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Evidence based pathways to intervention for children with Language Disorders

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Abstract

Background: Paediatric SLT roles often involve planning individualised intervention for specific children (provided directly by SLTs or indirectly through non-SLTs), working collaboratively with families and education staff and providing advice and training. A tiered approach to service delivery is currently recommended, whereby services become increasingly specialised and individualised for children with greater needs.

Aims: To examine 1) evidence of intervention effectiveness for children with language disorders at different tiers and 2) evidence regarding SLT roles; and to propose an evidence-based model of SLT service delivery.

Methods: Controlled, peer-reviewed studies, meta-analyses and systematic reviews of interventions for children with language disorders are reviewed and their outcomes discussed, alongside the differing roles SLTs play in these interventions. We indicate where gaps in the evidence base exist and present a possible model of service delivery consistent with current evidence, and a flowchart to aid clinical decision making.

Main Contribution: The service delivery model presented resembles the tiered model commonly used in education services, but divides individualised (Tier 3) services into Tier3A: indirect intervention delivered by non-SLTs, and Tier 3B: direct intervention by an SLT. We report the evidence for intervention effectiveness and which children might best be served by each tier, the role SLTs could take within each, and the evidence of effectiveness of these roles. Regarding universal interventions provided to all children (Tier 1) and those targeted at children with language weaknesses (Tier 2), there is growing evidence that approaches led by education services can be effective when staff are highly trained and well-supported. There is currently limited evidence regarding additional benefit of SLT-specific roles at Tiers 1 and 2. With regard to individualised intervention (Tier 3): children with complex or pervasive language disorders progress significantly following direct individualised intervention (Tier 3B), whereas children with milder or less pervasive difficulties can make progress when intervention is managed by an SLT, but delivered indirectly by others (Tier 3A), provided they are well-trained, -supported and -monitored.

Conclusions: SLTs have a contribution to make at all tiers, but where prioritisation for clinical services is a necessity, we need to establish the benefits and cost-effectiveness of each contribution. Good evidence exists for SLTs delivering direct individualised intervention, and we should ensure that this is available to those children with pervasive and/or complex language impairments. In cases where service models are being provided which lack evidence, we strongly recommend that SLTs investigate the effectiveness of their approaches.

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What this paper adds

What is already known on this subject. Many services use a tiered approach to service delivery, in which intervention for children with language disorders becomes increasingly individualised. A current dilemma is how to balance supporting and training other professionals who can reach a greater number of children with providing individualised intervention for a smaller number of children with the most severe language disorders, in the context of limited resource.

What this study adds. We highlight available evidence regarding the effectiveness of intervention and SLT roles at different tiers. We provide a model that is based on this evidence and that 1) describes the children who may best be served by each type of input and 2) illustrates what form SLT input could take at different tiers. We also provide a flowchart to aid clinical decision making.

Clinical implications. Our evidence review indicates that SLTs must ensure sufficient training and skills in others asked to deliver language interventions, recognising that these vary with the profile of needs of each individual child. Furthermore, education staff and families may require a high level of on-going support to enable them to deliver evidence-based programmes as intended. Children with complex and pervasive language impairments appear to require individualised SLT support which includes close collaborative working between SLTs, education staff and families, and in some cases direct SLT intervention. Thus, service delivery models should provide SLTs sufficient time to work effectively with these children.

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Recent models of Speech and Language Therapy (SLT) service delivery for children and young people conceptualise services as involving a hierarchy of SLT involvement, whereby some support is provided for all and greater support for those children with more severe needs (e.g., Gascoigne, 2006, Law et al., 2013). These models resemble similar models used in education and youth justice services, variously called Tiers/Stages/Waves or Response to Intervention models (e.g., Fuchs and Fuchs, 2006, Snow et al., 2015). However, there is some lack of clarity about the precise nature and aims of SLT roles at different tiers, and evidence that these roles are effective in achieving these aims is sparse.

Our purpose here is to first present a modified version of a tiered intervention model and to summarise for each tier the available evidence regarding the effectiveness of a) support and/or intervention for children at that tier and b) the SLT roles within each tier. Based on this evidence, we then suggest an overall model of SLT service delivery and a flowchart to aid clinical decision making. We recognize that evidence is not the only influence on clinical decision making; there are also ethical, financial and political considerations which influence service decisions. However, outcomes are important and presenting the evidence here is intended to stimulate discussion about the direction of the profession in relation to children's SLT services, highlighting where further research is needed. An important premise is the general agreement that communication is a human right and that SLTs have a key role to play in maximising communication in children with speech, language and communication needs. For the purposes of this paper, we focus on children with language disorders, which can occur in isolation or may be associated with other conditions such as autism and learning disabilities (Bishop et al., 2016a), and where a range of professionals with complementary skills may be involved with the child and family in order to maximise the child's functioning, activity and participation, both in education and socially.

Tiered intervention models

Tiered intervention models generally divide intervention into three different levels, waves or tiers. However, there is a mismatch in terminology used in education versus health services. This is shown schematically in Figure 1.

Education intervention tiers or waves are generally related to the characteristics of the children, where (for children with language disorders) Tier 1 aims to provide high-quality teaching for all; Tier 2 focuses on children performing just below age expectations, often providing them with education-led language programmes; and Tier 3 focuses on children with identified language disorders who are not making expected progress and likely require individualised intervention. Tiers are thus broadly matched to interventions, but focus on child need. In contrast to education tiers, the distinctions between "universal", "targeted" and "specialist" SLT services are related to the type of support or intervention provided by SLTs "Specialist interventions" are usually considered to involve individualised intervention provided by an SLT for a specific child (which broadly aligns with education's Tier 3). The label "targeted" vs. "specialist" varies as regards work carried out indirectly via a non-SLT, but managed by an SLT. For example, Scottish Government (2010) reflects most allied health profession practice in considering an SLT opening a duty of care and managing the case as determining a specialist intervention, which can be delivered 'directly' by an SLT or 'indirectly'

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by non-SLTs under the direction of the SLT, or by a mix of individuals, but Law et al. (2012) regard indirect therapy as "targeted" intervention because it is delivered by a non-SLT. This lack of agreement is alluded to in Figure 1 by the dashed arrows. To avoid confusion, we split Tier 3 into Tier 3B for direct individualised/specialist intervention and Tier 3A for indirect individualised intervention (currently called variously "specialist" or "targeted"). This distinction is also shown on Figure 1. In our view, it is critical to distinguish "indirect" work for which SLT has opened, and closes, an episode of care (which we call Tier 3A) from work provided by education services at Tier 2, where no episode of care is opened by an SLT, although the child may be on the special educational needs register.

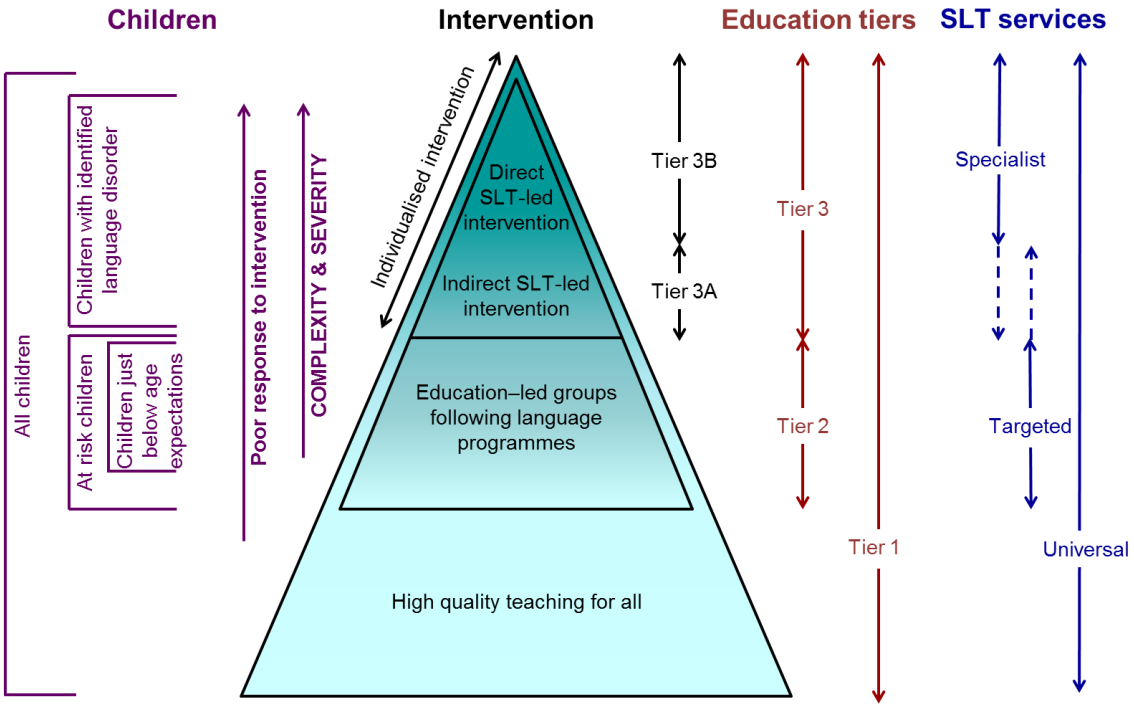

Figure 1 – Response to intervention model of intervention for children with language disorders

The definition of "targeted intervention" is unclear in SLT practice, but the primary focus is on "vulnerable" children (Gascoigne, 2006). Supporting others to provide small group work at Tier 2 with children who are just below age expectations would fall under "targeted" interventions in most definitions. However, any lack of distinction between what we call Tier 3A and Tier 2 is problematic if it is unclear whether or not an SLT opened an episode of care, and hence for which children's intervention an SLT has a legal and ethical responsibility.

"Targeted" intervention can also, in most interpretations, cover interventions/advice which target vulnerable groups of children who are deemed to be at increased risk of having language difficulties (e.g., those living in poverty), but whose actual language abilities have not been evaluated, resulting in probable variation within the group (i.e., some may have language abilities within the expected range for their age). This would usually be considered to be Tier 2 in the education model.

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"Universal" SLT services generally involve training or awareness raising programmes focusing primarily on improving the ability of parents and professionals such as teachers and health visitors to identify speech, language and/or communication difficulties in children or changing their everyday practice and interactions with children to maximise the chances of all children in developing good communication skills (thus aligning with Tier 1).

The lack of agreement in terminology could hinder mutual understanding and effective collaboration between education and health services, and in practice the intervention levels are not always clearly signalled (Law et al., 2012, p14), leading to a lack of common understanding regarding where responsibilities for intervention lie. For clarity, in this paper, we will consider the evidence of effectiveness of interventions in terms of levels shown inside the triangle in Figure 1, mapped roughly education services' Tiers 1, 2 and 3 which we label:

1. High quality teaching for all (Tier 1)
2. Education-led small groups following language programmes (Tier 2)
3. Individualised intervention where children are on the SLT caseload and the SLT has a duty of care (Tier 3). This is split into:
    A. Tier 3A: Indirect individualised intervention, planned and monitored by the SLT or other specialist professional (e.g., psychologist or specialist teacher), but delivered by parents or another professional.
    B. Tier 3B: Direct individualised intervention, delivered by the professional who planned the intervention.

For each tier, after considering the evidence for effectiveness of intervention, we consider the roles SLTs may play and the available evidence regarding the effectiveness of these roles. In addition, we consider evidence of effectiveness of SLTs' joint collaborative work and training with parents and education professionals, which occurs across all tiers.

Tier 1 interventions (high quality teaching for all)

Evidence of effectiveness of Tier 1 interventions

Effective Tier 1 teaching for language requires active classroom management and teaching to support the developing oral language skills of all children. Tier 1 intervention may involve teachers delivering language programmes to whole classes and studies have shown these can result in improved performance in grammar, morphology and vocabulary (Justice et al., 2010, Neuman et al., 2011). Tier 1 intervention may involve professional development (PD) for education staff. Several large-scale trials with robust designs have been carried out in Canada and the United States considering the effectiveness of PD for pre-school educators and a recent meta-analysis of studies of PD focusing on language and/or literacy (Markussen-Brown et al., 2017) found medium effects on adult-child interactions and large effects on the physical classroom space, but no significant effect on educator knowledge. Less than half of the included studies reported child outcomes, but the meta-analysis showed a small but non-significant effect on child vocabulary and small to medium significant effects on phonological awareness and alphabet knowledge. Surprisingly however, the improvements in child outcomes were not mediated by improvements in the way the adults interacted with the children. Markussen-Brown

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et al. (2017) also considered features of the PD which were associated with improved educator outcomes and found better outcomes for PD of longer duration and greater intensity (the average amount of PD was around 50-60 hours). They also found that courses alone had no significant effects, but courses plus other components such as coaching had significantly larger effects. Indeed, the most important factor for predicting educator outcomes was whether the PD included more than one component (e.g., course plus coaching and feedback, or the addition of a language curriculum or use of assessment data to guide lesson planning digitally).

Fewer studies have been carried out considering the effects of PD of teachers of school-aged children. Snow et al. (2014) found 6 days of PD plus follow-up support improved the oral language and literacy skills of children in socio-economically disadvantaged primary schools, although it is not clear whether the changes also applied to children with language disorders, as their results are not reported separately. However, in a smaller, less robust study in secondary schools (Starling et al., 2012), secondary-school aged children with language disorder were assessed following teacher training in language modification techniques (8 hours training plus observation and coaching). Results indicated positive changes in the children's written expression and listening comprehension (but not reading or speaking).

The above studies all involved a high level of commitment from researchers and staff. Courses alone do not appear to be effective unless combined with other components such as individual coaching and feedback which can be tailored to the needs of individual staff.

SLT roles in Tier 1 interventions

SLT-specific roles in universal health and education services for children are a relatively recent development with very little research evidence. A recent scoping review (Smith et al., in press) highlights the low quality of the available evidence with regards to SLT roles in health promotion for children aged 0-3 years without identified language difficulties. They concluded "the lack of quality in reporting and study design result in an inability to draw any conclusions regarding the effectiveness of speech and language therapy health-promotion services for early language delay".

Many SLTs who are involved in Tier 1 intervention focus on 1) raising awareness of the importance of language and communication and the impact of language and communication difficulties and 2) training others in the use of strategies which may promote the development of speech, language and communication (although rarely approaching the number of hours in the studies discussed above). The studies described above show that this can be effective, but the time commitment is large and the specific role of SLTs in this training has received little evaluation. However, a recent large-scale RCT (involving 2696 children, Thurston et al., 2016) investigated the effectiveness of whole school support from SLTs at both Tiers 1 and 2 (Talk of the Town), and found no effect on children's language skills or reading comprehension, although there were indications of improved language in children not in receipt of free school meals.

Other SLT roles at Tier 1 can focus on raising awareness within the general public (especially parents) and policy makers of 1) the importance of language to economic independence, health and well-being and 2) identification of children with language disorders

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and the 'red flags' and risk factors that may indicate a persistent language disorder (discussed below). These roles are often assumed by membership organisations and charities e.g. British Academy of Childhood Disability (BACD) or Royal College of Speech and Language Therapist (RCSLT). The effectiveness of these activities would need to be measured against those of other lobbying and public information activists.

Tier 1 intervention is often described as 'preventative,' but most models of education and SLT service delivery acknowledge that a number of children are likely to need further, more targeted or individualised support at Tiers 2 or 3 in addition to high quality teaching.

Tier 2 interventions (education-led small groups following language programmes)

Evidence of effectiveness of Tier 2 interventions

A number of research studies have evaluated interventions to support the oral language skills of children with weaknesses or "vulnerabilities" in this area in small group settings. These have focussed on expressive language (Petersen, 2011), receptive language (Phillips, 2014, van Kleeck et al., 2006) both receptive and expressive language (Talking Time, Dockrell et al., 2010, Nuffield Language Programme, Bowyer-Crane et al., 2008, Fricke et al., 2013, Talk Boost, Lee and Pring, 2016) and vocabulary (Elements of Reading (R), Apthorp et al., 2012, Hadley et al., 2015, Restrepo et al., 2013, Rich vocabulary instruction, Vadasy et al., 2015a, Connections, Vadasy et al., 2015b). The interventions were typically carried out by education staff in schools, but researchers provided training and on-going support, and measured fidelity in the delivery of the intervention. Evidence regarding generalisation to regular practice unsupported by researchers is only just emerging. The Talk of the Town evaluation included Talking Time and Talk Boost and several other Tier 1 and Tier 2 interventions with training and support provided by SLTs who were not involved in the development of the programmes and found no effect on the children's oral language or reading comprehension. However, the training provided was less intensive than in the original studies.

Many of the above studies provided manualised programs and many are available to purchase. If there is fidelity of treatment for a manualised intervention, there is no empirical reason to predict differential impact of delivery across professional groups. However, training and support may be required for good treatment fidelity. We have not identified research that evaluates and directly compares training and support provided by different professions (e.g. SLTs, educational psychologists, Special Educational Needs Coordinators, specialist teachers and charities) in terms of effectiveness or schools' preference.

SLT roles in Tier 2 interventions

Whilst SLTs frequently provide language and communication programmes for schools to use, the majority of the researchers leading the studies discussed above were education researchers or psychologists and provided the training directly to those delivering it. Training was provided by SLTs in Talk Boost (Lee & Pring, 2016) and the Talk of the Town evaluation (Thurston et al., 2016) with mixed results. Thus, any specific benefit of SLTs in Tier 2 interventions remains to be established.

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Tier 3 interventions (individualised intervention)

Individualised interventions are based on assessment of the individual child's needs. In clinical practice, a professional opens an episode of care for the child and should monitor the delivery and outcomes of that episode. Planning will usually take into account the views of the child, family and education staff, and intervention may be delivered by a combination of people. When asking others to share the delivery of intervention, the health professional has a responsibility to provide the necessary training, support and resources to ensure a high quality intervention which is specifically tailored to the child's needs. The concept of episodes of care used by SLTs, in which a case may be 'open' for treatment for a period and subsequently 'closed' contrasts with education provision which is ongoing throughout the school years, and now potentially to 25 years. Furthermore the approach could lead to a failure to assess the need for further provision, for example, SLTs in McCartney and Muir (2016) reported that school leavers with learning disabilities who had been discharged by SLT services following completed episodes of care in school were at risk of not being re-referred by school staff for assessment of post-school SLT service needs Careful explanation and discussion is required.

In this section we split individualised intervention into direct intervention, delivered by the SLT, although perhaps involving others in back-up support, versus indirect intervention, delivered by non-SLTs, such as parents or education professionals.

Direct individualised intervention (Tier 3B)

For children with Developmental Language Disorder (DLD, many of whom would previously have been diagnosed as having Specific Language Impairment, SLI), good evidence exists of positive effects for individualised 1:1 direct intervention with an SLT on improving vocabulary and expressive language skills (for reviews see Law et al., 2003, and Ebbels, 2014). Fewer studies explore the effectiveness of intervention for children with more severe and pervasive difficulties, including receptive language difficulties. In general, studies using standardised tests as outcome measures fail to show significant effects of intervention for these children (Boyle et al., 2009, Gillam et al., 2008), a finding which likely reflects the design and psychometric properties of the tests used (Dockrell and Marshall, 2015). In contrast to this, studies using more tailored measures of progress have found significant gains with intervention targeting either a range of areas (Ebbels et al., in press) or the specific language areas of receptive vocabulary (Parsons et al., 2005, Throneburg et al., 2000), word finding (Ebbels et al., 2012, Hyde-Wright et al., 1993), production and comprehension of specific grammatical structures (e.g., Ebbels et al., 2014, 2007), and narrative (Hayward and Schneider, 2000)

There is also emerging evidence that children with severe, complex and pervasive communication and language disorders (including those associated with autism and learning disabilities) can make progress with direct individualised intervention, usually in combination with collaborative work (discussed further below). Relevant studies tend to focus on the acquisition of specific skills, e.g. requesting using Picture Exchange Communication Scheme (PECS, Bondy and Frost, 1994), or precursor skills for language e.g., joint attention (Green et al., 2010). Evidence is also emerging of benefits from direct intervention targeting social communication for children with autism, with outcomes relating to language abilities (Kasari et al., 2012) and parents' ability to respond to their child in a synchronous manner (Green et al.,

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2010). This latter study used a complex mediation analysis to reveal a causal link from improving parental synchrony to improved child initiation of communication in children with autism several years after the original intervention (Pickles et al., 2016). The National Institute for Health Care and Excellence for children and young people with autism (NICE, 2013) found no single study that indicated benefit for improvement in communication and autism symptoms but noted suggestive evidence for benefit from early social communication intervention when data from a number of studies were combined (Kendall et al., 2013).

Indirect individualised intervention (Tier 3A)

Individualised intervention may be delivered indirectly through others; for pre-school children this is often via parents and for school-aged children via education staff. For pre-school children reviews of SLT interventions working through parents (Roberts and Kaiser, 2011, Tosh et al., in press) suggest that parental delivery of intervention can lead to growth in speech and language skills for children with expressive language difficulties, including those with intellectual disabilities. Roberts and Kaiser (2011) reported that the majority of studies analysed found larger effect sizes for expressive relative to receptive language and indeed expressive language was the focus of most parent implemented intervention.

Tosh et al. (in press) carried out further analyses considering the amount of training provided to parents and concluded that home programmes are effective when they are used with high dosage rates and parents receive direct training from an SLT. However, they found that across all studies reviewed, effective home programmes had a similar cost for SLT services as direct intervention for comparable gain (with indications that direct intervention provides a more consistent treatment response). This has implications for those attempting to address service delivery challenges through the use of such programmes. Tosh et al. (in press) also caution that the quality of the majority of studies providing evidence of the effectiveness of home programmes is low and thus "the evidence supporting the use of home programs remains poor". For children with autism, a review of parent-mediated approaches (Oono et al., 2013) did not find evidence of gains in child-related measures of language, communication or behaviour or reductions in parent stress, but did find evidence of positive change in patterns of parent-child interaction and possibly in receptive vocabulary and severity of autism symptoms.

For children in educational settings, indirect intervention is usually delivered by education staff or SLT assistants. Studies to date have demonstrated that when well-trained and supported staff are under the direct management of a research team or an SLT, they can deliver individualised intervention which leads to progress for: children with autism in joint attention (Lawton and Kasari, 2012) or joint engagement (Wong, 2013), children with speech and/or language disorders across a range of specific speech and language targets (Mecrow et al., 2010), and children with expressive (but not receptive) language impairments in expressive language (Boyle et al., 2009). The Boyle et al. (2009) study showed minimal treatment effects for children with receptive language impairments and/or progress on receptive language targets. In addition, an effectiveness study using the same intervention as that used in Boyle et al. (2009) did not result in improvement in receptive or expressive language when school staff were provided with the manualised programme, but with little on-going supervision (McCartney et al., 2011). The authors state that a likely reason for the differences between the studies was that, for many

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children in the later (McCartney et al., 2011) study, the intervention was not actually delivered as planned by the education staff, who were receiving lower levels of support.

Joint collaborative work with parents and/or education staff

Collaborative work with parents and education staff occurs at all tiers: i.e., with individual children with identified language disorders (Tier 3), small groups with language weaknesses (Tier 2), or whole classes of children (Tier 1). We therefore consider the evidence for collaborative work separately from the other interventions at each tier. Collaborative work will involve joint decision-making about the priorities and method of delivery of an intervention. The aim is often to reduce the functional impact of a child's difficulties on their access to the curriculum, social participation or well-being, and to practise new skills in a range of settings.

When parents are working on areas of language and communication development, these are likely to be specific to their individual child's needs. The focus may be on home tasks to generalise individualised SLT interventions and a recent review (Sugden et al., 2016) found this can be an effective aspect of intervention for speech sound disorders.

Collaborative work between education staff and SLTs may focus on individual children or on whole classes, and reviews (Cirrin et al., 2010, Archibald, in press) have concluded that collaborative work with teachers is beneficial in classes with high numbers of "at-risk" children and also for children with identified language disorders. Tambyraja et al. (2015) reported that the number of therapy sessions received did not predict response to intervention, but receiving a greater proportion of therapy sessions in the classroom was associated with greater progress in children with language disorders.

Training for parents or education staff

As with collaborative working, training for parents and others (particularly education staff) is relevant to all tiers. However, in all studies that included a training component and reported positive outcomes for children (see sections above) training was intensive and did not occur as an isolated training event. At Tier 1, successful professional development for education staff was at least 8 hours (in the Starling et al., 2012 study), but more often closer to 50-60 hours in Snow et al. (2014) and studies in the meta-analysis by Markussen-Brown et al. (2017) and accompanied by individual coaching or observation sessions. Tier 2 studies involved relatively intensive initial training (four days in Fricke et al., 2013; Bowyer-Crane et al., 2008) followed by regular (fortnightly), on-going training, support and monitoring for staff delivering programmes. The studies at Tier 3A demonstrating good outcomes for children had high levels of support for parents (Tosh et al., in press), or professionals who were employed and supervised directly by the SLT service or research team (Boyle et al., 2009; Mecrow et al., 2010). In the only study where the level of support provided to staff carrying out intervention resembles that provided by current routine SLT services (at least in the UK, McCartney et al., 2011), the intervention did not take place as planned and the children showed no progress. This highlights the need for regular monitoring and support in order to ensure that indirect intervention takes place as intended.

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SLTs routinely delegate direct work to others, but the Health and Care Professions Council (HCPC) standards of conduct, performance and ethics (2016) state explicitly: "You must only delegate work to someone who has the knowledge, skills and experience needed to carry it out safely and effectively" and " you must continue to provide appropriate supervision and support to those you delegate work to" (page 7). Furthermore, SLTs have no managerial control over education staff and cannot therefore oversee the delivery of 'delegated programmes'. Instead, partnership and co-working models are required.

In view of this, it is crucial to establish what levels of training, support, and monitoring are required in order to lead to positive outcomes for children across all tiers of intervention. It is also important to note the lack of evidence for low levels of training, or courses in the absence of additional support, coaching or collaborative working. Thus, it is unlikely that limited training offered as a cost-saving substitution for other forms of intervention will be effective. Services providing such training need to rigorously examine the outcomes for children in order to establish whether their input has been effective or not.

Models of service delivery and intervention

Based on the evidence summarised above, we have constructed a possible model of SLT service delivery (Figure 2) presenting possible SLT roles and a flowchart (Figure 3) showing the key questions which may indicate different pathways to intervention and the intervention an individual child might receive.

Our model in Figure 2 expands on our previous model in Figure 1. Here we have incorporated factors from the evidence base which indicate those children who may require individualised approaches. We have included severity of receptive language difficulties as a core factor in our model because the evidence suggests that these children do not make progress unless provided with direct SLT and/or joint collaborative work. We have added a second triangle on the right which provides examples of possible SLT roles at each Tier. Collaborative working and training are shown as cutting across all tiers, whereas other aspects of an SLT's role may be more specific to each tier. Our inversion of the right hand triangle represents firstly the weight of the current evidence base concerning SLT roles in supporting children with language disorders and secondly our view that those children with the greatest needs require the largest proportion of SLT time and specialist skills. This is not to say that children with milder difficulties do not require support, but rather that the specific technical skills of an SLT may be less essential for improving language outcomes for these children and thus a greater proportion of their support could be provided by other professionals. However, the limited evidence available means that this model may well need to change if further evidence emerges on treatment outcomes and cost-effectiveness of different SLT interventions.

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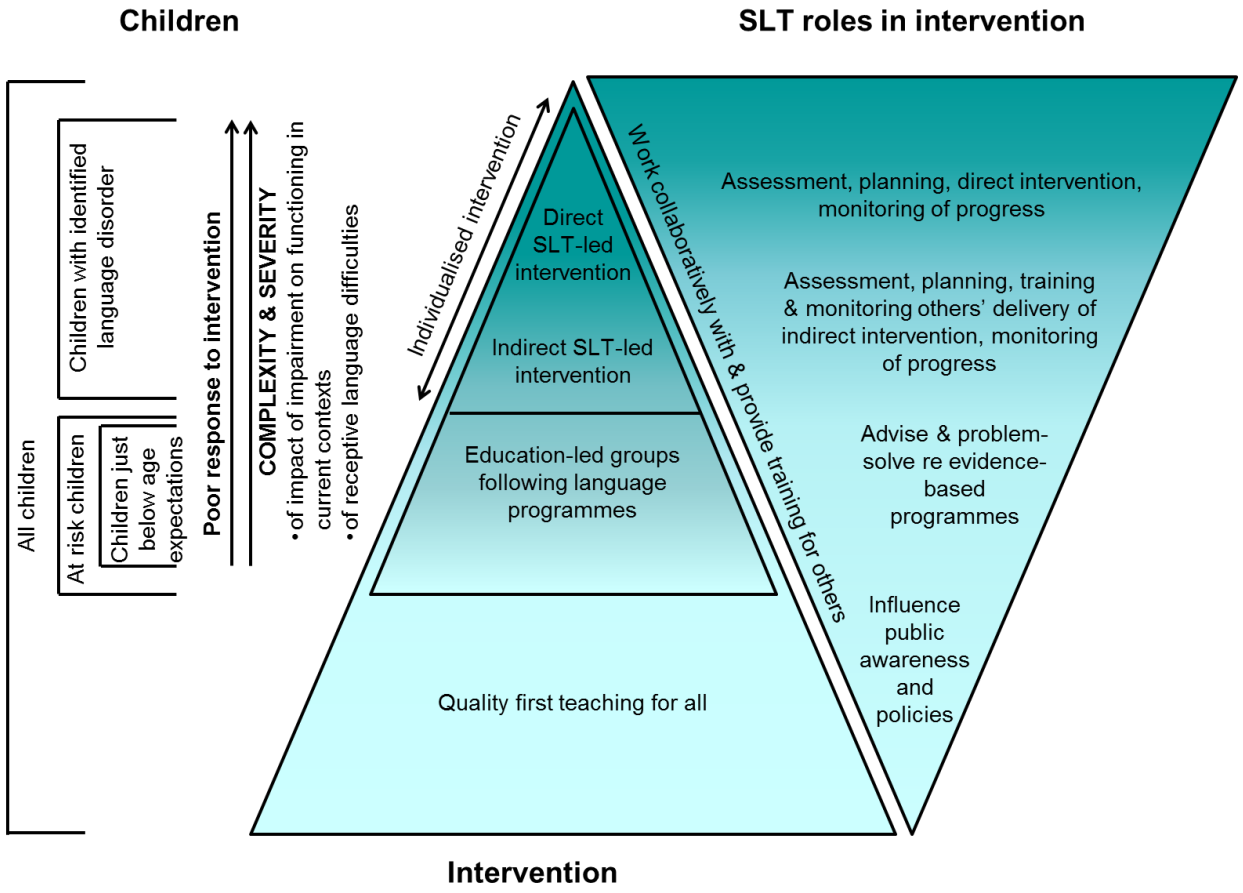

Figure 2: SLT roles in response to intervention model of intervention for children with language disorders

Identification of children likely to require individualised intervention at Tier 3

'Response to Intervention' models have been criticised for implying a "wait to fail" approach (see Reynolds and Shaywitz, 2009), where the impression is that children have to fail at Tiers 1 and 2 before accessing Tier 3. However, in our view, a pathway is needed for those children who should see an SLT without delay. This process requires clarity about which children are likely to need individualised intervention and which children are likely to resolve their language difficulties either spontaneously or with good support at Tiers 1 and 2, This is complicated by the lack of a sharp distinction between normal and impaired functioning and the wide variability in child language ability and rate of language development, especially in the pre-school years when early language difficulties are not necessarily predictive of later disorder and some children with language disorder meet early language milestones (Eadie et al., 2014, Zambrana et al., 2014).

Given wide variation in early language trajectories, it is important to consider predictive factors for persistent difficulties that will allow us more effectively to target resources for early intervention. Important 'red flags' which indicate the need for assessment by an SLT in the pre-school period are listed in Bishop et al. (2016b) based on those proposed by Visser-Bochane et al. (2017) and are repeated here for ease of reference:

- 1 to 2 years: no babbling, not responding to speech and/or sounds, no interaction;

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- 2-3 years: minimal interaction, no display of intention to communicate, no words, minimal reaction to spoken language, regression or stalling of language development;
- 3-4 years: at most two-word utterances (in their first language), child does not understand simple commands, close relatives cannot understand much of child's speech.

Similar 'red flags' have been suggested for autism spectrum disorder (e.g., Baird et al., 2003).

Longitudinal research has identified additional 'risk factors' which do not indicate the need for immediate SLT assessment, but are associated with an increased risk of a persistent language disorder. These 'risk factors' are a positive family history of language or literacy difficulties (Zambrana et al., 2014); pervasive language deficits affecting both receptive and expressive language, which probably reflect more severe language difficulties (Eadie et al., 2014, Tomblin et al., 2003), particularly in girls (Zambrana et al., 2014); and lower non-verbal IQ (e.g., Eadie et al., 2014, Tomblin et al., 2003, McKean et al., 2017). Zambrana et al. (2014) also identify cumulative risk from multiple risk factors, such that children with low language and multiple risk factors should be considered to be at high risk of persistent language disorder. Age is also an important factor: whilst the majority of children with early delays in expressive language will spontaneously improve by school entry (Rescorla, 2011, Paul et al., 2000), language difficulties still evident at school entry tend not to resolve (e.g., Conti-Ramsden et al., 2012). Indeed, when predicting language abilities at age7, the best predictor is language at age 4 and the addition of other factors does not improve prediction (McKean et al., 2017). Thus, by 4-5 years, language abilities are much more stable and school-aged children with language difficulties are at high risk of persistent language disorder.

Language disorders in the context of other developmental conditions such as Down syndrome, or autism are unlikely to resolve spontaneously (Pickles et al., 2014). Intervention for these populations is likely to have a broad remit: establishing communication within the family (perhaps introducing alternative and augmentative communication methods), developing and monitoring oral language, and providing evidence for statutory assessment of education, health and social care plans.

Evidence-based pathways to intervention for children with Language Disorders

We now bring together the evidence reviewed above on the effectiveness of the different tiers of intervention and the 'red flags' and 'risk factors' for persisting difficulties in a flowchart (Figure 3). This is intended to enable evidence-based decisions regarding the appropriate tier of

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intervention for an individual child. It includes key decision points, such as whether to refer for an SLT assessment, or to provide direct or indirect SLT intervention. Children can move between tiers based on their response to intervention and the functional impact of their difficulties at any given point in time. Some children have multiple co-occurring difficulties requiring a model of Intervention at different tiers simultaneously.

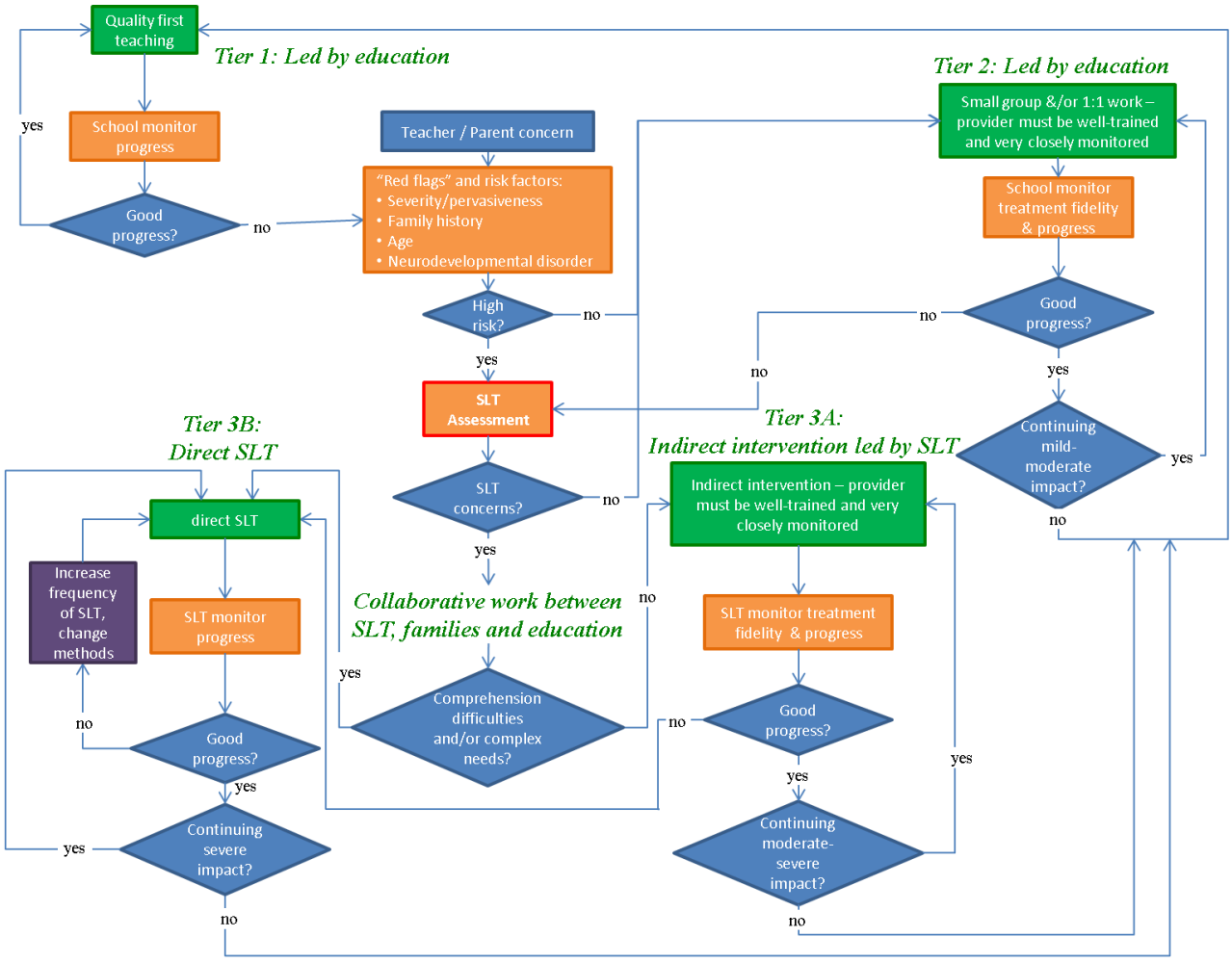

Figure 3: Flowchart of pathways to intervention

Children with the 'red flags' listed above should be assessed by an SLT. For children without these red flags, presence of one or more risk factors increases the likelihood of persistent language disorder. Children presenting with multiple risk factors should be prioritised for SLT; children with delayed language development but no additional risk factors may be best served in the first instance by education-led language programmes at Tier 2.

In addition to an assessment of risk, Figure 3 includes a response to intervention approach, through close monitoring of outcomes and subsequent changes to provision where

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necessary. We propose that the response to intervention be monitored by education staff for education-led interventions (at Tiers 1 and 2) and by the SLT for SLT-led interventions, where the SLT has a duty of care (at Tiers 3A and 3B). However, it is important to specify what is meant by a good or poor response to an intervention (Reynolds & Shaywitz, 2009) particularly for children with complex developmental disorders such as autism (Lord et al., 2005). In our view, if after Tier 2 intervention, a child has not reached expected language levels, they should be referred for an SLT assessment and potentially intervention. Judgements regarding progress following SLT-led intervention should be made in relation to specific individual targets, rather than broad standardised assessments. Failure to progress should result in a re-evaluation of the intervention and the outcome measures used and, if necessary, modification of the focus, method, or dosage, bearing in mind that children with pervasive difficulties are unlikely to make rapid progress after short-term interventions.

Prioritisation

Our models in Figures 2 and 3 are based on the evidence we have reviewed. We question the extent to which such information influences managers under pressure to prioritise their service delivery. All health provider services are trying to balance reaching the maximum number of individuals versus focusing on a smaller number where the impact on the individual could be greatest. One component of this dilemma for SLTs is the degree to which 1) other services could provide (cost-)effective support for different groups of children and 2) the SLT profession can add significantly to this support. Our aim is to make this information readily accessible, by separating evidence of effectiveness of general versus SLT-specific roles and interventions. We have shown that there is increasing evidence that intervention provided by education at Tiers 1 and 2 can be effective, but the evidence that SLT-specific roles at these levels increases this effectiveness is very limited.

An associated but different issue is the on-going debate about the prioritisation of younger children, with the aim of preventing potential future difficulties. This concept is primarily used in illness prevention and its validity in the context of children with neurodevelopmental or heritable disorders is questionable. However, the concept has utility when couched in terms of avoiding functional impairments or secondary sequelae (such as poor mental health) and enhancing skill development in individuals with long term conditions, even if the condition itself cannot be prevented. When making any assumptions about preventative intervention, the research on the variability in language trajectories in pre-school children and

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the spontaneous progress many pre-school children make should be borne in mind (see Wake et al., 2015).

In the context of neurodevelopmental disorders, it is essential that SLTs are clear about the anticipated outcomes of their work and the means of measuring progress. In the context of a health provider, discharge from treatment is often seen as the successful outcome of treatment, but, this may not be appropriate for children with long-term needs, as acknowledged by the NICE guidelines (Autism, Learning disability, ADHD, prematurity etc) which recommend life-long access to services. In the past, a focus on discharge as a metric of success may have resulted in SLT services prioritising children whose difficulties are likely to resolve with small amounts of input. In a resource limited environment, this could result in reduced access for children with severe and persistent disorders and disabilities. Our view is that such children, who are likely to make the least progress without SLT, should be prioritised, particularly where there is an impact on daily functioning. A key question therefore is how SLT services can provide high quality intervention for children with severe and complex communication and language disorders which adapts to the changing needs of the individual and their family.

Conclusions

SLT working in children's services have roles ranging from awareness raising and public engagement (Tier 1), to advice, support and training for professionals working with children failing to make progress (Tier 2) and finally to highly specialised and individualised direct or indirect intervention for children with severe and persisting language disorders (Tier 3). At all tiers, SLTs will be working collaboratively with families and education, with a particular focus on generalisation of skills and maximising access to the curriculum, social participation and well-being. We highlight the need to incorporate evidence of the effectiveness of these roles in service planning. Our model and flowchart reflect the current evidence and we hope will provide a framework for discussions about service delivery and clinical decisions for intervention for children with language disorders.

Ineffective services are wasteful of limited resources and time (including the time of SLTs, parents, education staff, and the children themselves) and yet there is evidence that SLTs frequently fail to use evidence-based interventions, preferring to use their own local methods (Roulstone et al., 2012). While clinical decisions may be a response to local need, resources, and priorities, SLTs should be clear how these differ from evidence-based interventions and collect data to establish whether they are effective in achieving their aims.

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Children with complex and pervasive language disorder and those with additional complex needs require the specialist skills of SLTs in order to make progress. SLTs need to have adequate time to work directly and collaboratively with these children, their families and educators, to improve their skills and reduce the functional impact of their language disorder.

References

APTHORP, H., RANDEL, B., CHERASARO, T., CLARK, T., MCKEOWN, M. & BECK, I. 2012. Effects of a supplemental vocabulary program on word knowledge and passage comprehension. *Journal of Research on Educational Effectiveness,* 5**,** 160-188.

ARCHIBALD, L. in press. SLP-Educator Classroom Collaboration: A Review to Inform Reason-based Practice. *Autism and Developmental Language Impairment*.

BAIRD, G., CASS, H. & SLONIMS, V. 2003. Diagnosis of autism. *Bmj,* 327**,** 488-493.

BISHOP, D., SNOWLING, M., THOMPSON, P., GREENHALGH, T. & CONSORTIUM, C.-. 2016a. CATALISE: a multinational and multidisciplinary Delphi consensus study of problems with language development. Phase 2. Terminology. . *PeerJ Preprints 4:e2484v1*.

BISHOP, D. V. M., SNOWLING, M. J., THOMPSON, P. A., GREENHALGH, T. & CONSORTIUM, C. 2016b. CATALISE: A Multinational and Multidisciplinary Delphi Consensus Study. Identifying Language Impairments in Children. *PLoS ONE,* 11**,** e0158753.

BONDY, A. S. & FROST, L. A. 1994. The picture exchange communication system. *Focus on autism and other developmental disabilties,* 9**,** 1-19.

BOWYER-CRANE, C., SNOWLING, M. J., DUFF, F. J., FIELDSEND, E., CARROLL, J. M., MILES, J., GOTZ, K. & HULME, C. 2008. Improving early language and literacy skills: differential effects of an oral language versus a phonology with reading intervention. *Journal of Child Psychology and Psychiatry,* 49**,** 422-432.

BOYLE, J. M., MCCARTNEY, E., O'HARE, A. & FORBES, J. 2009. Direct versus indirect and individual versus group modes of language therapy for children with primary language impairment: principal outcomes from a randomized controlled trial and economic evaluation. *International Journal of Language & Communication Disorders,* 44**,** 826-846.

CIRRIN, F. M., SCHOOLING, T. L., NELSON, N. W., DIEHL, S. F., FLYNN, P. F., STASKOWSKI, M., TORREY, T. & ADAMCZYK, D. F. 2010. Evidence-Based Systematic Review: Effects of Different Service Delivery Models on Communication Outcomes for Elementary School-Age Children. *Language Speech and Hearing Services in Schools,* 41**,** 233-264.

CONTI-RAMSDEN, G., ST CLAIR, M. C., PICKLES, A. & DURKIN, K. 2012. Developmental Trajectories of Verbal and Nonverbal Skills in Individuals With a History of Specific Language Impairment: From Childhood to Adolescence. *Journal of Speech Language and Hearing Research,* 55**,** 1716-1735.

COUNCIL, H. A. C. P. 2016. Standards of conduct, performance and ethics. London: Health and Care Professions Council.

DOCKRELL, J. & MARSHALL, C. 2015. Measurement issues: Assessing language skills in young children. *Child and Adolescent Mental Health,* 20**,** 116-125.

DOCKRELL, J. E., STUART, M. & KING, D. 2010. Supporting early oral language skills for English language learners in inner city preschool provision. *British Journal of Educational Psychology,* 80**,** 497-515.

EADIE, P., NGUYEN, C., CARLIN, J., BAVIN, E., BRETHERTON, L. & REILLY, S. 2014. Stability of language performance at 4 and 5 years: measurement and participant variability. *International Journal of Language & Communication Disorders,* 49**,** 215-227.

EBBELS, S., WRIGHT, L., BROCKBANK, S., GODFREY, C., HARRIS, C., LENISTON, H., NEARY, K., NICOLL, H., NICOLL, L., SCOTT, J. & MARIĆ, N. in press. Effectiveness of 1:1 speech and language therapy for

PeerJ Preprints NOT PEER-REVIEWED

older children with developmental language impairments. *International Journal of Language & Communication Disorders*.

EBBELS, S. H. 2014. Effectiveness of intervention for grammar in school-aged children with primary language impairments: A review of the evidence. *Child Language Teaching and Therapy,* 30**,** 7-40.

EBBELS, S. H., MARIC, N., MURPHY, A. & TURNER, G. 2014. Improving comprehension in adolescents with severe receptive language impairments: a randomised control trial of intervention for coordinating conjunctions. *International Journal of Language & Communication Disorders,* 49**,** 30-48.

EBBELS, S. H., NICOLL, H., CLARK, B., EACHUS, B., GALLAGHER, A. L., HORNIMAN, K., JENNINGS, M., MCEVOY, K., NIMMO, L. & TURNER, G. 2012. Effectiveness of semantic therapy for word-finding difficulties in pupils with persistent language impairments: a randomized control trial. *International Journal of Language & Communication Disorders,* 47**,** 35-51.

EBBELS, S. H., VAN DER LELY, H. K. J. & DOCKRELL, J. E. 2007. Intervention for verb argument structure in children with persistent SLI: a randomized control trial. *Journal of Speech Language and Hearing Research,* 50**,** 1330-1349.

FRICKE, S., BOWYER-CRANE, C. A., HALEY, A. J., HULME, C. & SNOWLING, M. 2013. Efficacy of language intervention in the early years. *Journal of Child Psychology and Psychiatry,* 54**,** 280-290.

FUCHS, D. & FUCHS, L. S. 2006. Introduction to response to intervention: What, why, and how valid is it? *Reading Research Quarterly,* 41**,** 93-99.

GASCOIGNE, M. 2006. *Supporting children with speech, language and communication needs within integrated children's services.,* London, RCSLT Position Paper, RCSLT.

GILLAM, R. B., LOEB, D. F., HOFFMAN, L. M., BOHMAN, T., CHAMPLIN, C. A., THIBODEAU, L., WIDEN, J., BRANDEL, J. & FRIEL-PATTI, S. 2008. The efficacy of Fast ForWord Language Intervention in school-age children with language impairment: A Randomized controlled trial. *Journal of Speech Language and Hearing Research,* 51**,** 97-119.

GREEN, J., CHARMAN, T., MCCONACHIE, H., ALDRED, C., SLONIMS, V., HOWLIN, P., LE COUTEUR, A., LEADBITTER, K., HUDRY, K., BYFORD, S., BARRETT, B., TEMPLE, K., MACDONALD, W. & PICKLES, A. 2010. Parent-mediated communication-focused treatment in children with autism (PACT): a randomised controlled trial. *The Lancet,* 375**,** 2152-2160.

HADLEY, E. B., DICKINSON, D. K., HIRSH-PASEK, K., GOLINKOFF, R. M. & NESBITT, K. T. 2015. Examining the acquisition of vocabulary knowledge depth among preschool students. *Reading Research Quarterly*.

HAYWARD, D. & SCHNEIDER, P. 2000. Effectiveness of teaching story grammar knowledge to pre-school childrne with language impairment. An exploratory study. *Child Language Teaching & Therapy,* 16**,** 255-284.

HYDE-WRIGHT, S. H., GORRIE, B., HAYNES, C. & SHIPMAN, A. 1993. What's in a name? Comparative therapy for word-finding difficulties using semantic and phonological approaches. *Child Language Teaching and Therapy,* 9**,** 214-229.

JUSTICE, L. M., MCGINTY, A. S., CABELL, S. Q., KILDAY, C. R., KNIGHTON, K. & HUFFMAN, G. 2010. Language and Literacy Curriculum Supplement for Preschoolers Who Are Academically At Risk: A Feasibility Study. *Language Speech and Hearing Services in Schools,* 41**,** 161-178.

KASARI, C., GULSRUD, A., FREEMAN, S., PAPARELLA, T. & HELLEMANN, G. 2012. Longitudinal Follow Up of Children with Autism Receiving Targeted Interventions on Joint Attention and Play RH = Targeted Interventions on Joint Attention and Play. *Journal of the American Academy of Child and Adolescent Psychiatry,* 51**,** 487-495.

KENDALL, T., MEGNIN-VIGGARS, O., GOULD, N., TAYLOR, C., BURT, L. R. & BAIRD, G. 2013. Whilst SLTs frequently provide language and communication programmes for schools the majority of *British Medical Journal,* 347**,** f4865.

PeerJ Preprints | https://doi.org/10.7287/peerj.preprints.2951v1 | CC BY 4.0 Open Access | rec: 27 Apr 2017, publ: 27 Apr 2017

LAW, J., GARRETT, Z. & NYE, N. 2003. Speech and Language Therapy Interventions for Children with Primary Speech and Language Delay or Disorder (Cochrane Review). *Cochrane Database of Systematic Reviews,* Issue 3**,** Art.No: CD004110. DOI: 10.1002/14651858.

LAW, J., LEE, W., ROULSTONE, S., WREN, Y., ZENG, B. & LINDSAY, G. 2012. *What works : Interventions for children with speech language and communication needs,* Nottingham, DfE.

LAW, J., REILLY, S. & SNOW, P. C. 2013. Child speech, language and communication need re-examined in a public health context: a new direction for the speech and language therapy profession. *International Journal of Language & Communication Disorders,* 48**,** 486-496.

LAWTON, K. & KASARI, C. 2012. Teacher-implemented joint attention intervention: Pilot randomized controlled study for preschoolers with autism. *Journal of consulting and clinical psychology,* 80**,** 687.

LEE, W. & PRING, T. 2016. Supporting language in schools: Evaluating an intervention for children with delayed language in the early school years. *Child Language Teaching and Therapy,* 32**,** 135-146.

LORD, C., WAGNER, A., ROGERS, S., SZATMARI, P., AMAN, M., CHARMAN, T., DAWSON, G., DURAND, V. M., GROSSMAN, L., GUTHRIE, D., HARRIS, S., KASARI, C., MARCUS, L., MURPHY, S., ODOM, S., PICKLES, A., SCAHILL, L., SHAW, E., SIEGEL, B., SIGMAN, M., STONE, W., SMITH, T. & YODER, P. 2005. Challenges in Evaluating Psychosocial Interventions for Autistic Spectrum Disorders. *Journal of Autism and Developmental Disorders,* 35**,** 695-708.

MARKUSSEN-BROWN, J., JUHL, C. B., PIASTA, S. B., BLESES, D., HØJEN, A. & JUSTICE, L. M. 2017. The effects of language-and literacy-focused professional development on early educators and children: A best-evidence meta-analysis. *Early Childhood Research Quarterly,* 38**,** 97-115.

MCCARTNEY, E., BOYLE, J., ELLIS, S., BANNATYNE, S. & TURNBULL, M. 2011. Indirect language therapy for children with persistent language impairment in mainstream primary schools: outcomes from a cohort intervention. *International Journal of Language & Communication Disorders,* 46**,** 74-82.

MCCARTNEY, E. & MUIR, M. 2016. School leavers with learning disabilities moving from child to adult Speech and Language Therapy (SLT) teams: SLTs' views of successful and less successful transition co-working practices. *Journal of Research in Special Educational Needs***,** n/a-n/a.

MCKEAN, C., REILLY, S., BAVIN, E. L., BRETHERTON, L., CINI, E., CONWAY, L., COOK, F., EADIE, P., PRIOR, M., WAKE, M. & MENSAH, F. 2017. Language Outcomes at 7 Years: Early Predictors and Co-Occurring Difficulties. *Pediatrics*.

MECROW, C., BECKWITH, J. & KLEE, T. 2010. An exploratory trial of the effectiveness of an enhanced consultative approach to delivering speech and language intervention in schools. *International Journal of Language & Communication Disorders,* 45**,** 354-367.

NEUMAN, S. B., NEWMAN, E. H. & DWYER, J. 2011. Educational Effects of a Vocabulary Intervention on Preschoolers' Word Knowledge and Conceptual Development: A Cluster-Randomized Trial. *Reading Research Quarterly,* 46**,** 249-272.

NICE, N. I. F. H. A. C. E. 2013. Autism spectrum disorder in under 19s: support and management London: NICE

OONO, I. P., HONEY, E. J. & MCCONACHIE, H. 2013. Parent-mediated early intervention for young children with autism spectrum disorders (ASD). *Evidence-Based Child Health: A Cochrane Review Journal,* 8**,** 2380-2479.

PARSONS, S., LAW, J. & GASCOIGNE, M. 2005. Teaching receptive vocabulary to children with specific language impairment: a curriculum-based approach. *Child Language Teaching and Therapy,* 21**,** 39-59.

PAUL, R., BISHOP, D. & LEONARD, L. 2000. Predicting outcomes of early expressive language delay: Ethical implications. *Speech and language impairments in children: Causes, characteristics, intervention and outcome***,** 195-209.

PETERSEN, D. B. 2011. A systematic review of narrative-based language intervention with children who have language impairment. *Communication Disorders Quarterly,* 32**,** 207-220.

PeerJ Preprints NOT PEER-REVIEWED

PHILLIPS, B. M. 2014. Promotion of syntactical development and oral comprehension: Development and initial evaluation of a small- group intervention. *Child Language Teaching & Therapy,* 30**,** 63-77.

PICKLES, A., ANDERSON, D. K. & LORD, C. 2014. Heterogeneity and plasticity in the development of language: a 17-year follow-up of children referred early for possible autism. *Journal of Child Psychology and Psychiatry,* 55**,** 1354-1362.

PICKLES, A., LE COUTEUR, A., LEADBITTER, K., SALOMONE, E., COLE-FLETCHER, R., TOBIN, H., GAMMER, I., LOWRY, J., VAMVAKAS, G., BYFORD, S., ALDRED, C., SLONIMS, V., MCCONACHIE, H., HOWLIN, P., PARR, J. R., CHARMAN, T. & GREEN, J. 2016. Parent-mediated social communication therapy for young children with autism (PACT): long-term follow-up of a randomised controlled trial. *The Lancet,* 388**,** 2501-2509.

RESCORLA, L. 2011. Late talkers: do good predictors of outcome exist? *Developmental Disabilities Research Reviews,* 17**,** 141-150.

RESTREPO, M. A., MORGAN, G. P. & THOMPSON, M. S. 2013. The efficacy of a vocabulary intervention for dual-language learners with language impairment. *Journal of Speech, Language, and Hearing Research,* 56**,** 748-765.

REYNOLDS, C. R. & SHAYWITZ, S. E. 2009. Response to Intervention: Ready or not? Or, from wait-to-fail to watch-them-fail. *School Psychology Quarterly,* 24**,** 130.

ROBERTS, M. Y. & KAISER, A. P. 2011. The Effectiveness of Parent-Implemented Language Interventions: A Meta-Analysis. *American Journal of Speech-Language Pathology,* 20**,** 180-199.

ROULSTONE, S., WREN, Y., BAKOPOULOU, I., GOODLAD, S. & LINDSAY, G. L. 2012. Exploring interventions for children and young people with speech, language and communication needs: A study of practice. *In:* DFE (ed.). London.

SCOTTISH_GOVERNMENT 2010. Guidance on Partnership Working between Allied Health Professions and Education, http://www.gov.scot/Resource/Doc/313416/0099357.pdf.

SMITH, C., WILLIAMS, E. & BRYAN, K. in press. A systematic scoping review of speech and language therapists' public health practice for early language development. *International Journal of Language & Communication Disorders***,** n/a-n/a.

SNOW, P. C., EADIE, P. A., CONNELL, J., DALHEIM, B., MCCUSKER, H. J. & MUNRO, J. K. 2014. Oral language supports early literacy: A pilot cluster randomized trial in disadvantaged schools. *International Journal of Speech-Language Pathology,* 16**,** 495-506.

SNOW, P. C., SANGER, D. D., CAIRE, L. M., EADIE, P. A. & DINSLAGE, T. 2015. Improving communication outcomes for young offenders: a proposed response to intervention framework. *International Journal of Language & Communication Disorders,* 50**,** 1-13.

STARLING, J., MUNRO, N., TOGHER, L. & ARCIULI, J. 2012. Training secondary school teachers in instructional language modification techniques to support adolescents with language impairment: a randomized controlled trial. *Language, speech, and hearing services in schools,* 43**,** 474-495.

SUGDEN, E., BAKER, E., MUNRO, N. & WILLIAMS, A. L. 2016. Involvement of parents in intervention for childhood speech sound disorders: a review of the evidence. *International Journal of Language & Communication Disorders***,** n/a-n/a.

TAMBYRAJA, S. R., SCHMITT, M. B., FARQUHARSON, K. & JUSTICE, L. M. 2015. Stability of Language and Literacy Profiles of Children With Language Impairment in the Public Schools. *Journal of speech, language, and hearing research : JSLHR,* 58**,** 1167-1181.

THRONEBURG, R. N., CALVERT, L. K., STURM, J. J., PARAMBOUKAS, A. A. & PAUL, P. J. 2000. A comparison of service delivery models: effects on curricular vocabulary skills in the school setting. *American Journal of Speech-Language Pathology,* 9**,** 10-20.

THURSTON, A., ROSETH, C., O'HARE, L., DAVISON, J. & STARK, P. 2016. Talk of the Town. Evaluation report and executive summary. Education Endowment Foundation.

TOMBLIN, J. B., ZHANG, X., BUCKWALTER, P. & O'BRIEN, M. 2003. The stability of primary language disorder: Four years after kindergarten diagnosis. *Journal of Speech Language and Hearing Research,* 46**,** 1283-1296.

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PeerJ Preprints NOT PEER-REVIEWED

TOSH, R., ARNOTT, W. & SCARINCI, N. in press. Parent-Implemented Home Therapy Programs for Speech and Language: A Systematic Review. *International Journal of Language & Communication Disorders*.

VADASY, P. F., SANDERS, E. A. & LOGAN HERRERA, B. 2015a. Efficacy of Rich Vocabulary Instruction in Fourth-and Fifth-Grade Classrooms. *Journal of Research on Educational Effectiveness,* 8**,** 325-365.

VADASY, P. F., SANDERS, E. A. & NELSON, J. R. 2015b. Effectiveness of supplemental kindergarten vocabulary instruction for English learners: A randomized study of immediate and longer-term effects of two approaches. *Journal of Research on Educational Effectiveness,* 8**,** 490-529.

VAN KLEECK, A., VANDER WOUDE, J. & HAMMETT, L. 2006. Fostering literal and inferential language skills in Head Start preschoolers with language impairment using scripted book-sharing discussions. *American Journal of Speech-Language Pathology,* 15**,** 85-95.

VISSER-BOCHANE, M. I., GERRITS, E., VAN DER SCHANS, C. P., REIJNEVELD, S. A. & LUINGE, M. R. 2017. Atypical speech and language development: a consensus study on clinical signs in the Netherlands. *International Journal of Language & Communication Disorders,* 52**,** 10-20.

WAKE, M., LEVICKIS, P., TOBIN, S., GOLD, L., UKOUMUNNE, O. C., GOLDFELD, S., ZENS, N., LE, H. N. D., LAW, J. & REILLY, S. 2015. Two-Year Outcomes of a Population-Based Intervention for Preschool Language Delay: An RCT. *Pediatrics*.

WONG, C. 2013. A play and joint attention intervention for teachers of young children with autism: A randomized controlled pilot study. *Autism***,** 1362361312474723.

ZAMBRANA, I. M., PONS, F., EADIE, P. & YSTROM, E. 2014. Trajectories of language delay from age 3 to 5: persistence, recovery and late onset. *International Journal of Language & Communication Disorders,* 49**,** 304-316.

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