel and Westby 2014). Accordingly, language difficulties are likely to have an early, and ongoing impact on the social and behavioural profiles of vulnerable adolescents, some of whom will come into contact with the youth justice system, and will invariably have experienced suspension and exclusion from school (Snow *et al.* 2016).

Policy makers, educators, and youth justice service providers should be concerned about the language difficulties of individuals in youth justice for several reasons. In the youth

justice system, young people are often placed in linguistically-demanding situations in which adequate abilities in vocabulary, grammar, narrative discourse, and figurative language (Walker, 1993) are assumed, such as police interviews and court appearances (Rost and McGregor 2012; Snow and Powell 2004b; Walker 1993). Inadequate language skills can affect the comprehension of "Miranda rights", the legal protections afforded to those who have been accused of a crime (Rost and McGregor 2012).

Despite this, apart from screening in England and Wales via the Comprehensive Health Assessment Tool (CHAT; OHRN, 2013), language difficulties are rarely systematically identified in the youth justice context (Richards 2014; Jordan 2014), which means that it is highly unlikely for incarcerated individuals with DLD to be referred to and receive specialist assessment and intervention in these settings (Snow and Powell 2011). In the community, many adolescents with DLD are also mis- or under-identified (Nippold, 2007), in part because DLD does not have easily-identifiable signs to the non-expert, and affected adolescents can often appear to have adequate conversation skills (Reed, 2005). Thus, the systematic identification of DLD is critical to connecting incarcerated youth with SLT services, so that their difficulties understanding others and/or expressing themselves are not misinterpreted as signs of non-compliance, rudeness, disinterest, and/or guilt (Beitchman *et al.* 1999; Snow and Powell 2004b), or in some cases aggression and hostility (Burgoon & Koper, 1984).

Interventions in youth justice are another significant issue for young people with DLD, as engagement in these services relies heavily on oral language skills (Snow and Powell 2012; Snow *et al.* 2016). Lipsey (2009) conducted a meta-analysis of the available youth justice intervention research and described the most efficacious therapeutic approaches, including counselling, social skills training, and educational/vocational interventions. Such interventions aimed to build academic, social, or vocational skills; treat mental health disorders; and/or address specific criminogenic needs (e.g. procriminal attitudes, substance

use, antisocial personality traits; Andrews and Bonta 2010), such as those targeted in anger management or sex offender rehabilitation programs (Lipsey 2009). As has been noted, however, these interventions are all delivered through the medium of oral language (Snow *et al.* 2016; Snow and Powell 2012). The verbal demands of these interventions likely compromise their effectiveness for incarcerated youth with DLD or other communication needs (Snow and Powell 2011), making it important to investigate youth justice interventions that take DLD into account. Language disorders should be addressed because of the intrinsic everyday importance of communication competence, and because a failure to do so reduces successful participation in youth justice services, some of which are court-mandated.

Although some evidence supports the efficacy of SLT interventions in community samples of adolescents (e.g. Ebbels, Marić, Murphy and Turner 2014; Murphy *et al.* 2017; Starling, Munro, Togher and Arciuli, 2012), there is little research concerning their efficacy for adolescents in the youth justice system. In a UK study, a speech and language therapist worked in a community Youth Offending Services (YOS) within the Intensive-Supervision and Surveillance Programme (ISSP) for recidivist young males serving community-based orders (Gregory and Bryan 2011). The researchers evaluated the effectiveness of SLT support provided within the service. The study involved several components that were flexibly conducted, depending on the context and assessed/perceived needs of each participant. The clinician screened all entrants (n = 72) to the ISSP during the year-long secondment, and wrote a communication intervention plan for the 49 judged to need SLT intervention. The level, frequency, and amount of support provided varied considerably, and the details of each intervention case were not provided. The interventions also differed in their content, including combinations of intervention strategies for vocabulary, grammar, memory, listening/attention, comprehension, narrative ability, social skills, speech, and fluency. The authors found that the performance of many participants improved on standardized language measures post-intervention. However, because there was no experimental control

in the intervention design, it was unclear whether the change was due to the interventions provided, other services, and/or the passage of time. There was also high variability in the intervention content and delivery, making replication difficult; and loss to follow-up was high. The youth justice staff who participated perceived that the contribution of the speech and language therapist in the team was beneficial to their program overall (Bryan and Gregory 2013).

One other investigation into the efficacy of intervention for communication difficulties comprised a series of single case studies (Snow and Woodward 2017). In this research, young males with identified DLD serving custodial sentences took part in individually-tailored one-to-one SLT interventions, once or twice per week over a 7-16 week period. Intervention targets varied between cases, including vocabulary, comprehension, social communication, and literacy. Snow and Woodward reported gains on re-administered standardized language tests, as well as positive therapeutic engagement and perceived utility of the intervention by participants. The results of this study are promising, but without an experimental component, such as multiple baseline design, case studies must be interpreted as providing only preliminary evidence of efficacy (National Health and Medical Research Council 2018).

In summary, there is a strong body of international evidence describing the high prevalence of DLD in youth justice populations (supervised both in the community and custodial settings). Given the high rates of mental health and executive functioning disorders in youth justice (Syngelaki *et al.* 2009; Hughes *et al.* 2017), these are also important considerations for the young persons' engagement with intervention, and the suitability of therapeutic goals. This is because therapeutic engagement relies heavily on mental health status and executive capabilities (Griffiths *et al.* 2012; Blair 2002). Research into the efficacy of SLT intervention for these vulnerable populations has bearing on policy-making and service-delivery for youth justice, as well as the evidence-base for SLT interventions. Despite growing interest, however, with only one previous intervention study of young people in

custodial settings, there is only preliminary evidence for supporting these young people with DLD via such interventions.

Current Study

In a series of four empirical single case studies, using multiple baseline intervention design (Level of Evidence 3b, Howick *et al.*, 2009), we evaluated the efficacy of one-to-one SLT intervention for incarcerated youth with DLD. We aimed to investigate the potential for SLT intervention to improve the communication skills of young males in a youth justice custodial setting. We had the following research questions: Were there changes following the interventions in (1) the primary outcome measures (probes), (2) and the additional measures including pre- and post-intervention standardized language subtests, teacher/participant ratings, and participant perceptions?; and (3) Were these changes maintained at one-month post-intervention? Given previous findings in the mainstream adolescent literature, and preliminary studies in youth justice settings, we hypothesized that there would be significant improvements in language and/or communication skills following one-to-one intervention delivered by a speech and language therapist.

Methods

We undertook a series of single-case multiple baseline experimental language intervention studies with incarcerated adolescents. The study was approved by the XXXXXXXXXX Human Research Ethics Committee.

Recruitment

The current study followed a wider assessment study (Swain, Eadie and Snow, under review) using a sample of 27 young males detained in a youth justice centre, who were recruited over a nine-month period. Inclusion criteria for the assessment study were as follows: having no documented history of acquired brain injury (ABI) with loss of consciousness for more than one hour; majority of schooling having been completed in an

English-speaking country; and no acute evidence of a psychotic illness that would impact participation in the assessments. These criteria have been used extensively in previous studies of DLD in young people in youth justice (Snow and Powell 2011; Snow and Powell 2004; Snow and Powell 2008; Snow and Woodward 2017). Recruitment and assessment processes were conducted by the first author, a practising speech and language therapist, with three years of clinical experience working with adolescents in the community, but no previous work with young people in custody. Selection criteria for recruitment were provided to youth justice and education staff, who then approached eligible young people to determine their interest in participating. Those who verbally consented attended a meeting with the researcher who read the plain language statement and consent forms aloud, in case literacy difficulties were present. Participants who provided written consent then participated in a structured biographical interview (see supplemental material, Appendix 2).

Assessment

The 27 participants in the assessment study completed a series of standardized assessments and questionnaires. Where indicated for logistical or clinical reasons, rest breaks were provided, and/or assessments were conducted over more than one session. Standardized assessments of oral language, social cognition, and executive functioning skills were conducted, along with self-report questionnaires measuring language, executive functioning, and mental health. The Clinical Evaluation of Language Fundamentals-4th Edition, Australian standardization (CELF-4) (Semel, Wiig and Secord 2006) is a norm-referenced assessment of language skills for 5- to 21-year-olds. The four subtests required to obtain a standardized Core Language Score were administered.

Participants and one of their teachers or staff members completed the La Trobe Communication Questionnaire (LCQ; Douglas, Bracy and Snow 2007). This 30-item assessment of perception of discourse-level skills has been validated with adults (Douglas, Bracy and Snow 2007) and adolescents with ABI (Douglas 2010). The LCQ has self-rating,

and close other-rating versions, and its items reflect the four maxims of Grice's (1975) cooperative principle of conversation (i.e. pertaining to quantity, quality, relation, and manner). The LCQ has high internal consistency with healthy adults (Cronbach's alpha: rated by self: 0.85; rated by other: 0.86; Douglas, O'Flaherty and Snow 2000), and young adults with a history of ABI (mean age ~20 years; Cronbach's alpha: rated by self: 0.91; rated by other: 0.90; Ryan *et al.* 2013). It also has good stability over time for self-report (8 weeks, r = .76; Douglas *et al.* 2000). A higher LCQ total score reflects more frequent communication difficulties.

Social cognition, particularly emotion perception, was assessed using The Awareness of Social Inference Test–Revised (TASIT-R) Part One: Emotion Evaluation Task (McDonald, Flanagan and Rollins 2011). Scores on the TASIT-R correlate with established measures of facial recognition: the Benton Face Recognition Test (r = 0.45), and social perception: Elkman Faces identification (r = 0.69), Elkman Faces matching (r = 0.70; McDonald *et al.* 2011).

We measured executive functioning, particularly reactive flexibility with the validated Contingency Naming Test (CNT) (Anderson *et al.* 2000), and organizational strategy with the Rey Complex Figure Organizational Strategy Score (RCF-OSS; Anderson *et al.* 2001), which has adequate validity (Martens, Hurks and Jolles 2014). The CNT assesses both simple and multi-dimensional shifting behaviour. It is a quick and efficient assessment, only requiring the naming of colours and shapes, and so is not confounded by literacy difficulties (Anderson *et al.* 2000). The RCF-OSS assesses participants' abilities to copy a complex figure, and redraw it after a delay, having not been told in advance that they would need to recall it. Executive functioning skills are required to competently complete this task, and the Organisational Strategy Score (RCF-OSS; Anderson et al., 2001) provides a validated measure of organisational strategy (i.e., how well individuals can approach, prioritise, and organise themselves during the task).

The Dysexecutive Questionnaire (DEX) (Burgess, Alderman, Wilson, Evans and Emslie 1996) is a rating tool of executive functioning, comprising 20 items assessing perceived difficulties in executive functioning. This measure has good internal consistency for adults (Shaw, Oei and Sawang 2015), and was completed by participants (self-rating form), and their teachers (other-rated form)

Due to the prevalence of anxiety and depression in youth offender populations (e.g. Hughes *et al.* 2017; Snow and Powell 2011; Snow *et al.* 2016), and their potential impact on participant engagement, we administered the Depression, Anxiety and Stress Scale 21-item version (DASS21) (Lovibond and Lovibond 1995), which has strong psychometric properties (Antony, Bieling, Cox, Enns and Swinson 1998).

Intervention

Participants.

Following the assessment study of 27 young males in custody (Swain *et al.* under review), the four participants in the current study (described throughout via pseudonyms) were drawn from this original sample, having met the following further selection criteria: having clinically significant difficulties in language skills, and having at least one month remaining in the youth justice centre. Clinically significant language difficulties were defined as below expected language skills on current CELF4 Core Language Scores, a history of language difficulties, and existing functional difficulties in language and literacy) (see Bishop *et al.* 2017). Following the completion of their assessment and feedback session(s), nine participants met the intervention study selection criteria, of which six agreed to participate in the intervention study. However, two of these intervention cases are not reported here due to methodological differences: one case focussed on voice therapy (see Quinn and Swain 2018), and the other case was an indirect (train-the-trainer) social communication intervention for a client with severe intellectual disability and DLD. For the four cases reported here, demographic data are displayed in Table 1, and detailed assessment profiles

are displayed in Table 2. Below, pertinent demographic and contextual information is summarized for each case, as well as the intervention content (i.e. language skills that were targeted).

[Insert Table 1 about here]

[Insert Table 2 about here]

Jason was 18 years and 1 month of age, with a history of serious offending, out-of-home care (OOHC), homelessness, depression, and self-reported Attention Deficit Hyperactivity Disorder (ADHD). He reported prior support from a speech and language therapist while at school. Jason presented with overall low-average language skills (see Core Language Score in Table 2), with relative weaknesses in recalling sentences, and formulating sentences. Despite Jason's Core Language Score falling within the low-average range on the CELF4, his significant difficulties with spelling and writing, were greatly affecting his engagement in the educational programs available to him while in custody. Jason was assessed as having executive functioning skills in the mild impairment-low average range. He was planning to enrol in a cookery course on release, and was increasingly concerned about his poor spelling. Together, Jason and the clinician decided to work on single-word spelling and vocabulary for cooking ingredients.

Mitchell was 17 years and 6 months old when he participated in the intervention study. He had experienced maltreatment and OOHC placement, and his violent and sexual offending had escalated following his first period of incarceration at the age of 15. Mitchell was targeted by other offenders in the facility because of the nature of his crimes, and was housed in the unit for vulnerable adolescents (typically 15-16 years old), despite his age. Mitchell reported academic and behavioural struggles at school, which he attended up to Year 9, as well as a history of speech and language difficulties, self-reporting that some SLT services were accessed during primary school. He also reported receiving a diagnosis of dyslexia while at school. Mitchell's assessment results indicated severe DLD (see Core

Language Score in Table 2), with particular difficulties with semantic understanding (Word Classes, Word Definitions), ability to recall sentences, and a relative strength in formulating sentences. He performed within the normal range on the social cognition and executive functioning tasks, and did not present with symptoms of depression, anxiety, or stress, despite reporting a diagnosis of depression. Given his difficulty with semantic understanding/expression, Mitchell decided in consultation with the clinician to work on (1) vocabulary, (2) auditory comprehension (finding the main idea), and (3) rhyming recognition/production. The third goal was partly chosen in order to further incentivize Mitchell's participation in the interventions. These goals were incorporated into the functional task of writing rap lyrics, for which Mitchell had a keen interest and talent.

Zach was 18 years and 2 months during the intervention study, and was housed within the unit for vulnerable youth. His early life was characterized by prolonged exposure to severe physical abuse, and emotional/environmental neglect, which was then repeated in an OOHC placement. Zach was diagnosed by a team of clinical and neuropsychologists with reactive attachment disorder, some features of borderline personality disorder, as well as mild intellectual disability (Wechsler Intelligence Scale for Children-Fourth Edition Full Scale Intelligence Quotient: 62-67). He had a history of severe violent offending. Zach also reported a history of ADHD, dyslexia, and receiving help from a teacher's aide in primary school. His language skills were within the moderate disorder range, with particular difficulty with recalling sentences, and semantics (Word Classes, Word Definitions). Zach had a relative strength in expressive grammar (formulating sentences). Zach's social cognition and executive functioning skills were also below age-expected levels. He rated himself as having communication difficulties and some executive difficulties, which aligned with the ratings of his teachers. Zach was keen to develop his expressive abilities, in order to better explain ideas and tell stories. Together with the clinician, Zach decided to work on (1) vocabulary for describing feelings, thoughts and actions of characters in a story; (2)

coordinating conjunctions to increase expressive syntactic complexity (e.g. and, so, then, but), and (3) story grammar elements (Stein and Glenn 1975) for retelling oral narratives.

Liam was 13 years and 11 months of age, and was incarcerated in the unit for young boys (10-14 years of age). He had experienced periods of OOHC, and was residing in a secure state-run residential care facility before his arrest. Liam had recently received a diagnosis of mild intellectual disability (Wechsler Intelligence Scale for Children-Fourth Edition Full Scale Intelligence Quotient: 66). He also had a history of depression, self-reported ADHD, and school difficulties, including a history of suspensions and exclusions. His offenses were primarily motor vehicle-related. Liam had severe-profound DLD (CLS: 55), severe emotion perception deficits, and executive functioning difficulties. He also scored highly on self-reported anxiety symptoms on the DASS21. His teachers in the youth justice centre reported that Liam exhibited severe communication and executive difficulties in the classroom, where he continually struggled to engage in schoolwork. Liam worked with the first author intensively on the following goals: (1) oral vocabulary from commonly-used (though unfamiliar) terms for Grades 5-7; (2) using the stimuli from goal (1) in a single word reading task to test reading accuracy; and (3) using stimuli from goal (1) in a sentence completion task to address expressive grammar.

Procedures.

Previous research indicates that the youth justice setting entails a certain level of unpredictability with respect to clinical interventions, as demonstrated by assessment studies (e.g. Snow and Powell 2004, 2008, 2011) and in an intervention study (Snow and Woodward 2017). Therefore it was known that flexibility in designing and implementing each intervention case study would be required. For this reason, each case describes an individual with a different communication profile, and individualized intervention protocol. The commonalities between the cases included: the same speech and language therapist (first author) implementing the one-to-one intervention; explicit training on language

and/or literacy skills; and each participant being a young male completing a custodial youth justice sentence.

Participants were invited to take part in an individualized intervention program with the first author. To inform the planning of the intervention for each participant, data from the standardized assessments of language, social cognition, and executive functioning (outlined above) were utilized. Depending on the assessment profile and the goals of each intervention, further standardized assessments were administered in some cases, including additional subtests from the Clinical Evaluation of Language Fundamentals-4th Edition (CELF4; Semel, Wiig and Secord 2006), and additional literacy assessments, detailed in the supplemental material (Appendix 1). When considering the planned "dose" of the intervention, there was relatively little evidence to support an optimal intensity (that is frequency and lengths of sessions) and dose (amount of therapy in session, duration of program) of intervention, appropriate for various speech, language and communication needs (SCLN), especially in paediatric populations (Justice, Logan, Jiang and Schmitt, 2017). For this reason, clear indications of optimal intensity and dose of intervention were not available to plan language interventions for children, let alone for adolescents (Scott, 2014; Warren et al., 2007). Thus for practical purposes, it was aimed that each of the three goals would have six sessions making a total of 18 for each participant's intervention program. Where possible, missed sessions were rescheduled, though this was not always an option.

The intervention goals for the four cases are summarized in Table 3. The interventions involved the explicit teaching of the concept or skill relevant to the goal. Each of these skills was then practised within a functional communication task (e.g. scripting task, rehearsal, reflection, discussion). Sessions were structured according to the preferences of the participant, and any constraints of the setting. However, each session included the following components: rapport building and familiarization; probe measurement; explicit teaching/training of language/literacy skills; and transfer of skill to functional tasks.

[Insert Table 3 about here]

Primary outcome measures: Probe data.

In each case, the intervention was divided into three goals, based on target skills (e.g. vocabulary, phonological awareness, text comprehension, spelling, reading). This allowed three opportunities to demonstrate change in the measured skills following the introduction of each intervention (i.e. within-participant replication). Outcome measures matched to each goal were devised, through discussion with participants, and measured throughout the intervention. Hereafter, we will refer to these outcome measures as "probes".

Each intervention goal had its own baseline, intervention, and maintenance phases. In the baseline phase, all three probe assessments were administered between two and seven times to establish pre-intervention performance; the intervention phases involved data collection during the implementation of each intervention goal (1-3); and the maintenance phase involved probe measurement after all the interventions had concluded. During each of the phases, all three sets of probes were measured in order to track their progress (even when they were not targeted). For every target skill, a pool of stimulus items was generated, totaling 30-50 items for each probe. A random 7-10 items from the set were used for each probe measurement, and performance was audio-recorded for later analysis. Further information regarding the development and measurement of the probes and stimuli is provided in the supplemental material (Appendices 1, & 3-8). The probes were the primary outcome measure for the single case multiple baseline design. Planned informal and statistical analyses for the probe data are detailed further below.

A "control probe" was also administered intermittently during the baseline, intervention, and maintenance phases where possible, using the non-word repetition subtest from the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen and Rashotte 1999). We expected performance on this probe to remain constant throughout the intervention. Therefore, the control probe gave further indication of the extent to which

changes to the targeted language skills could be attributed to the intervention. In addition, a clinician-rated measure of therapeutic engagement (adapted for use in SLT intervention with young people in youth justice by Snow and Woodward, 2017; see supplemental material, Appendix 10) was also administered throughout the intervention to document the engagement of participants across the sessions.

Secondary outcome measures.

To address whether changes would be detected on pre- and post-measures, relevant subtests for each case were readministered post-intervention (see supplemental material, Appendix 1), though these differed depending on the goals of each case, and whether this was logistically possible. Also, re-ratings on the Dysexecutive Questionnaire (DEX) (Burgess *et al.* 1996) and La Trobe Communication questionnaire (Douglas *et al.* 2007) were collected from the participant (self-rating) and their teachers/staff members.

A structured post-intervention interview was also conducted within 1 week of intervention with each participant to gauge their impressions of the intervention. In order to reduce the effects of social desirability bias in follow-up responses, each participant's youth justice worker or teacher was asked to undertake this short, structured interview with the participant about the intervention. The staff member was given a list of questions addressing participants' impressions of the intervention (see supplemental material, Appendix 9) and their responses were recorded on a one-page response sheet.

Follow-up.

A short (30-45 minute) follow-up session was planned for each participant at 1-3 months after the intervention. In this face-to-face session, data on probe performance (of three intervention goals, and control probe) was collected to determine maintenance of skills after 1-3 months.

Data analysis

All baseline, treatment, and maintenance session measurements were audio-recorded with permission of the participants, for later transcription and analysis. Once transcribed, the samples were coded and randomized by an independent speech and language therapist so that blind ratings of participant responses could be completed by the first author (see supplemental material, Appendix 1 for scoring criteria for each goal). Before the first author completed the blind ratings of the data, a randomly selected 20% of the clinician-judgement measures (not including spelling, reading, and rhyming measures, as these have clear correct/incorrect answers) were independently rated by a speech and language therapist and the first author (according to the scoring criteria for each goal, see Appendix 1). Inter-rater reliability on this randomly selected 20% of the data was established by comparing the scores from both raters. Point-to-point agreement was initially 78%. For each point of difference between the two raters, a consensus rating was agreed upon, representing 100% agreement. After this training process, the first author completed the blind ratings for the entire set of clinician-judgement measures. These blind ratings were then used for the final analyses.

We calculated descriptive statistics for the baseline, treatment, and maintenance phases. Tau-U analyses were conducted in order to ascertain the overall magnitude of change between phases (effect size), as well as the statistical significance of effects (Parker *et al.* 2011). Tau-U is a non-parametric distribution-free statistic designed for analyzing "nonoverlap data" between two phases (baseline, and intervention). The Tau-U statistic has been used in a similarly-designed study of children with autism spectrum disorder (Tan *et al.* 2014). Tau-U effect sizes are interpreted as follows: 0 – .65 as a small effect, .66 –.92 medium effect, > .92 large effect (Parker *et al.* 2011; Rispoli *et al.* 2013). Standard alpha levels were used ($p < 0.5$), and because the measures were serially dependent, we did not apply a Bonferroni correction (Tan *et al.* 2014). When a significant baseline trend was present, it was controlled for using the Tau-U statistic. We also compared the baseline phase with the combined intervention and post-intervention (maintenance) phases, and calculated

a Tau-U omnibus effect for each case, in order to measure the overall effect of all three intervention goals. Informal comparisons were made between the pre- and post-assessments and surveys, including self- and teacher-ratings of communication and executive functioning. We also examined the independently-collected data on the participants' perceptions of the interventions from the structured interviews.

Results

While 18 or more intervention sessions were planned, due to logistical constraints (e.g. early release into the community), extended periods of intervention were not possible for two of the cases. There were substantial, unpredictable factors affecting the participants' availability to attend their intervention sessions. These frequent cancellations affected the number of possible intervention sessions. The primary reason for cancellations was staff shortages (44%), followed by participants electing not to participate in the session (38%), and security issues including unit "lockdowns" due to unrest and incidents in the unit and/or Centre (17%). Other reasons were participants being: unwell, at court without prior notice, or on a leave without prior notice (total of 1%). Session frequency ranged from 2-8 times in a week (including a more intensive intervention involving more than one session per day). Table 4 displays the number of completed and cancelled (or rescheduled) sessions across each case, as well as the duration of each intervention. For the two participants who received shorter intervention phases, Jason and Liam, there were lower cancellation rates. However, for Mitchell and Zach, who completed fourteen and nine intervention sessions respectively, the rates of cancellation were much higher.

[Insert Table 4 about here].

Primary outcome measures: Probe data

In Figures 1-4, case charts for each participant are presented, displaying their performance on the primary outcome measures (probes) for each goal, as well as therapeutic

engagement and control probe measures. Table 5 displays the descriptive and Tau-U statistics, calculated for the scores in the baseline, intervention, and maintenance phases, as well as the scores across the intervention and maintenance phases (combined). Baseline performance on the probes (measured in percentage correct) was low across most goals and participants, indicating low proficiency pre-intervention. Overall, there was an improvement in scores post-intervention, with some variability across the goals of the four cases, and post-intervention performance ranging from 50-100% correct. Examining the Tau-U scores (effect sizes) in Table 5 allows for comparison across interventions and participants, regardless of probe task difficulty.

[Insert Table 5 about here]

Individual case results

Jason's engagement in his spelling and vocabulary intervention was variable, but appeared to improve over the course of the intervention goals. Considering the Tau-U statistics (Table 5), there was a significant large improvement in his performance on spelling-phonics, though this dropped to an average of 50% proficiency in the maintenance phase. The results on the spelling-morphology goal were highly variable, but still resulted in a large improvement on the Tau-U effect size, as did his performance on the vocabulary goal. While Jason participated in a truncated (2 week) intervention, there was still a significant improvement on the intervention probes.

[Insert Figure 1 about here]

Mitchell participated in a longer intervention focusing on vocabulary, auditory comprehension, and rhyme recognition/production, and had a consistent level of engagement in the sessions. Mitchell made large significant improvements on his vocabulary goal, which was scored from an average of his ability to provide a definition, and use the word in a sentence. The performance on the comprehension goal was more variable, but still demonstrated a significant improvement. The rhyming goal did not appear to improve

greatly (from an average of 80% correct to an average of 90% in the intervention phase). However, as Mitchell's performance in the baseline phase had a significant downward trend, there *was* a significant difference in the intervention phase, which was maintained after the intervention. Mitchell's performance was maintained for the rhyming goal at one month post-intervention (follow-up), though it dipped somewhat for the vocabulary and comprehension goals at this later time point.

[Insert Figure 2 about here]

Zach's intervention included vocabulary, expressive syntax and story grammar. Compared to his baseline, Zach's performance in the intervention phase was significantly higher, with a large effect size for the vocabulary and syntax goals. The performance on the vocabulary probe (average of the definition and sentence use components of probe) was particularly variable, and some points mirrored the fluctuations in engagement measured in some sessions (see session 6-9). There was a medium significant improvement in the narrative goal, but no maintenance measures could be collected on this task. For the follow-up sessions, it appeared that Zach's performance on the vocabulary and syntax goals remained quite high, but there was a substantial decrease on the narrative probe (returning to pre-intervention levels).

[Insert Figure 3 about here]

Liam's intervention included vocabulary, reading and sentence completion goals. The participation in this relatively short intervention still produced some medium-large improvements in the intervention phases, that were not statistically significant, with the highest level of mastery attained in the reading goal (100% in the maintenance phase). Along with the probes, his level of engagement also improved over the course of the intervention.

[Insert Figure 4 about here]

There were statistically significant, large effects (Tau-U > .92) in seven of the twelve comparisons (58%) between the probe measurements across the baseline and intervention

phases. Medium effect sizes (.66 ≤ Tau-U ≤ .5) were observed in all other baseline versus intervention phase comparisons, except the spelling-morphology goal in Jason's case, and two instances in Liam's case, where the small number of intervention sessions (and thus probe data points) in each phase likely affected the power of the analyses. The results suggest that the interventions produced a significant medium-large improvement in the probe task performance (baseline vs. intervention phases).

As an additional analysis, due to the low number of probe data points across some intervention goals, the intervention and maintenance phases were combined to compare with the baseline phases. The probe measurements in the maintenance phase were taken after the intervention was ceased, to see if any changes were maintained immediately after the completion of each goal. All of these baseline versus intervention-maintenance (combined) comparisons reached statistical significance with medium-large effects. When comparing the intervention and maintenance phases for each goal using Tau-U, there was no statistically significant difference between these phases. Therefore, gains achieved during the interventions appeared to have been maintained in all the post-intervention (maintenance) phases.

Examining the overall (omnibus) intervention effects, Mitchell and Zach (who completed the greatest number of sessions, see Table 5) achieved the most consistent improvements across their goals, with large significant omnibus intervention effects. This contrasts with the outcomes for Jason and Liam, both of whom had some significant, and some non-significant intervention effects for their individual goals, resulting in a medium (though still significant) omnibus intervention effect. For all three of Liam's goals, comparisons between baseline and intervention phases alone were not statistically significant, though for vocabulary and sentence completion the effect size was large (Tau-U = 1).

Therapeutic engagement of each participant was variable throughout the intervention, but was usually between 70 and 90 percent. There were some instances where performance on the probes increased in line with increases in engagement, as can be seen in the Figure 1. However, there are also instances where an upward trend in probe performance co-occurred with a downward trend in engagement (see Zach's performance).

The control probe (non-word repetition) was measured between three and five times, in each case except Liam's. Informal analysis of the control probe data showed that general stability was evident (within 2-3 raw score points) across the time points in the intervention, with some slight increases over time, especially in Zach's case.

Secondary outcome measures

Comparisons of pre- and post-assessments for each case indicated improvements in the re-assessed skills (see Table 6). Due to time constraints, Liam did not complete the post-assessments. As each intervention case was unique, different standardized tests were re-administered to capture possible changes in the targeted skills, and thus only informal analyses could be made. In the re-assessment of the formulating sentences subtest, Zach performed somewhat lower than before the intervention, though his performance on this subtest was relatively high to begin with (scaled score of 11). In all other instances, the performance on the re-assessed standardized subtests improved post-intervention. The degree of change differed across cases and measures, though for the measures which had scaled subtest scores, improvements ranged from 3-8 scaled score points (excepting Zach's formulating sentences score mentioned above), which are equivalent to increases between 1 and 2.6 standard deviations. These informal analyses suggest some positive impacts on wider language/literacy skills (see Table 6).

[Insert Table 6 about here]

On the self-rated communication measures, Mitchell and Zach both perceived an improvement in their own communication skills. On the other hand, Jason perceived his communication and executive functioning skills to be poorer post-intervention.

Many of the teacher ratings (see Table 6), indicated an improvement in communication and executive functioning skills post-intervention, including Jason's teacher rating (in contrast to his self-ratings). However, Mitchell's teacher rated his communication skills as improved following the intervention, but his executive functioning as worse. Similarly, both Zach's communication and executive functioning were perceived as worse post-intervention by his teacher.

Data from the independently conducted structured interviews with participants at the end of the intervention are displayed in Table 7. All participants perceived the intervention as useful, and indicated that they believed there was an improvement in their communication skills. The perceived degree of change varied across participants, however, all four were open to further SLT intervention, and none identified any aspects that could be improved.

[Insert Table 7 about here]

Follow-up

For two of the participants, at four weeks post-intervention, a follow-up session was possible, in which two probe collections were conducted (see Figures 2 & 3). Performance on the probes by Mitchell and Zach was generally lower in the follow-up sessions, but still substantially higher than in the baseline phase (except the narrative goal for Zach, which appears to have returned to its pre-intervention level). This provides provisional evidence of maintenance one-month post-intervention for the majority of goals (5 out of 6 measured), in the two cases that could be followed up.

Discussion

These findings make a unique contribution to the youth justice intervention literature. As a rigorous, albeit small-scale SLT intervention study with young people in custody, this research provides pertinent evidence of efficacy (Level of Evidence 3b, Howick *et al.*, 2009), and thus is relevant to stakeholders in research, policy, and service-provision.

Across the four intervention cases, the statistical analyses yielded significant results, with medium-large effect sizes, indicating improvement in the communication skills targeted. Intervention targeting vocabulary skills, in particular, resulted in consistent and sustained improvements across each intervention case. The participants with a longer intervention period (5-8 weeks) made stronger gains (as measured by larger effect sizes) in their language skills, suggesting a possible dose-response relationship, however this finding must be interpreted with caution, as features unique to each case may underlie differing responses. The level of mastery on intervention goals varied across participants, however this variability may be explained by the differing levels of difficulty on the intervention goals and probes that were set for each case.

Clinician ratings of therapeutic engagement were generally high throughout the intervention, and were at times aligned with performance on the probes, though not consistently. This suggests that therapeutic engagement is associated with performance, but that the direction of this relationship is unclear. This is consistent with research into the likely *reciprocal* relationship between engagement and performance: where increasing the engagement of students/clients is key to achievement (Reyes *et al.* 2012), and where it is equally likely that progress made on academic/therapeutic outcomes can drive an increase in engagement (Finn and Zimmer 2012). From the data in this study, it is not possible to determine whether improved performance was driving engagement, the reverse, or both. However, the relationship between achievement and engagement should be more closely investigated in future intervention research in youth justice.

Other supporting evidence that the interventions produced positive effects include relatively stable performance on the control probe, employed to ensure that other contextual/personal factors were not explaining the improvement in language/literacy skills. The control probe was generally stable over the course of the interventions, with a slight increase over time in one particular case (Zach). While this could indicate changes in the participant's contextual factors (e.g. mental health, self-efficacy), it may also be indicative of a training effect for the nonword repetition measure, as the same subtest is re-administered repetitively within a short space of time. However, overall the control probe adds weight to the conclusion that the interventions were effective.

Improvements observed via informal comparisons of standardized pre- and post-measures also provided some support for the notion that there were wider changes to the participants' language performance. However, it should be noted that a limitation of repeating standardized assessments as outcome measures is the risk of learning effects (as retesting occurred earlier than recommended in the assessment manuals), which may have explained this increase in test performance. For all but one measure, an improvement in language/literacy was detected on these standardized assessments.

Self- and teacher-rated improvements in communication support the validity of the intervention effects. In Jason's case, self-rated scores on communication and executive functioning were *worse* post-intervention, even though Jason reported an improvement in his communication skills in the independent structured interview (see below). This disparity is possibly explained by an increase in insight into his difficulties, which meant that the participant's perceptions of his skills were more closely aligned with formal assessments after the intervention. This phenomenon has been observed in interventions for young people in custody previously (Snow and Woodward 2017), as well as for adults with acquired communication disorders (e.g. Ross, Winslow, Marchant and Brumfitt 2006). However,

other explanations such as changes in mental health status, and issues with the reliability of the measure are also possible.

Teacher-rated scores on executive functioning and communication post-intervention were mostly positive. In contrast to the other improvements rated by the participants' teachers, the ratings from Zach's teacher indicated poorer communication skills post-intervention. This is despite the other measures of communication indicating an *improvement* in Zach's skills. It is possible that because Zach was a relatively new member of the class at the commencement of the intervention, his teacher became more aware of his abilities over time and realised the extent of his difficulties by the end of the intervention. This explanation accords with the fact that teachers' ratings of communication skills do not always correlate with structured language assessments. For example, Antoniazzi, Snow and Dickson-Swift (2010) found that teachers' ratings of their students' language skills in the first year of formal schooling were not well aligned with determinations based on formal language assessments. In addition, it is possible that the teacher-rated decline in communication skills was associated with the deterioration of the participant's mental health, which is common over the course of a long period of incarceration (Gonçalves *et al.* 2016). This may have produced poorer social interaction and communication. However, this explanation could not be confirmed.

The positive perceptions collected via the independent structured interview was also supportive of the efficacy of the interventions, with participants noting to different degrees the usefulness of the interventions to them, and the perceived change in their own communication skills. It should be noted, however, that the *lack* of negative participant feedback about the intervention may have (ironically) reflected their difficulties expressing themselves verbally to suggest any improvements.

The statistically and clinically significant results replicate similar findings of Snow and Woodward (2017). We have extended upon the previous research by providing increased

methodological rigour, as the single case design of this study includes experimental components (probe data). Snow and Woodward (2017) reported on six case studies, highlighting improvements in standardized language assessments following one-to-one SLT intervention, as was achieved in this study. Building upon this, statistically significant intervention effects (with medium-large effect sizes) were detected in this study across the multiple goals and cases, providing some evidence of internal and external validity.

The research also extends the work of Gregory and Bryan (2011) who evaluated a train-the-trainer language and communication intervention with youth justice staff, who then worked with 49 non-custodial offenders. The current study further demonstrates the efficacy of SLT intervention for improving the communication skills of young people in custody, tested in a one-to-one service delivery model. To determine whether similar gains would be detected with individuals serving community-based youth justice orders, further research is required.

It is important to note that gains in language/literacy skills following interventions were detected in spite of considerable logistical barriers affecting the consistency of the interventions. Such disruptions within a youth justice facility have been highlighted previously (Snow and Woodward 2017), and will also be detailed in forthcoming work. Disruptions were particularly prominent in the two intervention cases of longer duration, where the session cancellation rate was 50-60%. Given the considerable logistical challenges, the success of the interventions is noteworthy.

Implications

This study addresses the significant gap in knowledge concerning the efficacy of SLT intervention in youth justice. The finding that the interventions were efficacious for improving targeted language/literacy skills, and self-perceptions of communication, provides new evidence for policy-makers and youth justice service providers. These results should inform future service provision of SLT intervention programs with adolescents in these

settings, and should help to build a stronger case for the importance of including SLT services and perspectives in youth justice systems.

Single case design provided a rigorous, yet flexible, framework in which to plan, implement, and evaluate the language interventions. The intervention goals and stimuli for each intervention case were individualized depending on needs and priorities of each participant (as opposed to using a uniform, manualized intervention), as no intervention programs specifically developed for this population were available to be replicated. However, using single case design, the components and structure of each intervention was consistent to allow for evaluation and comparison across cases, while still allowing the flexibility needed regarding intervention goals, intensity, and length of the intervention. Therefore, single case design appears to be of value for the planning, implementation, and evaluation of language interventions, and may be useful for clinicians and researchers working with under-researched and/or vulnerable populations in the future.

Snow, Sanger, Caire, Eadie, and Dinslage (2015) proposed a modified Response to Intervention (RTI) model for use in youth justice settings, advocating research using single case design for one-to-one interventions, as well as quasi-experimental studies with matched groups (experimental and control). Along with additional single case design studies, future *group*-based studies should be considered in order to evaluate the efficacy of SLT intervention further. However, for these group studies, any unpredictability that leads to dropout or inconsistencies in the outcome measurement or intervention delivery would undoubtedly affect the completeness of the data collection. Therefore, the logistical constraints encountered in this setting necessitate considerable effort and "buy-in" from the youth justice provider, to counteract or manage these disruptions in future research.

The current research aligns with the emerging evidence highlighting the prevalence of neurodisability in youth justice, among which DLD is over-represented (Hughes *et al.* 2017). This research demonstrates the benefits of working to identify the markers of

neurodisabilities like DLD, and intervening to reduce their functional impacts. While intervention in custodial youth justice settings is vital in order to meet the needs of young people with DLD, future research should also investigate the benefits of delivering SLT services earlier in the "school-to-prison pipeline", as well as when these individuals transition back into the community. Also important for policy-makers, the provision of SLT assessment and intervention services could be targeted towards adolescents experiencing frequent school suspensions and exclusions, and for young people post-release who would ideally experience a continuity of care.

This research represents an intervention study from an often-overlooked discipline in the youth justice sector. Our results support moves to include SLT services in youth justice systems, and highlight further directions for intervention research. Future investigations could also examine the integration of specialist SLT services with currently available intervention approaches (e.g. Multisystemic Therapy: Asscher, Deković, Manders, van der Laan and Prins 2013). Such research could also explore how such multidisciplinary collaboration could best support young people in contact with the youth justice system. We also argue that further research would bolster efforts to address the overlooking of SLT in discussions of youth justice interventions, and to forge a permanent and pivotal place for this discipline/profession at the youth justice table.

Limitations

In an ideal single case design study, there is consistency in the number and frequency of intervention sessions, making for easy comparison between the cases (Gast and Ledford 2010). However, due to the unpredictability of the setting, there was considerable variability in the number of completed intervention sessions for each goal, and the overall length of the intervention programs between cases.

In addition, single case research studies should be replicated consistently across multiple cases. Despite the significant overlap between the cases, each intervention was its

own self-contained study, with distinct length, intensity, goals, and outcome measures. The common link between the cases was that a speech and language therapist provided explicit intervention to improve language and/or literacy of incarcerated young people. While internal validity could be established through the use of multiple baselines, because each case was individual, the evidence for external validity should be interpreted cautiously (Gast and Ledford 2010). It should also be noted that the sample of intervention participants was small and limited to participants who had at least one-month remaining at the Centre, and to those were willing to participate.

Follow-up was not possible for two of the cases, and for the other two, maintenance was assessed after only one month. Longer follow-up periods need to be built in to future studies. Another limitation was the lack of opportunity for the measurement of procedural fidelity (Ledford and Gast 2014), which should be addressed in later studies with more staff to independently review how well the original research plan was carried out. The impacts of the interventions could only be measured within the youth justice centre. As the custodial setting does not provide opportunities for a full range of communication experiences, we emphasize that further intervention studies (e.g. continued into the community) are needed, in order to investigate how interventions can promote successful prosocial engagement after release from custody. Notwithstanding the experimental components of these single cases, it must be acknowledged that an *n* of 4 is small, in the context of significant heterogeneity in this population. Additional research could thus provide further insights into the potential efficacy of SLT interventions.

Conclusions

In response to high rates of DLD in youth justice populations, this study contributes small-scale but robust evidence that one-to-one SLT intervention is efficacious in improving the language/literacy skills of young people in custody. This is supported by statistically

significant intervention effects, with medium-large effect sizes, obtained for the majority of analyses. The significant and medium-large omnibus effects for all four intervention cases is also supportive of this claim. The findings are also reinforced by the improvements in standardized language subtests and teacher- and participant-rated surveys, as well as the predominantly positive participant self-perceptions. These demonstrated the positive functional impact of the interventions. The intervention effects were also found to be generally maintained for the two cases that could be followed up, one month after the intervention.

SLT intervention appears to be efficacious in improving the communication skills of individuals in youth justice. This study provides additional evidence warranting youth justice services to provide specialist communication intervention to their clients, the majority of whom have some form of speech, language, and communication need, albeit often unrecognized. Future research should investigate the effects of SLT intervention with at-risk adolescents at multiple stages of the so-called "school-to-prison pipeline" (The Civil Rights Project 2000; Wald and Losen 2003), and determine how SLT services could be integrated with multidisciplinary youth justice interventions that seek to divert the trajectories of these young people.

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Tables and Figures

Table 1 Participant Demographics

	Jason	Mitchell	Zach	Liam
Age in Years; Months	18;1	17;6	18;2	13;11
Identified as Aboriginal and Torres Strait Islander (ATSI)	No	No	No	No
Self-Reported Attention Deficit-Hyperactivity Disorder (ADHD)?	Yes	Yes	Yes	Yes
Self-Reported Speech, Language, Communication Needs?	Yes	Yes	Yes	No
Depression	Yes	Yes	Yes	Yes
Anxiety	No	No	Yes	No
Other Self-Reported Conditions	None	Dyslexia	Dyslexia	None
Self-Reported Additional Help with Reading	No	No	Yes	No

Self-Reported Prior Speech and Language Therapy Service	Yes	Yes	No	No
Self-Reported Assistance by Teacher's Aide	No	Yes	Yes	Yes
Self-Reported Years of Education Completed	7	10	9	8
Self-Reported History of School Suspension/Exclusion	Yes	Yes	Yes	Yes
Self-Reported Participation in Alternative Schooling	Yes	Yes	Yes	No
Self-Reported Undertaken Further Training (Area)	Yes (first aid, white card – construction)	Yes (building apprenticeship)	Yes (cookery)	No
Placement in Out of Home Care (OOHC)*	Yes	Yes	Yes	Yes
Type of OOHC Placement (Most Recent)*	Secondary Homelessness ("couch surfing")	DHHS Residential Care	DHHS Residential Care	DHHS Residential Care
Age Removed from Home, years*	13	11	7	11
Most Serious Conviction*†	Aggravated robbery	Serious assault resulting in injury	Serious assault resulting in injury	Dangerous or negligent operation of a vehicle

* Collected with permission from Custodial Staff from client case files

† Classified according to the Australian and New Zealand Standard Offence Classification (ANZSOC, Third Edition, Australian Bureau of Statistics, 2011).

Table 2 Pre-Intervention Assessment Results

	Jason	Mitchell	Zach	Liam
CELF4 Recalling Sentences Scaled	7	4	2	3
CELF4 Formulated Sentences Scaled	7	7	11	2
CELF4 Word Classes Receptive Scaled	9	1	8	3

CELF4 Word Classes Expressive Scaled	8	2	5	4
CELF4 Word Classes Scaled	8	1	6	3
CELF4 Word Definitions Scaled	9	1	5	4
CELF4 Core Language Standard Score	87	57	76	55
Emotion Perception (TASIT-R Test 1)	Within expected range: 22	Within expected range: 25	Below expected range: 21	Well-below expected range: 11
Executive Functioning (Reactive Flexibility: CNT-Total Efficiency)	Executive difficulties unlikely: .472	Executive difficulties unlikely: .355	Executive difficulties unlikely .471	(Could not meet criterion to obtain score)
Executive Functioning (Organizational Strategy: RCFOSS)	Poor organizational strategy: 4	Good organizational strategy: 5	Poor organizational strategy: 4	Poor organizational strategy: 2
Mental Health (DASS21 Total)	10	6	24	11
Depression Symptoms	Normal: 2	Normal: 2	Mild: 12	Normal: 4
Anxiety Symptoms	Mild: 8	Normal: 4	Moderate: 10	Severe: 14
Stress Symptoms	Normal: 10	Normal: 6	Severe: 19	Normal: 4

Note. SD = Standard Deviation;

CELF4: Clinical Evaluation of Language Fundamentals-4th Edition Australian Standardisation (Wiig *et al.* 2006)

CELF4 Subscales: Below Average ≤ 7; CELF 4 Core Language: Average: 86-114, Mild Impairment: 78-85, Moderate Impairment: 71-77; Severe Impairment: ≤ 70;

TASIT-R: The Awareness of Social Inference Test–Revised (McDonald *et al.* 2011)

TASIT-R Test 1: Below expected range ≤ 20.37;

CNT: Contingency Naming Test (Anderson, Anderson, Northam and Taylor 2000); CNT Total Efficiency: Executive difficulties likely: ≤ 0.3;

RCFOSS: Rey Complex Figure Organizational Strategy Score (Anderson, Anderson and Garth 2001);
RCFOSS Score: Poor organizational strategy ≤ 4

DASS21: The Depressions Anxiety and Stress Scale (Lovibond and Lovibond 1995)

DASS21 Depression: Normal 0-9, Mild 10-13, Moderate-Severe ≥14;
DASS21 Anxiety: Normal 0-7; Mild 8-9; Moderate-Severe ≥10;
DASS21 Stress: Normal 0-14, Mild 15-18, Moderate-Severe ≥19;

Table 3 Intervention goals by participant

	Jason	Mitchell	Zach	Liam
Vocabulary	✓	✓	✓	✓
Discourse Skills (Narrative or Expository)		✓	✓	
Syntax (Sentence Structure)			✓	✓
Phonological Awareness		✓		
Spelling	✓			
Reading				✓

Table 4 Completed Cancelled/Rescheduled Sessions by Participant

	Jason		Mitchell		Zach		Liam	
	n	%	*n*	%	*n*	%	*n*	%
Cancellations (Total)	4	19.05	27	54.00	20	52.63	1	10
Completed Sessions (Total)	17	80.95	23	46.00	18	47.37	9	90
Baseline Sessions	7	41.2	4	17.4	5	27.8	2	22.2
Intervention Sessions	8	47.1	14	60.9	9	50.0	5	55.6
Maintenance Sessions	2	11.8	3	13.0	2	11.1	2	22.2
Follow-Up Sessions	-	-	2	8.7	2	11.1	-	-
Length of Intervention (weeks)	2		8		5		1	

Figure 1 Jason Intervention Probe Results (% Correct)

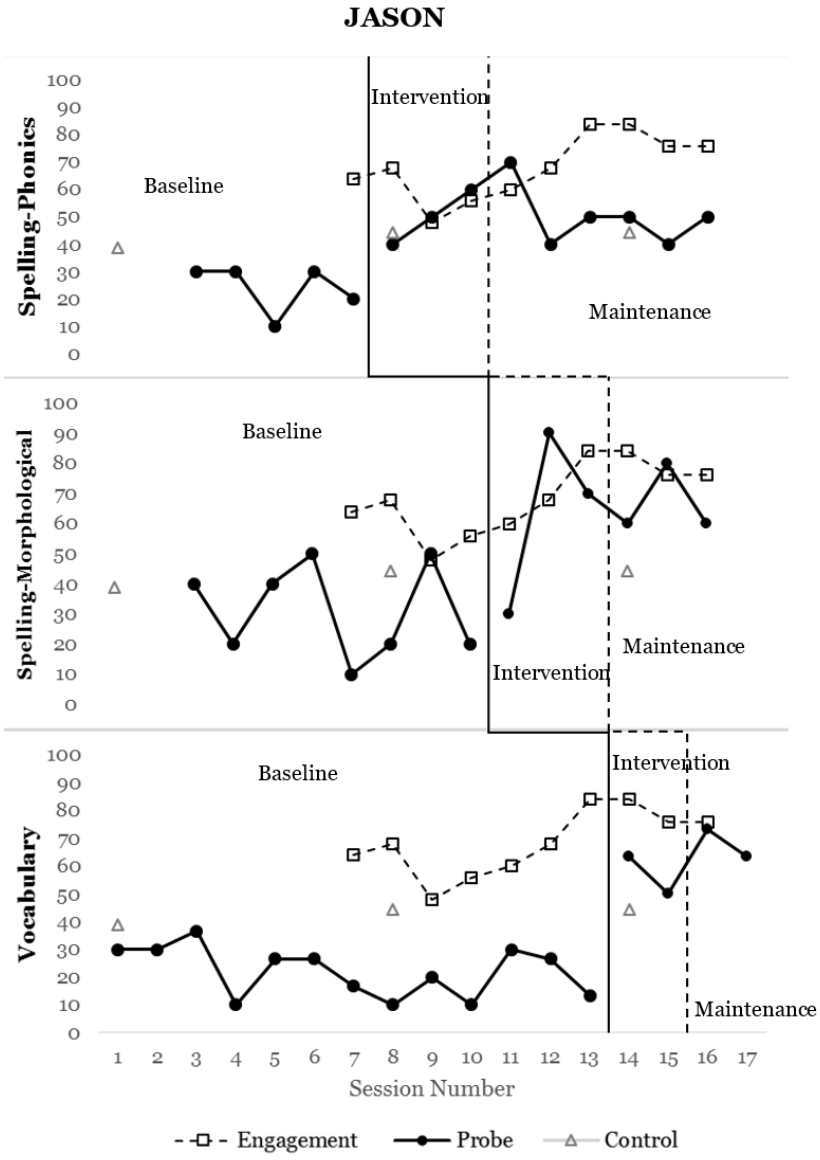

Figure 2 Mitchell Intervention Probe Results (% Correct)

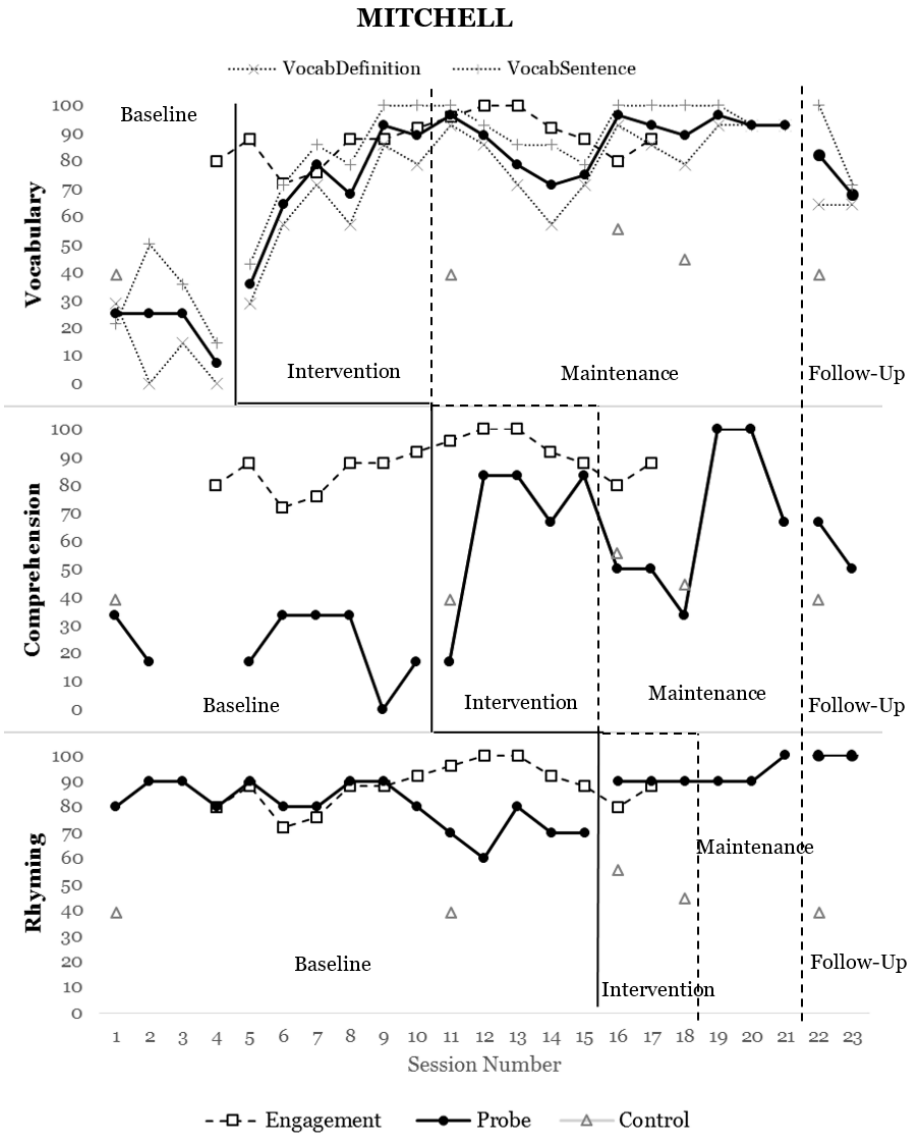

Figure 3 Zach Intervention Probe Results (% Correct)

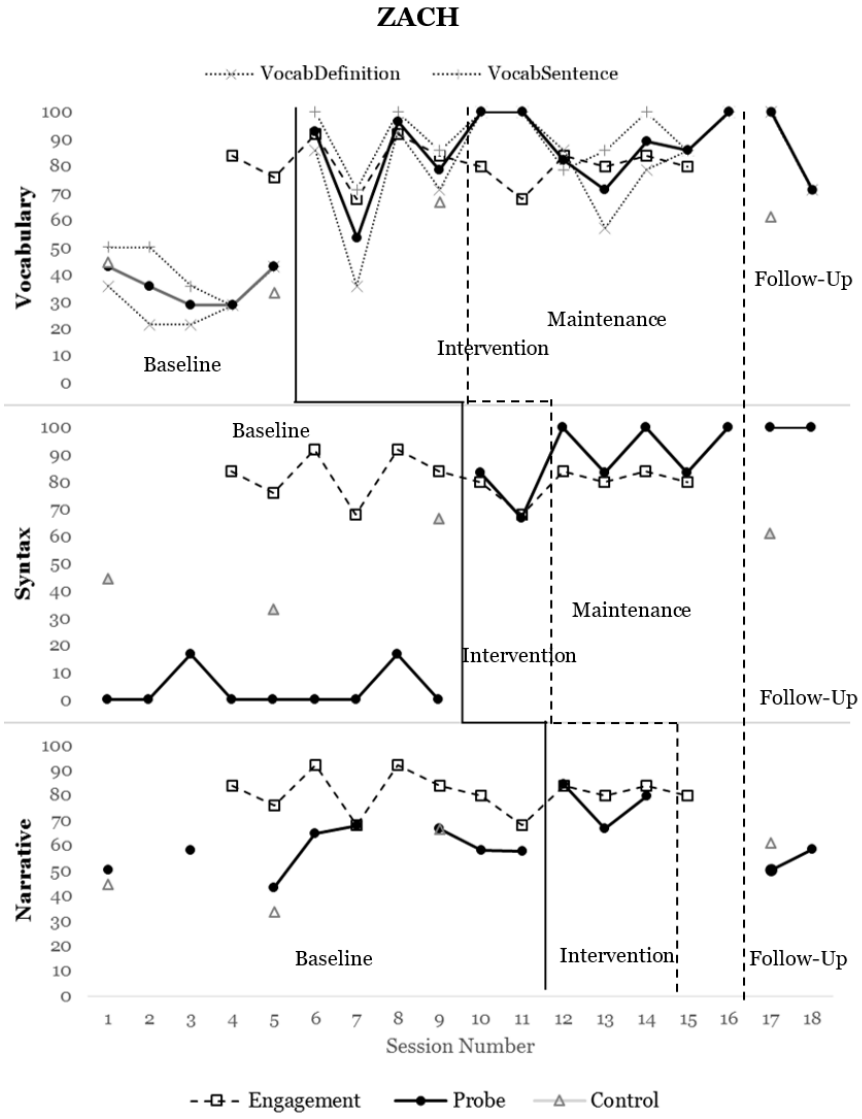

Figure 4 Liam Intervention Probe Results (% Correct)

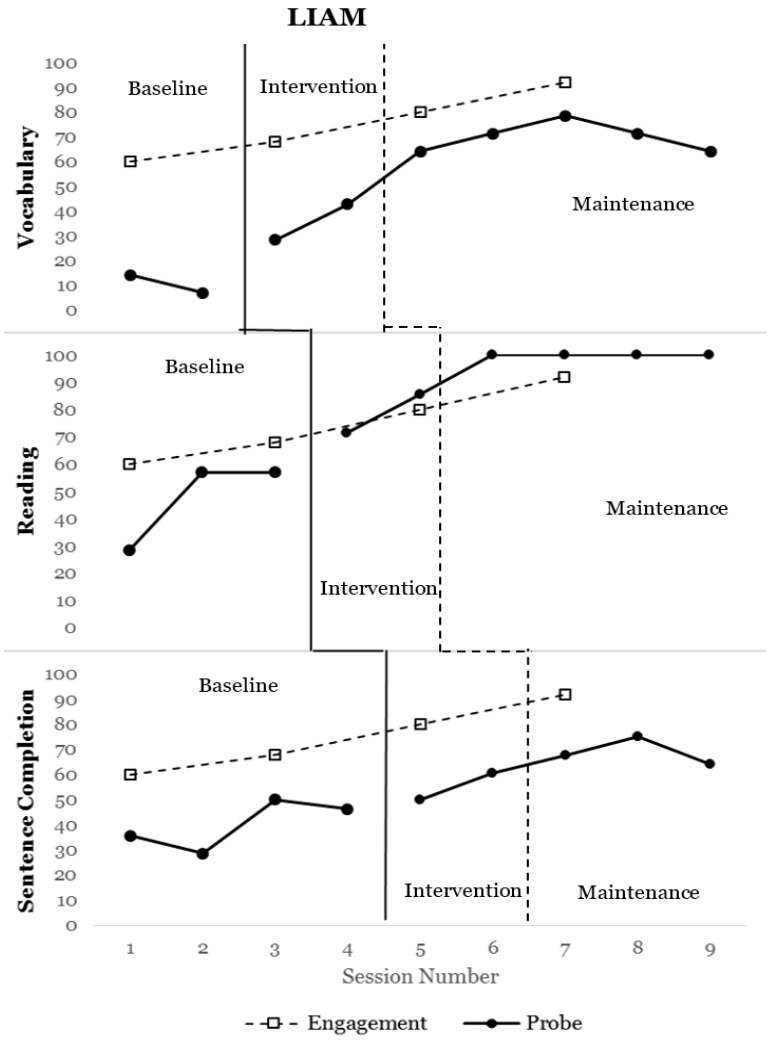

Table 5 Intervention Results – Descriptive statistics and Tau-U effect size analyses

		Jason		Mitchell		Zach		Liam	
		M	SD	M	SD	M	SD	M	SD
		Spelling-Phonics		*Vocabulary*		*Vocabulary*		*Vocabulary*	
Goal 1	Baseline	24	8.94	20.54	8.93	35.71	7.14	10.71	5.05
	Intervention	50	10.00	71.43	20.82	80.36	19.45	35.71	10.10
	Maintenance	50	10.95	88.31	9.05	89.80	10.99	70.00	5.98
	Intervention-Maintenance (Combined)	50	10.00	82.35	16.00	86.36	14.45	60.20	17.91

		Spelling-Morphology		*Comprehension*		*Syntax*		*Reading*	
Goal 2	Baseline	31.25	15.53	22.92	12.40	3.70	7.35	47.62	16.50
	Intervention	63.33	30.55	66.67	28.87	75.00	11.79	78.57	10.10
	Maintenance	66.67	11.55	66.67	27.89	93.33	9.13	100.00	0
	Intervention-Maintenance (Combined)	65	20.74	66.67	26.87	88.10	12.60	92.86	11.95
		Vocabulary		*Rhyming*		*Narrative*		*Syntax*	
Goal 3	Baseline	21.79	9.59	80.00	9.26	58.25	8.46	40.18	9.83
	Intervention	56.67	9.43	90.00	0	76.88	9.15	55.36	7.58
	Maintenance	70	9.43	93.33	5.77	N/A	N/A	69.05	5.46
	Intervention-Maintenance (Combined)	63.33	10.89	91.67	4.08	76.88	9.15	63.57	9.24
		Tau-U	p	Tau-U	p	Tau-U	p	Tau-U	p
Goal 1	Baseline vs. Intervention	1	**.025**	1	**.0105**	1	**.0143**	1	.121
	Baseline vs. Intervention-Maintenance	1	**.003**	1	**.0023**	1	**.0018**	1	**.040**
Goal 2	Baseline vs. Intervention	.667	.1025	.650	.057	1	**.0339**	.667	.248
	Baseline vs. Intervention-Maintenance	.833	**.0098**	.841	**.0022**	1	**.0009**	.889	**.039**
Goal 3	Baseline vs. Intervention	1	**.027**	1.667	**<.0001**	.875	**.0321**	.876	.105
	Baseline vs. Intervention-Maintenance	1	**.003**	1.222	**<.0001**	N/A	N/A	.95	**.020**
Overall	Baseline vs. Intervention	.874	**.0005**	1.078	**<.0001**	.9545	**.0001**	.8382	**.0128**
	Baseline vs. Intervention-Maintenance	.941	**<.0001**	1.018	**<.0001**	1	**<.0001**	.9423	**.0002**

Note. M = Mean; SD = Standard Deviation; All scores are reported as % correct; Tau U Effect size: 0 – .65 small, .66 –.92 medium, >.92 large. Statistically significant effects are in bold.

Table 6 Pre- and Post-Intervention Testing Results, including Self- and Teacher-Ratings

	Jason				**Mitchell**				**Zach**				**Liam**		
Measure	Pre	Post	Change		Pre	Post	Change		Pre	Post	Change		Pre	Post	Change
Communication Self-Rating (LCQ Total-**Self**)*	63	65	↓		65	52	↑		60	52	↑		-	-	-
Communication Rating-**Teacher-Rating** (LCQ Total-Other)*	67	59	↑		48	33	↑		61	78	↓		75	-	-
Executive Functioning Self-Rating (DEX Total-Self)*	30	32	↓		42	25	↑		38	33	↑		-	-	-
Executive Functioning Rating-**Teacher-Rating** (DEX Total-Other)*	41	38	↑		15	24	↓		41	63	↓		48	-	-
WJ-III Spelling of Sounds, Raw/Total (Age Equivalent)	33/45 (10;2)	36/45 (12;10)	↑		-	-	-		-	-	-		-	-	-
CELF4 Formulating Sentences	-	-	-		-	-	-		Raw: 53/56; Scaled: 11	Raw: 50/56 Scaled: 9	↓		-	-	-
CELF4 Word Definitions	-	-	-		-	-	-		Raw: 18/48; Scaled: 5	Raw: 26/48 Scaled: 8	↑		-	-	-
CELF4 Understanding Spoken Sentences Subtest	-	-	-		Raw: 4/15 Scaled: 2	Raw: 12/15 Scaled: 10	↑		Raw: 10/15 Scaled: 8	Raw: 14/15 Scaled: 13	↑		-	-	-
PAT-2 - Rhyming Subtest, Raw Score; A: Discrimination; B: Production	-	-	-		A: 8/10; B: 4/10	A: 10/10; B: 10/10	↑		-	-	-		-	-	-

Note. *Higher scores on the LCQ and DEX indicate more frequent difficulties; ↑ = Improvement; ↓ = Decline;

LCQ: La Trobe Communication Questionnaire (Douglas *et al.* 2000); LCQ Total-Self: Impairment ≥54; LCQ Total-Other: Impairment ≥45;

DEX: Dysexecutive Questionnaire (Burgess *et al.* 1996); DEX: No norms available

WJ-III: Woodcock-Johnson Third Edition (Woodcock *et al.* 2001);

CELF4: Clinical Evaluation of Language Fundamentals-4th Edition Australian Standardisation Core Language Score: Average: 86-114, Mild Impairment: 78-85, Moderate Impairment: 71-77; Severe Impairment: ≤ 70;

PAT-2: Phonological Awareness Test-2nd Edition (Robertson & Salter 2007);

CELF4 & PAT-2 Subtest Scaled Scores: Below Average ≤ 7

Table 7 Structured interview results

	Jason	**Mitchell**	**Zach**	**Liam**
Perceived as useful?	Yes	Yes	Yes	Yes
How useful (/10)	6	7	5	10
Self-perceived improvement in communication?	Yes	Yes	Yes	Yes
Degree of self-perceived communication improvement (/10)	5	8	5	10
Most helpful part of intervention?	Spelling. Working on different sounds to help spelling	The bigger words I can speak	Improving my communication	Everything
What could be improved?	Nil	F*** knows [nothing]	I can't think of anything	Nothing
Participant would be open to further intervention?	Yes	Yes	Yes	Yes