



Effectiveness of DAS Speech-Language Therapy: A controlled evaluation

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Abstract

Background: School-age children enrolled in the DAS speech-language therapy programme are often diagnosed with both dyslexia and language disorder. The current study shows the positive impact of language therapy on these children as it is practised by speech-language therapists (SLTs) at DAS.

Methods: The study involved 23 children in mainstream education aged 5 to 12 who were diagnosed with dyslexia and subsequently with mild-severe language disorder at the start of the study. A small-scale quasi-experimental design with a control group was used without random assignment of participants to either an intervention condition (n=11), or a control condition (n=12). The intervention group underwent language therapy directly delivered by DAS SLTs in a group setting (1 SLT : 2-3 children) once a week, an hour per session, for at least a term (i.e. ≥ 8 sessions). Participants in the control group matched those in the intervention group overall on age and level of severity but did not receive any speech-language therapy for the duration of the study. All participants in both groups received the same level of literacy support from educational therapists in the curriculum-based DAS Main Literacy Programme (MLP) whilst the study was on-going.

Results: Participants in the intervention group showed performance improvements compared to those in the control group in the primary outcome measures of different language skills as measured by the core language subtests of CELF®-4^{UK}, a standardised assessment tool used to assess the presence of a language disorder or delay in children aged 5-21. Statistically significant improvements were found in both the raw and scaled scores of the Formulated Sentences subtest. In addition, positive effect sizes ranging from small to large were observed for other subtests.

Conclusions: The current small scale controlled intervention study targeting the range of subskills addressed by CELF®-4^{UK} identified the significant impact of the approach adopted by SLTs at DAS, with strong effect sizes. The findings support the use of small-group intervention as effective for children with a range of severity in language disorders.

Keywords: speech-language therapy, SLT, DAS, language disorder, group therapy, language intervention

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INTRODUCTION

Language disorder is generally accepted as being neurobiological in origin (e.g. Krishnan, Watkins, & Bishop, 2016; Mayes, Reilly, & Morgan, 2015). Individuals diagnosed with a language disorder show language skills that are not commensurate with same-age peers, in the absence of cognitive deficits, neurological damage, sensory impairments, emotional disorders and/or environmental deprivation. Deficits associated with a language disorder include difficulties acquiring, understanding and using aspects of language pertaining to phonology, semantics, syntax, and morphology. Researchers and clinicians typically further categorise language disorders as either affecting the receptive or expressive modality, or both (e.g. mixed receptive and expressive language disorder). A receptive language disorder relates to a difficulty understanding what others say. An expressive language disorder involves a difficulty in communicating thoughts, ideas and feelings to others. Individuals with a language disorder exhibit great heterogeneity with respect to the deficits presented, modality affected, and severity. A diagnosis of language disorder in the preschool and school years has been variously termed as Primary Language Impairment (PLI), Specific Language Impairment (SLI), and recently, Developmental Language Disorder (DLD) (Bishop, 2017; Bishop, Snowling, Thompson & Greenhalgh, 2017; Bishop, 2014; Reilly et al., 2014).

The consequences of a language disorder that is developmental in nature are well documented. Individuals with a developmental language disorder struggle with academic achievement in the school years, lag their typically developing peers in coping with the increased language demands in school, and face considerable issues with literacy development (Dockrell & Lindsay, 2004; Snowling, Bishop, & Stothard, 2000) as well as difficulties with other academic skills such as mathematical skills (Beitchman et al., 1996). In addition, there is evidence that difficulties extend beyond the academic to the social domain in the school years, with affected individuals subjected to issues related to bullying and formation of peer relationships (Conti-Ramsden & Botting, 2004), with consequences that persist into adulthood (Law, Rush, Schoon, & Parsons, 2009; Tomblin, Freese & Records, 1992).

Dyslexia is a learning disorder that is also neurobiological in origin. Primary deficits associated with dyslexia include difficulties in accuracy and/or fluency in reading and spelling, in the absence of cognitive and sensory impairments (Lyon, Shaywitz, & Shaywitz, 2003). There is evidence that dyslexia and language disorder are closely related, although the exact nature of the relationship is still currently debated (Catts, Adlof, Hogan, & Weismer, 2005; Bishop and Snowling, 2004; McArthur, Hogben, Edwards, Heath, & Mengler, 2000). Individuals who are diagnosed with both dyslexia and a language disorder face daunting challenges in school exceeding that brought about by either diagnosis alone. Consequently, the provision of services to support these affected school-age individuals is paramount.

At the Dyslexia Association of Singapore (DAS), literacy support is provided by trained educational therapists through the Main Literacy Programme (MLP), a curriculum-based programme that primarily targets key essential learning components that are recommended for an effective literacy intervention, including language and vocabulary, phonemic awareness, phonics, morphology, reading fluency, comprehension, and writing, with emphasis on the written language and literacy and based on Orton-Gillingham principles. Therapy addressing language issues is provided by qualified speech-language therapists (SLTs) registered with the Allied Health Professions Council (AHPC) of Singapore. Language therapy is carried out following a skills-based intervention model in which therapy is determined by an individual's unique needs, whereby core deficits are addressed through a diagnostic / prescriptive approach based on clinical reasoning and remediation is provided at the level of hypothesised breakdown, independent of a curriculum, using language intervention principles, protocols, methods, strategies and techniques that have demonstrated efficacy to address the hypothesised breakdown. In contrast to the educational therapists at DAS, DAS SLTs focus almost exclusively on addressing issues in oral or spoken language in both the receptive and expressive modalities, and may include working on auditory attention, discrimination and memory. Phonological awareness difficulties may also be addressed since such difficulties are often experienced by individuals with a language disorder (e.g., Gillon, 2000). Language therapy is administered directly by DAS SLTs in group settings with groups not exceeding three children, at a frequency of one hour once a week.

LITERATURE REVIEW

In line with evidence-based practice, the language intervention practices typically adopted by the DAS SLTs in addressing the specific language deficits of children on their caseload are those that have been demonstrated to be beneficial. For example, DAS SLTs help children with word retrieval difficulties, a common issue associated with a language disorder, by helping them identify the semantic and phonological features of new vocabulary, a practice supported by the majority of published studies (Bragard, Schelstraete, Snyers, & James, 2012; Ebbels et al., 2012; German, 2002; Hyde Wright, Gorrie, Haynes & Shipman, 1993; Wing, 1990).

Similarly, DAS SLTs adopt various approaches that have been found to be useful in facilitating the development of syntax for children who struggle with syntax due to issues in understanding argument structure. This includes, but is not limited to, the use of Colourful Semantics (Bolderson, Dosanjh, Milligan, Pring & Chiat, 2011; Guendouzi, 2003; Spooner, 2002; Bryan, 1997) which is a meta-linguistic approach to help children develop awareness of acceptable word order and use accurate syntax in the creation of various sentence types through the use of colour coding of different thematic roles in sentences.

Furthermore, DAS SLTs align their clinical practice to incorporate procedures like imitation, modelling, or modelling plus evoked production strategies which have been shown to produce moderately large to large effects (Weismer & Murray-Branch, 1989) in helping children who have difficulties with syntax.

In contrast, there is a lack of research that evaluates whether group language therapy is as effective as individual therapy for school-age individuals diagnosed with both a language disorder and dyslexia. Much of the existing research on effectiveness of language therapy involved comparisons of individual versus group therapy for children with only a language delay or disorder. Intervention studies involving preschool children show no difference in outcomes for expressive vocabulary (Wilcox, 1991) for children aged between 1 and 4, and greater gains in expressive language but no difference in outcomes for receptive language (Barratt, 1992) when comparing intensive individual therapy to once-weekly sessions of group therapy over a 6-month period. For older children, group-based approaches have been suggested to be effective when teaching word-finding strategies to severely language impaired children (Hyde Wright, 1993), and sentence structure to children with primary delay using meta-linguistic training (Hirschman, 2000).

A more recent randomised controlled trial designed to compare outcomes resulting from various service delivery choices involving 161 school-age children (aged between 6 and 11 years) with persistent primary receptive and/or expressive language impairment found no significant post-intervention differences between individual and group modes of therapy on any of the primary outcome measures of standardised scores on tests of expressive and receptive language (Boyle, McCartney, Forbes, & O'Hare, 2007). While the results of these studies demonstrate the effectiveness of group therapy in language intervention, the scope of the studies is limited to children with a language disorder.

Research on the role of intensity of therapy in contributing to the efficacy of therapy targeted at helping school-age individuals diagnosed with both a language disorder and dyslexia is also lacking. Studies, mostly on preschool children, have found participants with primary language impairment making significant gains in treatment outcomes when treatment was intensive (e.g. three sessions per week) (e.g. Boyle et al., 1995). Nonetheless, no study exists that systematically compares the effects arising from differences in dosage to support the effectiveness of the current practice of administering an hour of language intervention per week for children diagnosed with a language disorder and dyslexia.

For these reasons, there is a pressing need to evaluate the efficacy of the DAS speech-language therapy programme that addresses language issues which is administered to school-age children to address language issues across the various linguistic domains (as opposed to a single domain like semantics) in a group setting at the intensity of an hour a week. The current small-scale study presents the first controlled evaluation that

lays the groundwork for further evaluative studies that provide a more balanced review of the effectiveness of speech-language therapy at DAS to inform clinical practice and service delivery in future, compared to the sole use of qualitative data (e.g. case studies) in the annual evaluation reports to evaluate effectiveness with respect to language intervention.

Specifically, this investigation would test the hypothesis that participants who had undergone speech-language therapy for language issues at DAS for at least a term show an improvement in their language skills when assessed using subtests from a standardised language assessment, compared to participants on a waiting list who have not received this support over the same period.

METHOD

Participants

All participants had been diagnosed with dyslexia prior and were simultaneously enrolled in the DAS Main Literacy Programme (MLP) as the primary intent of DAS SLT programme was to support these children in their language development. In addition, all participants had been identified from various referral sources after being assessed either by DAS psychologists, psychologists in private practice, paediatricians based in children's hospitals (e.g. KKWCH), and/or speech-language therapists based within or without DAS as needing more focussed speech-language therapy support and having potential language issues.

For participants in the intervention group, an additional criterion was involved, in that they had to be scheduled to commence language therapy at the beginning of the intervention period, or had only started language therapy immediately prior.

In contrast, participants in the control group were selected from the waitlist of children to be enrolled in the DAS Speech-Language Therapy programme. Due to staffing constraints, they were not foreseen to be scheduled for language therapy during the entire period of study. As much as possible, participants in the control group were selected to match the intervention group overall on age and level of severity.

Participants who met the criteria for each group were selected through opportunistic sampling from the various DAS Learning Centres which provided speech-language therapy intervention. A total of 23 participants were recruited, with a mean average age of 9;9 (SD = 1;6), comprising 17 males and 6 females.

A detailed breakdown of the number of participants in each group across the two age levels of 5-8 years old and 9-12 year old is shown in Table 1. It can be seen that the younger group of participants were well matched for age, whereas the older intervention

group were more than 1 year older than the controls. Typically, there are more children in the older age group presenting for support. The imbalance in the age groups arose because older children in the 9 – 12 year old group who were in need of speech-language therapy were seen as the priority for support.

Table 1: Breakdown of number of participants, average age and gender across the different age levels for both control and intervention groups

Gender	Control Group (n = 11)		Intervention Group (n = 12)	
	5 – 8yo Age Level (n = 4)	9 – 12yo Age Level (n = 7)	5 – 8yo Age Level (n = 3)	9 – 12yo Age Level (n = 9)
	Avg age (@t): 8;1	Avg age (@t): 9;7	Avg age (@t): 8;1	Avg age (@t): 11;2
Male(s):	3	6	1	7
Female(s):	1	1	2	2

Design

A small-scale quasi-experimental design with a control group without random assignment of participants to conditions (i.e., an intervention condition and a control condition) was used for the study.

Participants in the intervention group received speech-language therapy conducted by in-house DAS speech-language therapists, on top of literacy support provided by DAS educational therapists, throughout the duration of the study. The duration of speech-language therapy ranged between 8 to 20 weeks, at a frequency of 1 hour of therapy per week. The variance in duration of therapy was due to staffing constraints.

Participants in the control group received the same level of literacy support from educational therapists in the curriculum-based DAS Main Literacy Programme (MLP) as the intervention group. However, as mentioned earlier, they did not receive any speech-language therapy during the entire period of study due to staffing constraints.

The overall procedure involved in the study is illustrated below:

Group	Commencement of study (pre-test, t_0)	Intervention period	Conclusion of study (post-test, t_1)
Control	<ul style="list-style-type: none"> ◆ All participants were assessed on CELF®-4^{UK} 	<ul style="list-style-type: none"> ◆ All participants <u>did not</u> receive speech-language therapy in small groups ◆ All participants received literacy support from DAS educational therapists in the curriculum-based MLP 	<ul style="list-style-type: none"> ◆ All participants were assessed on CELF®-4^{UK}
Intervention	<ul style="list-style-type: none"> ◆ All participants were assessed on CELF®-4^{UK} 	<ul style="list-style-type: none"> ◆ All participants received speech-language therapy in small groups ◆ All participants received literacy support from DAS educational therapists in the curriculum-based MLP 	<ul style="list-style-type: none"> ◆ All participants were assessed on CELF®-4^{UK}

All participants from both the intervention and control groups were assessed at the commencement (t_0) and conclusion (t_1) of the study using the core language subtests of The Clinical Evaluation of Language Fundamentals®-Fourth Edition UK Edition (CELF®-4^{UK}).

Assessment measures

The primary outcome measure was a standardised test of language ability. The Clinical Evaluation of Language Fundamentals - Fourth Edition UK (CELF®-4^{UK}) assessment tool was selected to assess the language skills of participants. CELF®-4^{UK} is an individually administered standardised language assessment that is widely used as a diagnostic tool to determine if a student (ages 5 through 21 years) has a language disorder, with

Age level	Core Subtests	Description
5 - 8 y o	Word Structure	<p>Evaluates the ability to (a) apply word structure rules (morphology) to mark inflections, derivations, and comparison; and (b) select and use appropriate pronouns to refer to people, objects and possessive relationships.</p> <p>The participant completes an orally presented sentence that pertains to an illustration.</p>
	Concepts and Following Directions	<p>Evaluates the ability to (a) interpret spoken directions of increasing length and complexity, containing concepts that require logical operations; (b) remember the names, characteristics, and order of mention of objects; and (c) identify from among several choices the pictured objects that were mentioned.</p> <p>The participant identifies objects in response to oral directions.</p>
9 - 12 y o	Recalling Sentences	<p>Evaluates the ability to (a) listen to spoken sentences of increasing length and complexity, and (b) repeat the sentences without changing word meanings, inflections, derivations or comparisons (morphology), or sentence structure (syntax).</p> <p>The participant imitates sentences presented by the examiner.</p>
	Formulated Sentences	<p>Evaluates the ability to formulate complete, semantically and grammatically correct spoken sentences of increasing length and complexity (i.e. simple, compound, and complex sentences), using given words (e.g. car, if, because) and contextual constraints imposed by illustrations.</p> <p>The participant is asked to formulate a sentence, using target words or phrases, while using an illustration as a reference.</p>
	Word Classes 2 - Total	<p>Evaluates the ability to understand and explain logical relationships in the meanings of associated words.</p> <p>The participant selects two words among 3-4 words that go together and explains their relationship.</p>

established reliability and validity in the areas of test content, response processes, internal structure, relationships with other variables, and consequences of testing (Semel, Wiig, & Secord, 2006).

For the purpose of this study, only the core language subtests of CELF®-4^{UK} which comprise of the four most discriminating subtests for each age level were used. Performance in these core language subtests, when combined together, provides an overall measure of a student's language ability, with a high degree of reliability (average reliability coefficient: $r_{xx} \geq .90$) (Semel, Wiig, & Secord, 2006). The core language subtests for each age level, and a brief description of what was tested as indicated in the CELF®-4^{UK} manual, are listed on the previous page.

At commencement (t_0), the presence of a language disorder was indicated in all participants in both the control and intervention groups, based on their pre-test scores on the CELF-4^{UK} Core Language Subtests. The severity of the language disorder varied from mild (within -1 to -1.5 SD) to moderate (within -1.5 SD to -2 SD) to severe (-2 SD and below). An overwhelming majority of participants - 7/11 (63.6%) in the control group and 11/12 (91.7%) in the intervention group - were classified as having a severe language disorder. A detailed breakdown of the severity of the language disorder across the different age levels for both control and intervention groups at commencement of the study (t_0) is shown in Table 2.

Table 2: Breakdown of participants and the severity of their language disorder as indicated by CELF-4^{UK} Core Language score across the different age levels for both control and intervention groups at commencement of the study (t_0)

Severity (at commencement of study, t_0)	Control Group (n = 11)		Intervention Group (n = 12)	
	5 – 8yo Age Level (n = 4)	9 – 12yo Age Level (n = 7)	5 – 8yo Age Level (n = 3)	9 – 12yo Age Level (n = 9)
Mild: (within -1 and -1.5 SD)	-	-	-	1
Moderate: (within -1.5 SD to -2 SD)	2	2	-	-
Severe: (-2 SD and below)	2	5	3	8

The number of language therapy sessions attended by participants in the intervention group varied considerably, with an average of 12.09 hours of speech-language therapy sessions (SD= 3.56; Range: 8-20). A detailed breakdown of the number of hours of speech-language therapy attended across the two age levels of 5-8 years old and 9-12 year old is shown in Table 3.

Table 3: Breakdown of the number of hours of speech-language therapy attended by participants in the intervention group across the different age levels

Intervention Group (n = 12)			
5 – 8yo Age Level (n = 3)		9 – 12yo Age Level (n = 9)	
Average number of SLT attended (hrs) = 11.00		Average number of sessions (hrs) = 12.56	
SD:	3	SD:	4.1
Range:	8 – 14	Range:	9 – 20

Intervention

Therapy followed a skills-based intervention model in which intervention was determined by a student's individual needs, whereby core language deficits were addressed through a diagnostic / prescriptive approach based on clinical reasoning and remediation was provided at the level of hypothesised breakdown, independent of any curriculum. Intervention sessions were conducted in small groups (2-3 children per group) and targeted the development of children's receptive and expressive language, in terms of syntax, morphology, semantics, as well as auditory attention, discrimination and memory. Phonological awareness activities were also included within the scope of therapy if required. Since participants in the intervention group presented with unique therapy needs due to differing severity levels and/or varied hypothesised underlying causes for their language deficit(s), the focus of therapy conducted for each participant in the intervention group was determined by the SLT responsible for the participant based on his or her clinical reasoning.

All four SLTs involved in the study were experienced speech-language therapists who were registered with full registration with the Allied Health Professions Council (AHPC) throughout the period of study. The AHPC is "a professional board under the Ministry of Health which governs and regulates the professional conduct and ethics of registered

allied health professionals, in accordance to the Allied Health Professions (AHP) Act 2011" (Allied Health Professions Council, n.d., para. 1).

Ethical permission was granted by the DAS Research Committee. Informed parental consent was obtained for each participant, and all participants were informed that they could withdraw from the study at any time.

RESULTS

The primary interest of the study was to investigate whether participants who have undergone language therapy at DAS for at least a term (i.e. ≥ 8 sessions) show an improvement in their overall language skills when assessed using subtests from the standardised language assessment compared to participants who have not done so during the same period. The results obtained by the intervention and control groups at commencement (t_1) and completion (t_2) are summarised in Table 4 below. The data for both age groups was collapsed for the majority of the subtests where possible, and analysis undertaken. A t -test was undertaken to check for differences between the intervention and control group. Effect sizes are also presented, based on Cohen (1988), because the small group sizes meant that the impact of the support was unlikely to reach significance. Effect sizes therefore can provide a more meaningful statistic to measure the improvements made by participants in this study.

Comparisons of the pre- and post-test results for intervention and control groups for the CELF®-4^{uk} subtest that is significantly improved are represented visually in the following figures:

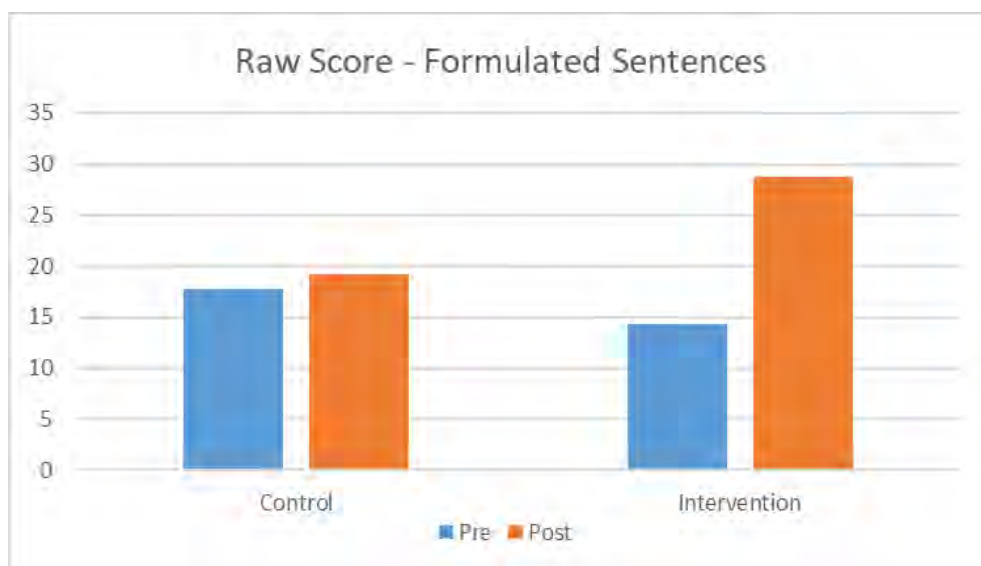


Figure 1. Raw Scores - Formulated Sentences (Pre- and Post-)

Table 4: Mean data raw scores for pre- (*t*) and post- (*t*) assessments with standard deviation in parentheses, with effect sizes and significance

CELF®-4 ^{UK} Subtest	Control Group (pre-)	Control Group (post-)	Diff.	Intervention Group (pre-)	Intervention Group (post-)	Diff.	Effect size	Significance
Concepts and Following Directions [Raw]	33.09 (9.26)	35.82 (9.46)	2.73 (2.65)	36.75 (9.43)	44.08 (6.39)	7.33 (7.81)	1.74	p=0.08
Concepts and Following Directions [Scaled]	4.54 (3.5)	5.36 (3.47)	0.82 (1.20)	4.6 (1.78)	6.8 (3.61)	2.2 (3.91)	0.5	NS
Word structure* [Raw]	18.75 (2.22)	18.75 (1.89)	0.00 (1.41)	11.33 (2.52)	19.67 (3.21)	8.33 (3.21)	2.00	N/A (4 and 3 per group)
Recalling Sentences [Raw]	29.27 (9.73)	30.64 (9.34)	1.36 (2.25)	28.08 (11.55)	34.67 (10.42)	6.58 (5.30)	1.38	P=0.07
Formulated Sentences [Raw]	17.73 (9.32)	19.18 (8.89)	1.45 (3.67)	14.33 (9.81)	28.83 (11.25)	14.50 (8.48)	2.15	p=0.0002** *
Formulated Sentences [Scaled]	2.18 (1.99)	2.00 (1.55)	-0.18 (1.47)	1.58 (1.73)	3.58 (3.18)	2.00 (1.21)	1.21	P=0.01**
Word Classes - Receptive [Raw]	5.86 (1.77)	7.00 (1.29)	1.14 (1.46)	7.00 (2.27)	8.50 (1.85)	1.50 (1.51)	0.24	NS
Word Classes - Expressive [Raw]	2.86 (1.46)	3.00 (1.41)	0.14 (0.69)	3.78 (1.64)	4.89 (1.45)	1.11 (1.40)	1.4	P=0.07
Word Classes 2 - Total* [Scaled]	4.3	5	-	4.6	5.1	-	NS	NS

* Data is available for both 5 – 8yo and 9 – 21yo Age Levels for all subtests except Word Structure (which applies only to the 5 – 8yo Age Level) and Word Classes 2 – Total (a combination of Word Classes 2 – Receptive and – Expressive Subtests, which applies only to the 9 – 12yo Age Level).
** / *** - statistically significant

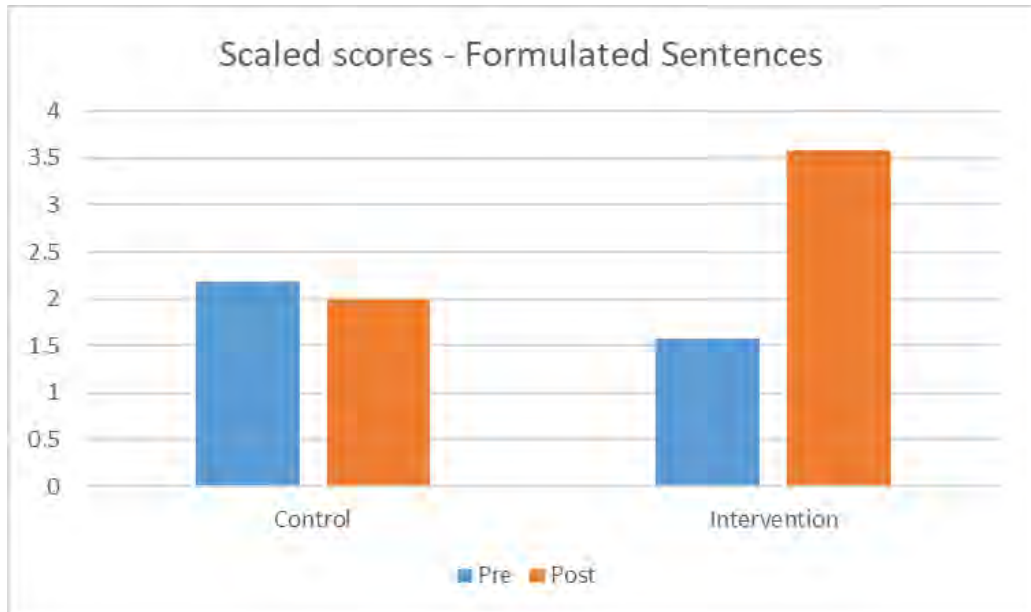


Figure 2. Scaled Scores – Formulated Sentences

DISCUSSION

This study investigated the effectiveness of the existing DAS speech-language therapy approach which adheres to a skills-based intervention framework in which language intervention is determined by a student's individual needs. Core deficits in a student's receptive and expressive language, in terms of syntax, morphology, semantics, auditory discrimination and memory, or phonological awareness are addressed through a diagnostic / prescriptive approach based on clinical reasoning and remediation is provided at the level of hypothesised breakdown, independent of any curriculum. Consequently, within the boundaries of sound clinical reasoning and evidence-based practice (EBP), DAS speech-language therapists have the flexibility to determine and implement specific therapy techniques, strategies or protocols deemed most appropriate in addressing a student's individual needs at the point of intervention when planning and implementing therapy, rather than applying a structured, pre-determined intervention protocol for each area of language difficulty. Such evidence-based practice is premised on the American Speech and Hearing Association's (ASHA) guidelines on EBP (ASHA, n.d.) and involves the integration of not just external scientific evidence and client/patient/caregiver perspectives, but also clinical expertise and expert opinion. Another feature of current DAS speech-language practice is that therapy is typically delivered in small groups (2-3 children per group) at a frequency of an hour per week.

All scores for the intervention group were enhanced in comparison with the control group. Participants in the intervention group made statistically significant improvements in results in one subtest of the standardised assessment (the Formulated Sentences subtest), which showed significant improvement in scaled scores (raw scores: $p = 0.0002$; scaled scores: $p = 0.01$). Scaled scores are the most difficult measure to improve, because they are adjusted for age. There was a trend towards significance on the following tests: Concepts and Following Directions; Recalling Sentences and Word Classes 2-Receptive.

Groups were well matched at pre-test, with no significant differences. Effect sizes were calculated, which allows for a comparison between different subtests that are scored on different criteria, and shows impact where statistical significance is not reached. The most conservative method was adopted where intervention and control standard deviation varied, using the average standard deviation of the 2 groups. A positive effect size (Cohen, 1988) was identified, with $d=0.2$ representing a 'small' effect size, 0.5 representing a 'moderate' effect size and 0.8 representing a 'large' effect size. It may be seen that the effect sizes for Concepts and Following Directions, Formulated Sentences, Word Structure, Recalling Sentences and Word Classes 2-Expressive were particularly strong.

Many studies on the efficacy of intervention that target several language areas, or a specific area, have reported significant gains using outcome measures other than standardised tests (e.g. Ebbels, Maric, Murphy, & Turner, 2014; Ebbels et al., 2012; Parsons, Law, & Gascoigne, 2005; Hayward & Schneider, 2000; Throneburg, Calvert, Sturm, Paramboulas, & Paul, 2000). In contrast, the majority of those that do use standardised tests as outcome measures fail to show significant effects of intervention (Boyle, McCartney, Forbes, & O'Hare, 2009; Gillam et al., 2008). Hence, it is encouraging to note that participants of this study in the intervention group made statistically significant improvements in results of one subtest of the standardised assessment, and that effect sizes were particularly strong in others.

Direct comparisons of current results with studies using other approaches, for example, a more structured approach designed to target oral language difficulties in small group settings, are difficult to make. A structured approach is generally rooted in manualised intervention, in which lessons are built around units based on specific linguistic targets and follow a pre-determined, structured sequence that builds upon learning established by earlier units, with accompanying principles, protocols and/or techniques in its delivery to facilitate acquisition of programme targets. Obstacles to direct comparisons include variances in the scope of language domains targeted, the age-group of participants, the service delivery model, duration and the intensity of intervention. Moreover, programmes based on a structured approach are typically delivered by educational staff or paraprofessionals (e.g., SLT assistants) who have undergone thorough training by the programme developer(s) and/or their certified trainers to ensure fidelity and SLTs play

only minor roles in initial programme-related training in such programmes (if at all), rather than being the main agents of intervention in direct contact with the child. These notwithstanding, the results of the current study compare favourably with a study of a structured programme delivered by trained paraprofessionals and developed to facilitate the acquisition of age-specific syntax and vocabulary in both the receptive and expressive modalities (Phillips, 2014). In the study, significant findings on proximal measures of intervention-linked syntax and listening comprehension in all grades were reported, as well as positive trends in near-transfer standardised syntax measures (e.g., Sentence Structure from the CELF®-4^{UK}) or listening comprehension measures in two of the three grades. The participants were young children from prekindergarten to first grade (age range 40 – 101 months). However, the participants were identified for the study by virtue of having scored below the 30th percentile on several standardised language measures, indicating below-average language abilities. This criterion for participant selection is less stringent than the criterion of at least -1 SD away from the mean, or just below the 14th percentile, usually indicated for a diagnosis of a language disorder.

In terms of therapy techniques, strategies or protocols used by DAS SLTs, it is only possible to highlight studies that have targeted individual domains or aspects of language. With respect to syntax and morphology, for example, the use of modelling with imitation has been found to be effective for teaching novel derivational morphemes to younger children with SLI (Connell & Stone, 1992). In the study, children aged between 5 and 7 years old who were presented with a target morpheme being used in a meaningful way and then asked to repeat what they had heard showed significantly more use of the target morphemes. Similarly, recasting has been found to increase production of a range of morphosyntactic structures including the passive construction and gerund formation in children with SLI (Camarata & Nelson, 1992; Camarata, Nelson & Camarata, 1994; Nelson, Camarata, Welsh, Butkorsky, & Camarata, 1996), though for recasts to be maximally effective, the density of recasts needs to be sufficiently increased (Proctor-Williams & Fey, 2007; Fey & Loeb, 2002; Proctor-Williams, Fey, & Loeb, 2001) and when children are already using the target form to a certain extent (Saxton, 2000). In the domain of semantics and vocabulary, semantic strategies like classifying words into predefined categories, defining words, elaborating on the functions of objects, and phonological strategies such as identifying the initial sounds of words, and counting the number of sounds and syllables in words, have been shown to have a positive effect in improving the word-retrieval abilities of children (Wing, 1990). These strategies are frequently used by DAS SLTs to address language issues pertaining to syntax and morphology, as well as semantics and vocabulary.

Furthermore, the results of the current investigation lend some support to the efficacy of the current service delivery model of providing speech-language therapy in small groups (2-3 children per group), rather than individually, at least for therapy that target language issues (as opposed to articulation or fluency issues, for example). The results

are consistent with several other studies investigating the effects of group therapy for children with a language disorder. For younger children, a controlled study on the efficacy of individual versus group therapy on children with primary delay between 0-7 years old found group therapy targeting communication skills effective in situations where there was direct contact between the SLT and children (Best, Melvin & Williams, 1993), albeit at an intensity of two such sessions per week, more than that provided in the current study. For older children, group-based approaches have been reported to be effective for teaching word-finding to 4 children with an average age of 8 years (Hyde Wright, 1993), and sentence structure (Hirschman, 2000) to children with primary delay between 9-11 years old. In a randomised control trial involving 161 children with primary language impairment aged between 6 -11 years old that compared language outcomes following individual versus group modes of speech and language therapy, researchers concluded that there was no significant post-intervention differences between individual and group modes of therapy conducted by SLTs (Boyle et al., 2007).

Similarly, the results can be cautiously interpreted to suggest that the therapeutic approach adopted by DAS SLTs is suitable in addressing the language issues faced by children with a language disorder of varying severity ranging from mild to severe while simultaneously diagnosed with dyslexia. Research on the efficacy of intervention on this group of children is difficult to come by. The majority of studies focus on therapy contributing to a positive effect on vocabulary and expressive language skills (e.g. Law, Garrett & Nye, 2003; Ebbels, 2014), with the benefits less clear for children with receptive language difficulties, and/or more severe language issues like those faced by the participants of the current study. It must be noted that the participants in such studies are not diagnosed with both dyslexia and language disorder.

Finally, it is only recently that intensity of therapy and its effects on therapy outcomes have received more attention in research. More intensive therapy seemed to suggest better outcomes in earlier research (e.g. Barratt, Littlejohns & Thompson, 1992). The consensus today is that the relationship between the two is more nuanced than generally assumed. The findings of one study exploring the relationship between language outcomes and intensity of intervention suggest that more intensive language treatment, when considered purely as a measurement of total overall therapy duration, is not necessarily associated with better treatment outcomes (Schmitt, Justice, & Logan, 2017). For this study, direct child measures, weekly treatment logs and videotapes related to 233 children with language impairment in the US public school system were collected and used to examine children's language outcomes and treatment experiences. Baker (2012) similarly expressed the view that the interplay of frequency, session duration, and total intervention duration is far more complex to conclude with certainty that more intense intervention equates to better therapy outcomes when commenting about the optimal intensity of intervention in speech-language pathology in general (i.e. beyond language disorders and including speech sound disorders in children, emergent literacy, reading, aphasia, dysphagia, stuttering, motor speech disorders, voice disorders, and

traumatic brain injury). The results of this study seem to suggest that children diagnosed with both a language disorder and dyslexia undergoing language therapy at DAS at an intensity of an hour per week do benefit from the intervention, but the question of whether the participants, or which group of participants, would have benefitted more (or less) from differences in intensity of therapy remains unanswered.

LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

It should be noted that, although controlled, this evaluation represents a small-scale study, but this in itself is important because it reflects a naturalistic approach to language intervention. The impact of SLT has typically been seen as difficult to evaluate, because the approach is individually tailored to the needs of each child or group of children. Adding to the complexity is the fact that the population size of children simultaneously diagnosed with language disorder and dyslexia is not large to begin with and, even within this niche group, there are considerable variances in severity of the language disorder, areas of weakness and strengths in receptive and expressive language, and the cognitive, sensory and communication profiles of each child. Furthermore, there is wide variability in terms of co-morbidities with other medical conditions, age of entry when intervention was first accessed, previous and current experiences with therapy and/or other literacy interventions, and the level of parental and educator knowledge and commitment available to support the child at home and in the different schools which contributes significantly to the intricacies of intervention and limits the research designs that may be used in measuring its effectiveness. Consequently, it is posited that accounting for the variances mentioned and separating the effects arising from the interactions with and interplay of each of these factors is overwhelmingly complex and of limited practical value. Consequently, in contrast with the previous research cited here, the current study attempted to evaluate an approach to language intervention, rather than adopting a standard intervention applied across the board regardless of need. It could therefore be seen to be more useful clinically in identifying the impact of language therapy, and not simply an evaluation for research purposes.

Nevertheless, the design of the study is subject to a number of limitations, most specifically in the small number of participants, which reflect standard procedures in SLT support, and an imbalance in the age groups, with the children in the intervention group older than the controls. Interestingly, this is likely to reflect more severe difficulties in this group, who despite the advantage of age continue to struggle with language (e.g. Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998). It might be predicted that their difficulties would be harder to remediate, so this is a good challenge for the approach. It is particularly rewarding to be able to report the impact of the intervention with this group.

A further key issue emerging is the usefulness of undertaking language therapy within a small-group framework. The most pertinent research here examining this approach is

the report by Boyle et al., 2007, which also confirmed the usefulness of the small group approach in comparison with individual therapy. SLT is a lengthy and expensive process, although crucial to the development of effective language skills. If further large scale research confirms that working in small groups can be just as beneficial as individual therapy, this could transform opportunities for children with language disorder/dyslexia, who are typically doubly disadvantaged by their complex needs. This would ease the pressure on highly skilled therapists and the use of small groups in themselves could facilitate further progress within the group. It would also be useful to consider the optimum number of sessions, but this may well vary depending on the severity of the difficulties, and the difficulty in ensuring that progress will continue long term, after the therapy has ended.

CONCLUSIONS

The small scale controlled intervention study targeting the range of subskills addressed by CELF-4^{UK} identified significant impact of the approach adopted by SLTs at DAS, with strong effect sizes. The findings support the use of small-group intervention as effective for children with a range of severity in language disorders.

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