

■ A Pilot Study to Evaluate a New Early Screening Instrument for Speech and Language Delays

■ Une étude pilote pour évaluer un nouvel instrument de dépistage des retards de la parole et du langage

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Abstract

The early identification of speech and language delays is a crucial first step in the effective prevention of developmental and socioemotional problems. Children's early cognitive and language development has bearing on later development and readiness for learning and social competence. The Speech and Language Pathology Early Screening Instrument (SLPESI) was developed to identify possible speech and language delays in 18 to 21-month-old children. The purpose of the present study was to pilot the SLPESI and assess its ability to identify speech and language delays in children of this age group. A total of 252 children, aged 17-23 months, participated in the SLPESI. The test took less than five minutes to administer. Of the 252 children screened, 56 (22%) were recommended for assessment by a Speech and Language Pathologist (S-LP) based on the results of the questionnaire. Of those recommended, 34 came in for assessment and 31 (91%) were assessed and diagnosed with speech and language delays ranging from mild to severe. In order to examine the reliability of the SLPESI, 19 children who passed the initial screening procedure were brought in for a follow-up assessment. Of these, 18 had age-appropriate speech and language skills and one had a mild to moderate speech and language delay. The SLPESI proved to be a quick and effective screening instrument that may help predict speech and language delays in children 18-21 months of age.

Abrégé

La détection précoce des retards de la parole et du langage est la première étape décisive menant à la prévention efficace des problèmes de développement et socio-affectifs. Le développement cognitif et du langage précoce chez un enfant a une influence sur son développement ultérieur ainsi que sur sa capacité à apprendre et ses aptitudes sociales. L'instrument de dépistage précoce en orthophonie (IDPO) a été conçu pour identifier les troubles éventuels de la parole et du langage chez les enfants de 18 à 21 mois. Le but de la présente étude était d'administrer l'IDPO et d'évaluer sa capacité à identifier les retards de la parole et du langage chez les enfants de ce groupe d'âge. Au total, 252 enfants âgés de 17 à 23 mois ont participé à l'étude. L'instrument prenait moins de cinq minutes à compléter. À partir des résultats du questionnaire, 56 (22 %) des 252 participants ont été référés à un orthophoniste pour une évaluation. Des 56 enfants référés, 34 se sont présentés à l'évaluation et 31 (91 %) ont été évalués et diagnostiqués avec un retard allant de léger à sévère. Afin d'examiner la fiabilité de l'IDPO, 19 des enfants qui avaient passé le questionnaire de dépistage ont été rappelés pour un suivi. De ce nombre, 18 possédaient les compétences normales de la parole et du langage pour leur âge et un seul avait un retard léger à modéré. L'IDPO est donc un outil rapide et efficace qui pourrait prédire si un enfant de 18 à 21 mois a un retard de la parole et du langage.

Key words: Early intervention, speech and language delays, screening, 18-month-olds

Speech and language delays are common and serious developmental problems which affect many children. A speech and language delay is typically defined as a significant deficit in the child's level of development of speech and language (Fey, 1986). While reported prevalence rates vary widely (Burden, Stott, Forge, & Goodyer, 1996; Law, Garrett, & Nye, 2005) it has been estimated that up to 11% of Canadian children in kindergarten may suffer from some form of language delay (Rome-Flanders & Cronk, 1998).

The identification of speech and language delays and the subsequent referral of children to appropriate intervention programs are the primary goals of screening. Speech and language delays have been shown to negatively impact not only later communication and literacy abilities but also the development of other academic areas, such as mathematics and sciences (Aram & Hall, 1989; Fey, Catts, & Larrivee, 1995; Bickford-Smith, Wijayatilake, & Woods, 2005; Shriberg & Kwiatkowski, 1994; Gersten, Jordan, & Flojo, 2005; Lewis, Freebairn & Taylor, 2000). Negative behavioural, emotional, and social consequences have also been reported (Boyle, Gillham, & Smith, 1996; Rome-Flanders and Cronk, 1998).

The timing of an intervention is also important. The general view is that positive outcomes are most likely when intervention occurs at the earliest possible time after diagnosis of a delay (Aram & Hall, 1989; Law et al., 2005; Whitehurst & Fischel, 1994). While there is evidence that intervention beyond age three can have a positive impact (Bernhardt & Major, 2005; Law et al., 2005; van Agt, van der tege, de Ridder-Sluiters, Verhoeven, de Koning, 2007), it has been argued that the effectiveness of intervention may diminish after this age since language patterns have already been established (Law, Boyle, Harris, Harkness, & Nye, 2000). Greenspan and Shanker (2004) have proposed that 18 months of age, a period when synaptic plasticity is more evident than later in childhood, is an optimal time for developmental screening and early intervention. Screening for speech and language delays in children before age two is often done through parent reports. Commonly used parent report screening instruments include the *Denver Developmental Screening Test* (DDST; Frankenburg, Dodds, Archer, Bresnick, Maschka, Edelman, & Shapiro, 1992), the *Minnesota Child Development Inventory* (MCDI; Ireton & Thwing, 1974) and the *MacArthur-Bates Communicative Development Inventories* (Fenson, Marchman, Thal, Dale, Bates, & Reznick, 2003). The DDST is an instrument used to screen children aged two weeks to six years, and includes language skills, as well as gross and fine motor skills. The MCDI is used to screen children two months of age to six years; the 320 item instrument assesses cognition, language, motor development, social and emotional development, and adaptive behavior. These commonly used instruments take a substantial amount of time to administer and require that aspects of development not central to speech and language also be assessed. Even inventories that focus primarily on communication and language like the *MacArthur-Bates Communicative Development Inventories*

(Fenson, et al., 2003) take considerable time for parents to complete.

While there are many other behaviours (e.g. imitation, use of gestures) that are used to identify speech and language delays, the number of spoken words continues to be a key indicator on screening instruments. Most developmental research suggests that 18 month old children should be able to say 10-20 words (Reznick & Goldfield, 1992; Girolametto, Wiigs, Smyth, Weitzman, & Pearce, 2001), although several screening instruments indicate impairment only with substantially fewer spoken words. For example, the Nipissing District Developmental Screen (NDDS; 2000) indicates that children 18 months of age should speak five or more words. The Ages & Stages Questionnaires, Third Edition (Squires & Bricker, 2009) indicates that 18 month old children should speak at least eight words in addition to informal referents to parents. Since this sets the bar low, children with mild speech and language difficulties may not be identified by these instruments. This is an important issue as it has been shown that even children with mild impairments, such as late-talkers, may have long-term language problems (Rice, Taylor and Zubrick, 2008; Zubrick, Taylor, Rice, and Slegers, 2007). Thus, there is a need for a screening instrument that is quickly and easily administered and able to identify children that may be diagnosed with mild speech and language delays.

The Speech and Language Pathology Early Screening Instrument (SLPESI) was created in 2006 by the four speech-language pathologists (S-LPs) who authored this report. It was designed to identify possible speech and language delays in children 18-21 months of age. The purpose of the present research was to conduct a pilot study to assess the validity of the SLPESI, particularly its ability to identify children with mild speech and language delays. It was hypothesized that the SLPESI would accurately identify speech and language delays of all severity levels in 18-21 month old children.

Method

Participants

A total of 252 children aged 17-23 months, who were receiving immunizations at public health clinics, participated in this study. Thirteen participants fell outside the original intended target age (seven were 17 months, five were 22 months and one was 23 months). The participants were a mix of urban and rural families who accessed immunization clinics in three different central Alberta communities.

Speech and Language Pathology Early Screening Instrument

The SLPESI consists of six "yes or no" questions to be answered by parents with reference to their child. It takes less than five minutes to administer. The questions are based upon developmental norms (see references in Table 1) and refer to speech and language behaviours that have been shown to be indicative of speech and language delays

(Tsao, Liu, & Kuhl, 2004; Olswang, Rodriguez, & Timler, 1998; Sheridan, 1975). To derive the SLPESI questions, the S-LPs began with a diverse list of age appropriate speech and language skills. Through an informed analysis and discussion and in the context of their clinical experience, only skills deemed essential in making a differential diagnosis were included in the instrument. A response of “no” to any of the questions on the instrument is considered indicative of a potential speech and language delay, and thus identifies the need for subsequent in-depth assessment by a S-LP. The instrument also includes a comment section in which parents and the administrator can record comments regarding the child’s difficulties.

Procedure

Administration of the screening instrument took place during 18-month immunization appointments at public health clinics. The administrator, a student research assistant, received SLPESI training from a S-LP. Administrator training entailed protocol review, observation of the screening instrument administration, and supervised practice by a S-LP. As a large majority of children are immunized through public health clinics, it was reasoned that this would be an ideal opportunity to reach a large number of children with the screening procedure. It was anticipated that few parents would decline the opportunity to have their child screened due to the ease and brevity of the administration process. Following an immunization, it is recommended to parents that they wait approximately 15 minutes in the event of an adverse reaction. It was during this period that parents were approached by the administrator and asked to consider having their child participate in the study. Upon informed consent, parents were asked to complete the self-report SLPESI and were also asked whether they could be contacted in the future regarding the study.

After parents had completed the SLPESI, a debriefing with the administrator occurred. The administrator informed parents that there is a wide range of speech and language skills considered normal at 18-21 months. It was indicated to parents that a “no” answer may suggest a speech and language problem but it was emphasized that this was only an initial screening procedure and was not diagnostic. Parents were then given information sheets containing speech and language development norms for children 18 months to five years of age. Parents were encouraged to follow their child’s development using these norms as a reference. Parents were also provided with S-LP contact information at this time. During the interaction with the family, the administrator recorded qualitative information on the SLPESI form. This included both the specific comments parents made about their child’s development (e.g. “seems to know information but does not verbalize”), as well as general comments about their concerns (e.g. doctor told them not to worry about speech).

Where the screening procedure indicated a S-LP assessment was not required, parents were invited to contact a S-LP if they had future concerns regarding their

child’s speech and language development. Parents were also informed that although the screening procedure suggested there were no current concerns with their child’s speech and language development, they might be contacted and asked to come in for a subsequent assessment to assess the validity of the SLPESI. Accordingly, 19 of these children were later randomly selected for assessment by a S-LP.

In the event that a parent responded “no” to any of the screening questions, the child was referred to a S-LP for assessment. If the parent agreed, they were contacted within one week by a S-LP to arrange an assessment appointment. Assessments were completed at no charge, as part of regular health service delivery in the three communities. Each assessment took approximately one hour to complete. The assessment included the administration of the Receptive Expressive Emergent Language Test – 3rd Edition (REEL-3; Bzoch, League, & Brown, 2003), a standardized tool that uses primary caregivers as informants for assessing receptive and expressive language skills in young children (0-36 months). A raw score was calculated and then converted to an ability score and a percentile rank equivalency. Delays were defined as mild (7-15 percentile), moderate (2-6 percentile), or severe (<2 percentile) in accordance with the severity guidelines for developmental language delay provided by the Alberta Health Unit Speech and Language Pathology Standards document (Alberta Ministry of Health, 1993). As well, information about consonant inventory and social communication skills was gathered by observation, parent report and interaction with the child, which is common practice in speech and language pathology when assessing children of this young age. The information obtained on consonant inventory and social communication skills was not used in determining severity, but rather considered relevant information that may be monitored in the future.

The assessment determined whether a speech and language delay existed, the type and severity of the delay and service recommendations. Service recommendations included: no need for further service, monitoring the child’s development, or beginning a treatment program. The S-LPs were not blind to the screening results. The pilot study was reviewed and approved by the Community Research Ethics Board of Alberta.

Data Analysis

Descriptive statistics were used to determine the frequency and severity of speech and language delays among the children whose families brought them in for follow-up assessments. Investigators estimated the positive predictive value (the percentage of children identified as needing S-LP assessment who actually had a speech and language delay), and negative predictive value (the percentage of children correctly identified as not having a speech and language delay), and provided exact binomial 95% confidence intervals for these estimates of the SLPESI. Bayes Theorem (Devender, 1996) was used to estimate the sensitivity and specificity of the screening instrument (see Appendix B). Finally, correlation analysis was used to determine the significance of relationships among the dependent measures.

Table 1
Summary of the “No” Responses

Question	n.	% of “No” Responses
1. Does your child use 10-20 words? Girolametto et al. 2001; Rescorla, Roberts & Dahlsgaard, 1997; Rescorla, 1989	48	85.7
2. Does your child imitate words and sounds? Downey, Mraz, Knott, Knutson, Holte, Van Dyke, 2002; Olswang & Bain, 1996; Olswang, Rodriguez & Timler, 1998	8	14.3
3. Does your child often babble and make vocal sounds? Kagan, 1971; Paul & Jennings, 1992; Rescorla & Ratner, 1996; Stoel-Gammon, 1991	3	5.4
4. Will he/she bring a familiar object from another room? Downey et al., 2002; Thal et al., 2004	3	5.4
5. Can your child point to some body parts? Bates, Bretherton, & Snyder, 1988; Downey et al., 2002	15	26.8
6. Does your child respond to simple questions? Bonifacio, Girolametto, Bulligan, Callegari, Vignola, & Zocconi, 2007, Olswang et al., 1998	5	8.9

Results

Descriptive Statistics

A total of 255 parents were approached to participate in the study. Of these, 252 agreed to participate and their children were screened for speech and language deficits using the SLPESI. The average age of participants screened with the SLPESI was 18.7 months (SD = 1.1). Of the 252 children screened, 22% (n = 56; 95% CI = [18% - 28%]) of their parents responded “no” to at least one question on the SLPESI and were recommended for S-LP assessment. Of the 56 children recommended for assessment, 62.5% (n = 35) were male and 37.5% (n = 21) were female. Sixty-one percent (n = 34) of the children recommended for S-LP assessment received it, while 39% (n = 22) did not, as their parents declined the opportunity. Of those recommended for assessment, there was no significant difference in the total number of “no” responses on the SLPESI between the group that returned for S-LP assessment (mean = 1.5; SD = .7) and those that did not return for assessment (mean = 1.4; SD = .7). Of the 34 who came in for assessment, 31 (91%) were diagnosed with a speech and language delay. The remaining three children presented with age appropriate skills. In order to assess the possibility of false negatives, 19 children, who were randomly selected from the 196 that passed the screening and thus had zero “no” responses, were assessed by a S-LP. Eighteen (95%) had age appropriate speech and language skills and one was diagnosed with a mild to moderate speech and language delay.

Based on the 34 children whose parents brought them in for follow-up assessment, the sensitivity of the screening

instrument was calculated to be 0.83 resulting in a false negative rate equal to 17%. The specificity of the screening instrument was calculated to be 0.97, resulting in a false positive rate of only 3%. In addition, a significant correlation was found between the screening and assessment results ($r = .82, p < .01$), so children who were recommended for assessment were likely to be diagnosed with speech and language delays.

Severity

The severity of speech and language delays for children who came in for S-LP assessment as a result of the screening procedure was as follows: the largest proportion of children who did not pass were found to have a mild speech delay (n = 12; 35.3%); six children (17.6%) had mild to moderate delays; five (14.7%) had moderate delays; four (11.8%) had moderate to severe delays; four (11.8%) had severe delays; and three (8.8%) children had age appropriate language skills. For the 34 children who came in for the follow-up assessment, there was no significant correlation found between degree of severity and the number of “No” responses on the SLPESI.

SLPESI Questions

Table 1 presents a summary of the “no” responses from the SLPESI. The two most common questions that parents answered “no” to on the SLPESI were question 1, “Does your child use 10-20 words?” (85.7%; n = 48) and question 2, “Can your child point to some body parts?” (26.8%; n = 15).

Discussion

As hypothesized, the SLPESI was found to be a robust indicator of speech and language delays in 18-21 month old children. Thirty-one of the 34 children (91%) who were recommended for and whose parents agreed to a S-LP assessment as a result of the screening procedure were subsequently diagnosed with speech and language delays ranging from mild to severe. Despite its simplicity, the instrument showed high estimated sensitivity and specificity.

Research indicates that typically developing 18-month-old children use at least 10-20 words (Girolametto et al., 2001). While the number of words spoken was not explicitly recorded, the high sensitivity of the instrument suggests that it may be effective in identifying those with mild delays. While some of these children may be late talkers who will eventually develop normal language, up to 25% will not, emphasizing a need for early identification and intervention (Agin, Geng, & Nicholl, 2003; Thal, Reilly, Seibert, Jeffries, & Fenson, 2004; Paul & Fountain, 1999; Whitehurst & Fischel, 1994).

Table 1 suggests that questions one, three, and five of the SLPESI may be sufficient to identify the majority of speech and language delays. Using cross tabulation calculations, it was determined that of the 56 children identified by the screening instrument as having a speech and language delay, 55 (98%) would have been identified using questions one, three and five alone. Prior to revising the SLPESI, evaluation in a larger population would be required.

The choice of the immunization clinic as the venue for this research turned out to be fortuitous. The parents had time and were willing to have their 17 to 23-month-old children screened for speech and language delays. The opportunity to participate was declined for only three of 255 children. In the area in which the study was conducted, 70% of children participate in 18-month immunization clinics. Therefore, these clinics are an effective avenue for screening a large percentage of the population. Given the SLPESI's ease and clarity of administration, there were few questions regarding procedure posed to the administrator. The SLPESI could even be completed by a parent.

Although a majority (61%; $n=34$) of the parents agreed to the recommended assessment, it was concerning that a substantial proportion (39%; $n=22$) of families did not. We did not investigate the parents' reasons systematically. However, qualitative information and observations from the study suggest that this may reflect a lack of knowledge regarding developmental milestones and the importance of early intervention. In the administrator's recorded comments, those who refused the referral often expressed that they had no concerns about their child's development. Several parents also commented that their general practitioner had told them not to be concerned about their child's lack of language development. It appears, therefore, that there may be a need for education initiatives pertaining to the availability and potential benefits of early intervention for speech and language delays, targeting

not only parents, but also physicians and other potential referral sources such as public health nurses.

Shriberg and Kwiatkowski (1994) found that children with an early history of language impairment may be at risk for continuing impairment and delays in acquisition of literacy skills. Although many children's delays resolve with age (Agin, Geng, & Nicholl, 2003; Law et al., 2005), some children may experience significant problems in later literacy (Donlan, 1998; Bickford-Smith, Wijayatilake, & Woods, 2005) and are at risk for language-based learning disabilities (Agin, Geng, & Nicholl, 2003). Early speech and language skills are also a crucial indicator of future educational success (Bickford-Smith et al., 2005). Moreover, speech and language delays are related to difficulties in the development of skills in other academic areas, such as mathematics (Gersten, Jordan, & Flojo, 2005) and have been associated with social, emotional, and/or behavioral problems (Boyle, Gillham, & Smith, 1996; Rome-Flanders & Cronk, 1998). Given these outcomes, there is a clear need for accurate screening, diagnosis and intervention of speech and language delays. It has been suggested that the timing of speech and language intervention is important in predicting its success, with 18 months being optimal (Greenspan & Shanker, 2004). The results from this first study indicates that the SLPESI may be a useful tool for this purpose.

Limitations

Demographic information was limited to age and gender. While it was felt that requesting additional more sensitive demographic information, such as ethnicity and socioeconomic status, might be perceived as intrusive by parents, clearly such data are relevant to some of the study's outcomes and should be obtained in future studies using the SLPESI.

It is important to note that the S-LPs who conducted the assessments were aware of the screening results. Although it is standard practice for S-LPs to review screening results or other relevant information prior to assessment, this does introduce potential bias. The current study used a single standardized tool (the REEL-3), which includes observation, parent report, and interaction with the child to determine diagnosis. The use of additional assessment tools may have enhanced confidence in the accuracy of the diagnosis.

While the SLPESI proved to have high estimated specificity and sensitivity in the study, reliability estimates could not be determined, as we did not obtain repeated measurements in the population screened. In addition, as this screening instrument required a single response to any condition for the test to be considered a positive result, this precluded the test of internal consistency. The SLPESI contained six questions. Regression models for item selection ideally would be used to examine the contribution of each question in its ability to identify speech and language delays. However, there were insufficient numbers of outcomes, positive responses for some items, and co-linearity among items to perform such analyses.

Speech and language assessments were not completed on 22 of the 56 children who screened positive on the SLPESI as their parents declined the opportunity for evaluation. Therefore, a diagnosis could not be determined for these children which limits the interpretation of our findings. Additionally, 19 of the 196 children who screened negative on the SLPESI were randomly selected for a speech and language assessment. Diagnostic information on the remaining 177 children was not obtained.

Future validation research should include the collection of additional demographic information, such as socioeconomic status, and the administration of more than one standardized assessment tool by clinicians who are blind to the screening process. Furthermore, larger samples and diagnostic information on all participants is required to validate the SLPESI, and this research should include test-retest reliability and inter-rater reliability assessments. A potential direction for continued research on late talkers may be to examine whether a difference exists between children who receive early intervention and those who receive either later or no intervention in the context of the impact on later academic success.

Conclusion

While there is a need for further validation of the SLPESI, these preliminary results suggest that it shows promise as an efficient and accurate screening instrument for identifying possible speech and language delays in children 18-21 months of age. Of particular interest was the SLPESI's accuracy in identifying children who later scored in the mild range of language delay on the REEL-3. Should future research establish validity, administration of the SLPESI at 18-month immunization clinics would allow children to be identified and assessed at this early age. This would translate into more timely initiation of treatment and, hopefully, improved outcomes.

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Appendix 1

The Speech and Language Pathology Early Screening Instrument

Name: _____ **Birth Date:** _____

Parents: _____ **Phone:** _____ / _____

Address: _____ **E-Mail:** _____

Parent Questionnaire:

(Please circle Yes or No)

- | | | |
|-------------------------------------------------------------------------------------------------------------|-----|----|
| 1. Does your child use 10-20 words? | Yes | No |
| 2. Does your child imitate words and sounds? | Yes | No |
| 3. Does your child often babble and make vocal sounds? | Yes | No |
| 4. Will he/she bring a familiar object from another room when asked? e.g. Go get your teddy from your room. | Yes | No |
| 5. Can your child point to some body parts? e.g. nose, tummy | Yes | No |
| 6. Does your child respond to simple questions? E.g. «Where is Mommy?» | Yes | No |

PARENT'S COMMENTS:

ADMINISTRATOR'S COMMENTS:

DATE: _____

Appendix 2

Positive Predictive and Negative Predictive Values Associated with the SLPESI

255 Parents approached

252 Screened; 56 Test Positive

34 Assessed at follow-up; 31 Diagnosed with speech/language delay

19 Randomly selected from those testing negative; 1 Diagnosed with speech/language delay

Let T = Test; D= speech/language delay

$P(T+) = 56/252 = 22\%$ (95% CI = [18 – 28%] exact binomial confidence interval)

$PPV = P(D+|T+) = 31/34 = 91\%$ (95% CI = [78 – 97%])

$NPV = P(D+|T-) = 18/19 = 95\%$ (95% CI = [75 – 99%])

By Bayes' theorem:

$$\begin{aligned} \text{Sensitivity} &= P(T+|D+) = P(T+ D+)/P(D+) = [P(D+|T+) \times P(T+)]/[P(D+|T+) \times P(T+) + P(D+|T-) \times P(T-)] \\ &= [.91 \times .22]/[.91 \times .22 + 1/19 \times .78] = 0.83 \end{aligned}$$

False Negative rate = $100 \times (1 - \text{sensitivity}) = 17\%$

$$\begin{aligned} \text{Specificity} &= P(T-|D-) = [P(D-|T-) \times P(T-)]/[P(D-|T-) \times P(T-) + P(D-|T+) \times P(T+)] \\ &= [(.95) \times .78]/[(.95) \times .78 + .09 \times .22] = 0.97 \end{aligned}$$

False Positive rate = $100 \times (1 - \text{specificity}) = 3\%$