Characterizing early detection of language difficulties in children born preterm

Julie Boyer [a,b,*], Cyril Flamant [b,c,d], Gerald Boussicault [c], Isabelle Berlie [d], Géraldine Gascoin [d,f], Bernard Branger [d], Sylvie N'Guyen The Tich [d,e], Jean-Christophe Rozé [b,c,d]

[a] Department of Otolaryngology (ENT), Nantes University Hospital, France
[b] Centre d'Investigation Clinique INSERM CIC004, University Hospital of Nantes, France
[c] Nantes University, Department of Neonatal Medicine, University Hospital of Nantes, France
[d] "Loire Infant Follow-up Team" (LIFT) Network, Pays de Loire, France
[e] Angers University, Department of Neuropediatrics, University Hospital of Angers, France
[f] Angers University, Department of Neonatal Medicine, University Hospital of Angers, France

ARTICLE INFO

ABSTRACT

Background: The optimal age for assessing language difficulties in premature children remains unclear.
Aims: To determine the most predictive and earliest screening tool for later language difficulties on children born preterm.
Study design: A prospective population-based study in the Loire Infant Follow-up Team LIFT
Subjects: All children born <35 weeks of gestation between 2003 and 2005 were assessed at corrected ages by four screening tools: the Ages & Stages Questionnaire (ASQ) communication scale at 18 and 24 months, the language items of Brunet Lezine test at 24 months, and the "Epreuves de Repérage des Troubles du Langage" (ERTL) at 4 years.
Outcome measures: After 5 years, the kindergarten teacher evaluated the vocabulary, grammar and pronunciation capacities of the child in comparison with the classroom performances.
Results: Among 1957 infants enrolled at discharge, 947 were assessed by their teacher with 12.2% (n = 116) of language difficulties. Full data at all time points were available for 426 infants. The area under curve of the receiver operator characteristic curve obtained for the ASQ communication scale at 18 months was significantly lower (0.65 ± 0.09) than that obtained at 24 months (0.77 ± 0.08) and the languages items of Brunet Lezine test at 24 months (0.77 ± 0.08), and the ERTL at 4 years (0.76 ± 0.09). The optimal cut-off value for ASQ communication at 24 months is ≤45 [sensitivity of 0.79 (95%CI: 0.70–0.86); specificity of 0.63 (95%CI: 0.59–0.66)].
Conclusions: The Ages & Stages Questionnaire communication scale at 24 corrected months appears as an acceptable test at an early time point to identify preterm children at risk of later language difficulties.

1. Introduction

Infants born preterm (<35 weeks of gestational age) are at particular risk for a range of impairments, including language dysfunction. The risk of developing latter language difficulties is described as higher in children born preterm than children born at term [1–3]. Although the prevalence of cognitive and neuromotor impairment decreases with increasing gestational age [4], children born at 33–34 weeks of gestation should also be carefully monitored to ensure prompt detection and management of neurodevelopmental impairment [5]. Even in the absence of neurological disorder, infants born preterm appeared to obtain lower performance scores than control full-term infants on grammar, vocabulary and speech pronunciation tests [1]. In a recent meta-analysis, language difficulties remained present throughout primary school, a period of time during which language development should become more stable and adult-like [3].

To identify infants born preterm at risk of language difficulties, screening tests are used at different ages by several interveners as parents, psychologists and/or teachers. The validity of parental report is described in literature [6], particularly at 24 months [7]. The Ages & Stages Questionnaire (ASQ) has been validated as an efficient screening tool [8,9], even compared to formal psychometric assessment tools, such as the Bayley Scales of Infant Development [10] or the Brunet–Lezine test [11]. Moreover, the teacher reports seem helpful for an early detection of learning problems [12,13], but with limits [14].

Identification of children at risk for developmental delay or related problems may lead to intervention services and family assistance at a young age when chances for improvement are best. This rationale

* Corresponding author at: Department of otolaryngology (ENT), Nantes University Hospital, France.
E-mail address: julie.boyer@chu-nantes.fr (J. Boyer).

supports preschool screening for speech and language delay, or primary language impairment/disorder, as a part of routine well-child care [15]. Some general interventional follow-up programs for children born preterm have been developed and appear to be effective [16–18]. An early identification of language difficulties should be followed by systematic language-focused interventions in infants born preterm [2].

Although the benefits of the early detection of language difficulties among infants born preterm are clear [2], the performance of screening tests should be improved to target interventions at an earlier stage in children with the highest risk of long-lasting language difficulties [15, 16]. However, the appropriate age for their assessment is unclear [15], but it should take place before primary school. The aim of this longitudinal population-based study was to determine the most predictive screening tool at the earliest age for the detection of children born preterm at risk of developing language difficulties.

2. Materials and methods

2.1. Study population and data collection

We included all surviving children born between January 2003 and December 2005 at less than 35 weeks of gestation and enrolled in the LIFT (Loire Infant Follow-Up Team) cohort [19], a population-based cohort of infants born in the Pays de la Loire region in Western France. Written consent was obtained from all parents or their proxy before inclusion. This cohort is registered at the French CNIL (The National Commission for Information Technology and Civil Liberties, or Commission Nationale de l'Informatique et des Libertés, No. 85111). The following perinatal data were recorded: gestational age, birthweight, cranial ultrasound/magnetic resonance imaging (MRI) abnormalities, and duration of oxygen therapy; as the socioeconomic status of parents.

2.2. Baseline assessments

Language ability was assessed at 18 and 24 months of corrected age, using 6 items (Table 1) from the communication section of the Ages & Stages Questionnaire (second edition) [8,20], filled as described in the guidelines [21]. This yielded to a communication specific score. The questionnaires were filled before the medical and psychological assessment not to influence parents' responses. Also at 24 months, the developmental quotient (DQ) is determined by a specialized psychologist based on the revised Brunet–Lezine Test. It is an early childhood psychomotor test developed in France from 1943 and revised between 1994 and 1996 on a sample of 1032 French children [11], with rigorous methods including the evaluation of test–retest reliability and internal reliability, both of which were high [9]. The test is divided in 4 sections: posture, eye movements, socialization and language. Only the language section ($DQ_{language}$) was analyzed with 3 item sub-tests: "*Does the child use his own surname when he talks about himself?*"; "*Does the child make 2–3 words sentences?*"; "*Can he name 6 pictures on 15?*".

At 4 years, the "Epreuves de Repérage des Troubles du Langage", divided in four tests (words' repetition, sentences' repetition, prepositions well using and sentences' constructions), were performed, as a validated test for French-speaking countries commonly used to screen and monitor children with language difficulties [22–24].

2.3. Outcome assessment

After 5 years old, during their 6th year of follow-up in the LIFT cohort, the kindergarten teachers were asked by the parents to complete a questionnaire about school performance for each child. This validated questionnaire [25], used by the French Education Ministry to evaluate academic trajectories [26], explored five domains: language, transverse abilities, socialization, motor capacities, and number processing. The performance of each child was compared with the average performance of the classroom. Our study focused on the language section of the questionnaire divided into three parts: vocabulary, grammar, and pronunciation. For each item, the question was: "*Concerning the "vocabulary/grammar/pronunciation", and in comparison with the average performance of the classroom, would you consider the child's performance to be: good (3 points), fair (2 points) or insufficient (1 point)?*" Then a composite score was obtained to illustrate language difficulties, without making distinction between understanding and production abilities. Then, three levels of global language ability were defined: no language difficulty (9 points); intermediate language ability (≥ 6 and <9 points; 1 to 3 items scored as fair, and no item scored as insufficient); and language difficulties (<6 or at least 1 item scored as insufficient).

2.4. Statistical analysis

First, the neonatal characteristics of the population assessed by the kindergarten teacher were compared to those of the non-assessed population, to verify their comparability, with tests using means comparison. Using the Ages & Stages Questionnaire communication scale at 18 months and 24 months, the $DQ_{language}$ at 24 months and the ERTL-4 score as continuous variables, four Receiver Operating Characteristic (ROC) curves were computed to determine the ability of each assessment tool performed at particular ages to detect language difficulties based on the "teacher-assessed language difficulty" predictivity. These curves were built using data on the children with data available at all

Table 1
Assessment at 18 and 24 months: items of the Communication Scale of the ASQ used in the present study.

ASQ 18 months — communication Part

1- When your child wants something, does he/she tell you pointing at it?
2- When you ask him/her, does your child go to a different room to get a familiar toy or object?
3- Does your child imitate a two-word sentence? For example, when you say a two-word phrase, such as "Mama eat", "Daddy play", "Go home", or "What's this?" does your child say both words back to you?(check "yes" even if his words are difficult to understand)
4- Does your child say 8 words or more, in addition of "mom" and "dad"
5- Without showing her first, does your child point to the correct picture when you say, "Show me the kitty" or ask, "Where is the dog?" (She needs to identify only one picture correctly)
6- Does your child say two or three words that represent different ideas together, such as "See dog", "Mommy come home", or "Kitty gone"? (Don't count word combinations that express one idea, such as "bye bye", "all gone", "all right", and "what's that?") Give an example of your child's word combinations:
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ASQ 24 mois — Partie Communication

1- Without showing her first, does your child *point* to the correct picture when you say, "Show me the kitty" or ask, "Where is the dog?" (She needs to identify only one picture correctly)
2- Does your child imitate a two-word sentence? For example, when you say a two-word phrase, such as "Mama eat", "Daddy play", "Go home", or "What's this?" does your child say both words back to you?(check "yes" even if his words are difficult to understand)
3- Without giving her clues by pointing or using gestures, can your child carry out at least three of these kinds of directions?
  a. "Put the toy on the table" d. "Find your coat"
  b. "Close the door" e. "Take my hand"
  c. "Bring me a towel" f. "Get your book"
4- If you point to a picture of a ball (kitty, cup, hat, etc.) and ask your child, "What is it?" does your child correctly name at least one picture?
5- Does your child say two or three words that represent different ideas together, such as "See dog", "Mommy come home", or "Kitty gone"? (Don't count word combinations that express one idea, such as "bye bye", "all gone", "all right", and "what's that?") Give an example of your child's word combinations:
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6- Does your child correctly use at least two words like "me", "I", "mine" and "you"?
The parents reported their child abilities to perform a task by answering "yes" (10 points), "sometimes" (5 points), or "not yet" (0 point) for each item.