RUNNING HEAD: Scoping review: Intervention outcomes for school-aged children

A scoping review of intervention outcomes for school students with communication difficulties

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ABSTRACT

Purpose: For speech-language pathologists (SLPs) working in schools, outcome measurement is an important element of practice, enabling us to evaluate the efficacy of our service provision and guiding future decision-making, funding and resource allocation. When selecting outcomes to measure, it is helpful to consider both the level at which change may be occurring and the extent or impact of that change. The primary aim of this review was to identify the outcomes measured in intervention studies for school-aged children with speech, language and communication difficulties (SLCD), using the *International Classification of Functioning, Disability and Health* (ICF; WHO, 2001) to classify the outcomes. A second aim was to identify tools used in research studies to measure the outcomes.

Method: A systematic search of five databases was undertaken to identify papers reporting outcomes for children who had received intervention targeting SLCD. Articles written in English and published between January 2000 and August 2021 were included. The Taxonomy for Categorising Outcome Measures for SLCD (TAXCOMS) was created to enable a review of outcomes and measurement tools.

Results: There were 125 papers included in the final review. Most papers (*n*=109, 87.2%) reported on studies that included outcome measures that captured changes at Body Function level, while approximately half captured Activity level change. Only 24 (19.2%) explored changes to Participation.

Conclusion: Change at the Body Function or Activity levels does not always reflect change at the Participation level. Measuring outcomes at the Participation level enables SLPs to determine the real world impact of the adjustments they have recommended or intervention they have provided. However, in order to measure outcomes at the Participation level, we need the tools for capturing those changes for school-aged students with SLCD.

INTRODUCTION

Children have a right to education and a right to receive supports that will enable them to develop to their full potential and achieve their educational goals. This is recognized in two Articles of the Convention of the Rights of the Child (UNICEF, 1989): Articles 28 and 29. In many countries these rights are integrated into government documents that guide the provision of education. For instance, in Australia, educational goals have been articulated in the Alice Springs (Mparntwe) Education Declaration (2019), signed by the Coalition of Australian Governments (COAG), which states two goals for education in Australia: 1) that the education system promotes excellence and equity; and 2) that children will become confident and creative individuals, successful lifelong learners, and active and informed members of the community (p.4).

Australian curriculum documents, developed to enact the vision of the Alice Springs (Mparntwe) Education Declaration (2019), recognize both explicitly and implicitly the role of speech, language and communication for participation and success in educational settings. Research too, has long identified the link between communication skills and learning as well as academic attainment (e.g., Eadie, 2022; Johnson et al., 2010). It follows, therefore, that children with speech, language and communication difficulties (SLCD) might have reduced participation in a range of school activities (Daniel & McLeod, 2017).

SLCDs are not uncommon among school-aged students. In Australia, they have been identified by teachers as the second most prevalent area of learning need in a study of 14,500 primary and secondary school students, with only specific learning needs being more commonly identified (McLeod & McKinnon, 2007). Students with a history of SLCD are significantly more likely than same-aged peers to have difficulty with literacy, numeracy and approaches to learning (Harrison et al., 2009; McCormack et al., 2011; Tambyraja et al., 2020), and to self-report less enjoyment of school and higher instances of bullying (Esteller-

Cano et al., 2021; McCormack, et al., 2011). Researchers predict significant costs associated with SLCD, based on decreased academic achievement, workforce participation and lost wages; however, intervention has the potential to reduce this impact (Cronin et al., 2020; Le et al., 2022).

Speech-language pathology services in the education system

Speech-language pathologists (SLPs) are one of the professional groups employed by schools to support students with SLCD through their expertise in identifying communication adjustments, or through direct intervention targeting particular speech and language skills that are below the expected level and/or impacting a student's school achievement (ASHA, 2010). Internationally, professional associations have published guidelines and/or statements to facilitate the work of SLPs in schools. For instance, in 2022, Speech Pathology Australia (SPA) released new documents to guide the work of SLPs in education. The *Practice Guideline* (SPA, 2022a) states, "The aim of speech pathology services in education settings is to improve educational outcomes and experiences for children by addressing a range of barriers to access, participation and progress" (p. 9). The accompanying *Position Statement* (SPA, 2022b) includes a number of principles that may guide SLPs' practice, including the need for evidence-based and outcome driven services, and the importance of working in partnership with students, teachers and families to ensure positive outcomes are achieved. Similarly, in the US, ASHA's *Roles and responsibilities of speech-language pathologists in schools* [Professional Issues Statement] recognizes that "SLPs, like all educators, are accountable for student outcomes…data-based decision making, including gathering and interpreting data with individual students, as well as overall program evaluation are essential responsibilities".

It is clear then, that to ensure alignment with the professional associations' guidelines, it is essential that SLPs measure outcomes. This will also ensure that SLPs are engaging in evidence-based practice (i.e., using data from outcome measurements to inform practice), and fulfilling the Code of Ethics of their professional association. Such Codes are typically underpinned by principles such as beneficence and fairness/justice (i.e., seeking to benefit others through our work and to provide services consistent with need) (SPA, 2020). Yet, while the importance of measuring outcomes is known, there is a lack of clarity regarding the outcomes that should be measured to evaluate the effectiveness of speech pathology services.

The ICF and measuring outcomes

The International Classification of Functioning, Disability and Health (ICF; WHO, 2001) is a tool that may help guide outcome selection. It was designed as a health classification system with a primary aim being "to provide a scientific basis for understanding and studying health and health-related states, outcomes and determinants" (p.5). It has a number of recognised applications, including as a research tool "to measure outcomes" and as a clinical tool for "rehabilitation and outcome evaluation" (p.5).

Within the ICF, health and well-being are considered the result of functioning body structures and systems, but also the consequence of being able to undertake activities and participate in daily life (WHO, 2001). The ICF provides a list of body structures and systems, as well as a list of activities/life situations in which we use those structures and systems. Together, they ensure holistic consideration is given to the full range of domains that contribute to health and wellbeing, and thus the outcomes that could be measured when examining the impact of health service provision.

Research and commentaries have suggested specific domains within each component of the ICF that apply to speech-language pathology practice (e.g., McLeod, 2006), which could be

used as a foundation for categorising and selecting the outcomes we measure to evaluate the impact of our service provision on a school student's health and wellbeing. However, a challenge of using the ICF for this purpose is the overlap that seemingly exists, based on the definitions provided, between some components and domains within the framework. For instance, it may be difficult to distinguish between the *mental functions related to the reception of language* (b1670 - defined as "specific mental functions of decoding messages in spoken, written or other forms, such as sign language, to obtain their meaning" and an activity such as *learning to read* (d140 – defined as "developing the competency to read written material…such as recognizing characters and alphabets, sounding out word with correct pronunciation…") (cf. McCormack et al., 2012).

Furthermore, it may be difficult to determine the level being targeted, particularly within the Activity and Participation component. While diagrammatic representation of the ICF framework typically separates these two elements, the coding system does not, which can make it difficult to use the system to explore and categorise Activity outcomes as distinct from Participation outcomes. Yet, the definitions of these two elements within the ICF do provide some scope for delineation.

According to the ICF, *Activity* is the "execution of a task or action by an individual" while *Participation* is "involvement in a life situation" (WHO, 2001, p.14). Thus, the ICF suggests we can look at an outcome and identify if it reflects *capacity* to execute an action in a standardised environment, or *performance* in the actual context in which one lives and participates. The gap between an individual's capacity in a standardized environment and performance in their actual context can then be considered to reflect environmental differences, and so implementing environmental (social, physical, and attitudinal) changes could lead to improved participation. This conceptualisation provides a helpful basis then for

147 operationalising the ICF codes within the Activity and Participation component so as to
148 create a system or taxonomy for categorising and guiding outcome selection.

149 Previous researchers have suggested outcome measurement tools that address different ICF
150 domains for children with speech impairment (McLeod & Threats, 2008) and for preschool
151 children with communication disorders (Cunningham et al., 2017). Baker et al. (2022) have
152 generated a taxonomy, the Speech Outcome Reporting Taxonomy (SORT), and used this to
153 review the types of data collected as outcomes in intervention research for children with
154 phonological impairment. Their taxonomy included eight different domains from those most
155 proximal to intervention targets (e.g., treatment data and generalization data) to those more
156 distal (e.g., activity and participation measures, quality of life measures and measures of
157 impact on others).

158 Their taxonomy was focused on the type of data collected as outcomes (e.g., treatment data,
159 generalization data, Quality of Life), rather than the type of skills being assessed as
160 outcomes. Furthermore, their study reported the results of applying this taxonomy, rather than
161 the process for doing so. Baker et al. (2022)'s results showed that only 11 of 220 papers (5%)
162 measure outcomes at a distal level (e.g., Activity and Participation), which may reflect the
163 challenges with defining what those outcomes look like and ways they may be measured.

164 In the literature, the lack of distinction between Activities and Participation domains means
165 that tools for measuring these components are usually grouped together, despite them being
166 distinct constructs (Threats & Worrall, 2004). One way of addressing this issue may be to
167 create a taxonomy or framework for differentiating between different levels and types of
168 outcomes. Within the current study, we aimed to create a taxonomy to categorise outcome
169 measures and to support the selection of outcome measures in clinical practice. We were then
170 able to address the following objectives:

Research Aim:

- To identify the outcomes measured in current intervention studies and categorise these using a taxonomy based on the ICF.
- To identify tools for measuring outcomes at different levels for school-aged children with SLCD.

METHOD

The scoping review followed a framework outlined by Arksey and O'Malley (2005) and consistent with the PRISMA-ScR guidelines for reporting on scoping reviews (Peters et al., 2021; Tricco et al., 2018). The procedure involved: 1) Identifying the research question; 2) Identifying relevant studies; 3) Study selection; 4) Charting the data; and 5) Collating, summarising and reporting the results. The research questions were outlined in the preceding section and the results will be reported in the next section. The focus of this section is stages 2-4 of the review process.

Identifying relevant studies

A systematic search of five databases (Medline, CINAHL, PsychINFO, Embase, HaPI) was undertaken in November 2021 to identify papers reporting outcomes for children who had received intervention targeting SLCD. A multi-layered search strategy was employed in the database searches to identify relevant papers. Limits were put in place to restrict the search to scholarly papers (i.e., peer-reviewed) published from January 2000 to August 2021.

The search strategy and analysis were informed by previous research into outcome measurement undertaken in speech pathology with other populations (e.g., Calder et al., 2018; Cunningham et al., 2017; Eadie et al., 2006). Different terms referring to speech, language and communication difficulties were used to capture relevant papers. Truncation

was used to ensure papers were not excluded due to morphological differences in terms. A range of terms was also used to capture papers focused on the school-aged population, and papers focused on measuring outcomes or effects of treatment (see Table 1 for a list of search terms).

{Insert Table 1 here}

Study selection

Articles were included if the research design was an interventional study (randomised controlled trial or quasi-experimental design) or single case research design, participants were of school-age (defined as 5 to 18 years, or where attendance at school was explicitly stated in the participant description); and where participants had speech, language and communication difficulties (SLCD), defined as speech and/or language difficulties as a primary diagnosis (that is, not secondary to another known condition). Articles written in English and published between January 2000 and August 2021 were included.

The scoping review process is illustrated in Figure 1. Initially, papers were identified through the database searches and duplicates were removed. Two researchers (authors 1 and 3) screened the titles and abstracts of all papers for the participants' diagnosis and age-group, and papers were removed where this did not match the inclusion criteria. The remaining papers were then sourced to enable full-text review. Arksey and O'Malley (2005) have suggested that inclusion and exclusion criteria can be revised throughout the study based on increased familiarity with the literature. Thus, the research team (all authors) identified further exclusion criteria for the scoping review to assist in narrowing and defining the focus of the study. The reasons for exclusion and numbers of papers identified under each category is provided in Table 2. The papers were then distributed among the research team to determine eligibility and where appropriate to complete the full review.

{Insert Figure 1}

{Insert Table 2}

During the full-text screening, many papers (*n*=607) were excluded due to meeting one or more of the exclusion criteria identified by the research team. Note that some papers met more than one of these exclusion criteria but were not counted twice. Papers were excluded using the first exclusion criterion identified. Following the screen, 125 studies remained to be reviewed.

In selecting papers for the final review, the research team chose to focus on those that included a direct intervention addressing speech and/or language difficulties of unknown origin. As such, papers with outcomes impacting Body Structures and Contextual Factors (Environmental and Personal) may have been excluded from the review (e.g., papers with intervention targeting oral structural impairments or classroom adjustments alone). Given this, in the section that follows the focus is on papers that measured outcomes that could be aligned with domains from the ICF components of Body Functions, Activity, and Participation.

Charting the data

Prior to the review, the team met to consider the elements that needed to be extracted and reported from each of the 125 papers. The following information was recorded to enable a summary of the literature accessed and reviewed: study design; population (including country, clinical presentation, age range and sample size); intervention (including program, target area, dosage, delivery method and time between pre- and post-outcome measurement) and control group details (if applicable). The following information was recorded to enable the research aims to be met: the skill/outcome being measured aligned with the operational

definitions provided in Table 3, and the measurement tool(s) (including age range, method of administration, person and time for administration).

To ensure reliability of the data analysis, two members of the research team (authors 1 and 2) reviewed the ICF categorisation of all outcomes across the 125 papers. After reviewing the categorisation for approximately 20% of the papers, the research team members met to identify discrepancies and discuss their justification for the ICF categories they had applied. This led to the development and refining of operational definitions that could be applied to the categorisation of outcome measures in subsequent studies, which we have named the TAXCOMS (Taxonomy for Categorising Outcome Measurement for SLCD).

TAXCOMS: Taxonomy for Categorising Outcome Measurement for SLCD

The TAXCOMS (Taxonomy for Categorising Outcome Measurement for SLCD) was developed specifically for this study to categorise each outcome of interest and each measurement tool, using the ICF as a framework.. The TAXCOMS is presented in Table 3 and includes five common areas of speech pathology practice: speech, expressive language (spoken), receptive language (spoken), expressive language (written), receptive language (written – i.e., reading). Operational definitions are provided for three different outcome levels associated with each: i.e., skills at a Body Function level which are discrete and contained; tasks at an Activity level which integrate multiple Body Function skills and are undertaken in a standardised setting; and performance at a Participation level which are actions undertaken in a natural environment.

{Insert Table 3}

Previous research that has used the ICF as a framework to consider the association between difficulties with speech and language functions and activities and participation (e.g.,

McCormack et al., 2009; 2011; McLeod, 2006; Washington, 2007) helped guide the identification of relevant codes and operational definitions for each. The intention of the research team was to enable differentiation between codes and levels to ensure they have more clinical relevance and applicability. For instance, for the area of practice related to "speech", the Body Function code of *Articulation* was selected, alongside the Activity code of *Speaking* and the Participation code of *Conversation*. For the range of practice area related to "writing", the Body Function code of *Expression of written language* was selected, alongside the Activity code of *Learning to write* and the Participation code of *Writing*. Once these had been identified, the ICF definitions were then operationalised to reflect how they might be used in practice.

With the TAXCOMS, it was then possible to explore the degree to which those outcomes have been reported in intervention research for school students with SLCD.

RESULTS

Characteristics of research papers included in the review

Many of the papers reported on single case studies or case series with fewer than 10 participants. However, some papers reported comparative research designs, randomised control trials or pseudo-randomised control trials with larger sample sizes, ranging between 10 and 1156 participants. Studies were undertaken in the United States, Canada, United Kingdom, Ireland, New Zealand, and Australia.

The participants had language difficulties (e.g., including reported diagnoses of developmental language disorder, specific language impairment, low language, social communication/pragmatic disorder, narrative difficulties, word-finding difficulties, receptive and/or expressive language impairment) and/or speech difficulties (e.g., including reported

diagnoses of motor speech disorders, speech sound disorders, childhood apraxia of speech, articulation disorder, phonological disorder). Some children in the studies identified experienced additional communication difficulties including stuttering or difficulties with reading comprehension. Within the studies, the participants ranged in age from 4 years to 18 years; however, the majority of studies focused on primary school aged participants.

Interventions reported in each study ranged from published intervention programs to interventions designed by the authors to target the particular needs of the participant(s). The frequency of delivery varied from daily, bi- or tri-weekly to one session per week; with session durations ranging from 15 minutes to 1hr and 40 mins per day. The intervention programs ran for 5 through to 21 weeks. Most were delivered by an SLP or student SLP, but some were co-delivered with teachers and some were delivered by teachers or teaching assistants alone. Some interventions were delivered to individuals, others to student pairs, and others were small group or whole-class interventions. Most were delivered in person, but some were computer-based or delivered online (via telehealth).

Outcomes measured in intervention studies

The first aim of this study was to identify the outcomes measured in current intervention studies and categorise these according to the ICF. The operational definitions provided in Table 3 were used to guide this categorisation and the results are presented in Table 4. The most commonly measured outcomes in intervention studies for school-aged students with SLCD aligned with domains described within the Body Functions component of the ICF (*n*=109, 87.2%). Some papers also included measurement of outcomes aligned with Activity domains (*n*=61, 48.8%), but few measured outcomes aligned with Participation domains (*n*=24, 19.2%). It should be noted that in most papers multiple outcomes were measured and so the total number of papers identified in each section is greater than 125.

{Insert Table 4 here}

Examples of Outcomes and Measurement tools described in intervention studies

The second aim of the study was to identify specific outcomes and examples of measurement tools used in the intervention studies to evaluate outcomes across the different practice areas (speech; spoken language -expressive and receptive; and written language - expressive and receptive language) and the levels (Body Function, Activity, and Participation). In Table 5, examples of outcome measurement tools found within the literature are categorised according to the TAXCOMS. Table 5 demonstrates a working example of using the TAXCOMS, provides examples of the outcomes and measurement tools using the ICF framework and exemplifies how the research team completed the data analysis in this study using the TAXCOMS. In the following sections, the results are broadly summarised.

{Insert Table 5}

Body Functions

In the *speech* area of practice, outcomes at the Body Function level considered accuracy of phoneme production using measurement tools such as the Goldman Fristoe Test of Articulation 2 (Goldman & Fristoe, 2000) or calculations of percentage of consonant correct (PCC) based on conversation samples. In the *spoken language* area of practice, outcomes at Body Function level focused on the use of discrete language skills (such as use of particular morphological endings or knowledge of particularly vocabulary items). These were measured through probes, standardised measures (e.g., Receptive and Expressive One-Word Picture Vocabulary Tests; Brownell, 2010), or subtests within standardised measures (e.g., Clinical Evaluation of Language Fundamentals Preschool 2 (CELF-P2) Word Structure subtest; Semel et al., 2004). In the *written language* area of practice, outcomes at Body Function level

considered phonological awareness using formal and informal tools to measure skills (including Letter-sound knowledge; rhyme identification; reading non-word lists). See Table 5 for further examples.

Activity

In the *speech* area of practice, Activity level outcomes considered intelligibility in phrases and/or sentences, measured in structured tasks or by tools such as the Children's Speech Intelligibility Measure (Wilcox & Morris, 1999). In the *spoken language – expressive* area of practice, Activity Level outcomes considered syntax, narrative and pragmatics via tools such as the Bus Story (Renfrew, 1997) or Expression, Reception and Recall of Narrative Instrument (ERRNI; Bishop, 2004) or subtests within tools such as the Formulating Sentences subtest of the CELF-4 (Semel et al., 2003). Other tools included measures of oral narrative story complexity (macro-structure), analysis of T units and use of target verbs in semi-structured conversational task. In the *spoken language – receptive* area of practice, Activity Level outcomes considered literal and inferential comprehension of passages/stories through formal assessments such the ERRNI (Bishop, 2004), or subtests of tools such as the Assessment of Comprehension and Expression (ACE 6-11 - Inferential comprehension of spoken messages task; Adams et al., 2001) or Oral and Written Language Scales (OWLS: Listening Comprehension; Carrow-Woolfolk, 2011), or informal tasks such as Idiom interpretation and explanation or cloze activities. Other outcomes considered ability to follow multi-step instructions via tools such as the CELF-4 (Concepts and Following Directions Task; Semel et al., 2003).

In the *written language - expression* area of practice, outcomes at the Activity level considered spelling and sentence construction/content as measured by single word spelling lists and dictation or alternatively by analysis of particular elements of essays (e.g., planning,

vocabulary). In the *written language – receptive* area of practice, outcomes included decoding accuracy measured by tasks such as single word reading lists and comprehension (reading a story and answering questions) measured via standardised assessment tools such as the Burt Reading Test (Gilmore et al., 1981) and Neale Analysis of Reading Ability (Neale, 1999).

Participation

In the *speech* area of practice, Participation level outcomes considered communication success/breakdown during communication activities measured by self-reflection or feedback from communication partners or observers. In the *spoken language - expression* area of practice, outcomes considered pragmatic skills via tools such as the Analysis of Language Impaired Children's Conversation (ALICC) (Conversation Dominance, Loquacity, Responsiveness, Response Prob, Prag Prob; Adams et al., 1981) used in real-world contexts and interactions with others via tools such as the Strengths and Difficulties Questionnaire (Goodman, 1997). Informal measures were through gathering perceptions of communication partners (e.g., parents/ teachers). In the *spoken language – receptive* area of practice, outcomes also considered pragmatics via the ALICC (Adams et al., 1981) or a test of pragmatic skills during naturalistic play, and other rating scales completed by parents/teachers such as the CELF4 Pragmatics Rating Scale (Semel et al., 2003) or Children's Communication Checklist-2 (Bishop, 2006) or clinician tools such as the Behaviour Rating Inventory of Executive Function (BRIEF; Gioia et al., 2003). Other tools included the creation of an observation profile and/or child portfolio (completed by parents to identify strengths, difficulties and goal outcomes), parent perception forms (parents list examples of improvement with their child) and the gathering of parent feedback on generalisation of strategies outside the clinic (e.g., to other people/ settings/ activities).

In the *written language* area of practice, Participation level outcomes related to expression (i.e., writing) were measured by assessment of a writing piece completed in the classroom (artefact analysis) to explore language proficiency level; teacher rating of oral language and literacy; written summaries of classroom content. Outcomes related to reception (i.e., reading) at the Participation level were measured by retelling a story and evaluating students' demonstrating understanding of key components.

DISCUSSION

The scoping review described in this paper aimed to explore the outcomes assessed and measurement tools used in intervention studies with school aged students with SLCD in order to identify the levels of attainment typically targeted and/or reported. The ICF was identified as an appropriate framework for categorising the levels of outcomes; however, there was a noted lack of consistency in how domains and definitions within the ICF had been used previously. As such, operational definitions of relevant ICF domains were created and used in the current review and presented in a taxonomy (TAXCOMS: Taxonomy of Communication Outcome Measures) for children with SLCD which can be used to select outcome measures and classify outcomes of speech-language pathology services for school-aged students.

Outcomes measured

As shown in Table 5, the majority of intervention studies included in this review measured and reported outcomes at the level of Body Function and/or Activity, according to our operational definitions. It is the nature of intervention studies that they are often conducted in controlled environments, so outcomes at a Body Function and/or Activity level are likely the most straightforward to measure. Furthermore, diagnosis of SLCD and identification of

intervention targets has typically been based on an assessment exploring Body Functions, and therefore it is easy to reassess using the same measure to review change. However, given that the ultimate aim of intervention in education settings is "to improve educational outcomes and experiences for children" (SPA, 2022a), it is important that the effects of the intervention extend to real-world settings (i.e., Participation level). This is consistent with the notion that the ultimate goal of intervention is generalisation and that intervention goals about generalisation should be explicit ("train to generalise") rather than "train and hope" (Osnes & Lieblein, 2003; Stokes & Baer, 1977).

It may be that change at a Participation level is difficult to measure within the timeframe of most intervention studies. However, it would be beneficial for researchers routinely to schedule post-intervention follow-up data collection of Participation level outcomes to provide evidence that the intervention is effective in real-world activities and settings.

It may also be that a lack of tools for measuring participation outcomes is a factor in the lack of measurement at this level reported in the research studies reviewed for this paper. From a psychometric perspective, measures used to assess outcomes should have evidence of responsiveness (i.e., sensitive to changes over time). Funding for the development of valid, reliable, and responsive tools is needed to support SLPs to measure outcomes at the level of participation.

When Activity or Participation related outcomes were targeted in the studies within this scoping review, these focused on learning and applying knowledge and communication, rather than social relationships. While a focus of education is using oral and written communication for learning, school settings also provide places for students to use communication to build and maintain friendships and social relationships. Particularly as students enter the later primary and secondary school years, social interaction is a priority of

many young people and SLCD can impact this negatively (cf. Durkin & Conti-Ramsden, 2007; Forrest et al., 2018). Thus, it is important for the selection of outcomes at an Activity and/or Participation level to include consideration of this element of education as well.

Another factor potentially impacting the measurement of outcomes at the level of Participation may be the challenge of conceptualising what outcomes at this level look like, and therefore, what measurement of outcomes at this level might entail. The operational definitions and taxonomy (TAXCOMS) presented in this paper might provide a conceptual foundation for future research, scholarly discourse and outcome measurement development.

Supporting students with SLCD at school often requires identification, implementation and monitoring of reasonable adjustments, thus there is a need for intervention research that measures related outcomes (i.e., Environmental Factors) in order to inform our practice. In the current scoping review, studies investigating environmental outcomes were not captured in the search criteria; however, it would be a valuable area for future research. Currently, it is unclear if the lack of measurement of domains aligned with Participation/Environmental Factors is due to a lack of tools to measure outcomes associated with these components. In future research it is important to investigate outcome tools for environmental factors.

Limitations and Future Directions for Research

This review raises a number of avenues for future research, so the possibilities that follow are not an exhaustive list. Instead, they reflect the breadth of areas to explore in this important area of practice.

There is research exploring the use of outcome measurement in other fields of speech pathology and with other populations (see Adair et al., 2018; Calder et al., 2018, Cunningham et al., 2017, Eadie et al., 2006); however, there is little research that has explored if SLPs

working with school students with SLCD (with or without a diagnosis) are routinely measuring outcomes, how they are measuring outcomes or what outcomes they believe are important to measure to show progress and impact. A recent survey of SLPs across Australia, New Zealand, the United Kingdom and Canada provided some insight into the tools being used to measure outcomes for primary school students and the factors that influence choice of tools (authors, in review). It would be helpful to expand such a survey to other countries and capture those working with secondary school students as well. It would be interesting to see if the taxonomy presented in the current paper could be applied to such research, or alternatively whether the taxonomy had perceived/actual clinical value in supporting SLPs to identify and administer outcome measurement.

This review revealed a number of researchers had chosen to measure outcomes using probes they developed for the purpose. It would be interesting to explore the nature/content of those probes further and the reason for their development, similar to the study undertaken by Limbrick et al. (2013) to explore the nature and rationale behind the creation of informal speech assessments.

In the future, it would be beneficial to review studies undertaken with children speaking languages other than English also, and reviewing the outcomes measured within those. Similarly, it would be helpful to consider studies that have been published in venues other than peer-reviewed journals, to avoid the potential of publication bias influencing the data gathered and reviewed. Finally, it may be of benefit to consider additional information about the authors and funding of the research to acknowledge when this may have influenced the measurement approaches used.

In order to guide our identification of the outcomes that should be measured following intervention, it is important to consider the views of those receiving intervention and their

significant others. A qualitative study has begun the process of exploring client preferences – that is, the outcomes desired by school students attending speech pathology service and families. The themes that emerged from that study suggest the confidence and capacity to participate might be more important than successful specific communication goals, and the support and encouragement provided by the SLP is a key contributor to a positive experience (authors, in preparation). Finally, it should be noted that this study identified outcome measures but did not examine the evidence for use of the measures identified in intervention studies so this scoping study (and the TAXCOMS presented here) doesn't provide recommendations for which measures to use.

Conclusion

The ICF provides a useful framework for exploring the reported health outcomes for individuals who have received intervention in clinical practice and/or research, and for determining the level of improvement (i.e., improved function/skill; ability to use that function/skill in a structured activity or use within everyday life activities). For instance, speech-language pathology outcomes for school students may include changes to a student's speech production, or changes to that student's ability to use those skills in life activities such as participating in learning activities in class and social interactions in the playground. If the goals of the Alice Springs (Mparntwe) Education Declaration (2019) are to be met, it is the latter type of outcome that is of most interest. While research over the years has shown that speech pathology intervention is effective at improving speech and language skills (Law et al., 2003; National Academies of Sciences, Engineering, and Medicine, 2016). The results of this review suggest most research has focused on measurement at that level of discrete functions, or at the level of a structured activity. However, it is unclear whether these

improvements in speech and language skills translate to real-world, functional improvements in a child's participation at school and educational outcomes. The taxonomy presented in this paper (TAXCOMS: Taxonomy of Outcome Measures for children with SLCD) might assist with identification of tools/strategies for measuring outcomes at a participation level, and encourage those implementing intervention in research and clinical practice to consider how and when they could gather this data and use it to inform their clinical decisions.

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DATA AVAILABILITY STATEMENT

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Figure 1.

PRISMA flow diagram for new systematic reviews which included searches of databases, registers and other sources. Adapted from: Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *British Medical Journal, 372*(71). doi: 10.1136/bmj.n71.