# The Global School Adaptation Score: A New Neurodevelopmental Assessment Tool for Very Preterm Children at Five Years of Age

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**Objective** To determine the usefulness of a neurodevelopmental assessment tool consisting of a questionnaire administered to teachers to measure the Global School Adaptation (GSA) scores of very preterm children at the age of 5 years.

**Study design** A sample of 445 very preterm children (<35 weeks of gestation) was assessed at 5 years of age using GSA and IQ scores. According to the consistency between the scores, children were determined to be well classified, intermediately classified, or misclassified. The differences between groups were assessed through univariate and multivariate logistic regression.

**Results** The GSA score was highly or intermediately consistent with the IQ score for 89.2% of the children, and 10.8% were considered misclassified. Children with a higher GSA than IQ score had more autonomy and self-confidence ($P < .01$), and those with a lower GSA than IQ score had more behavioral problems ($P < .01$). Analysis by logistic regression showed that sex and gestational age significantly affected the consistency between the 2 scores. Thus, girls were less likely to have a lower GSA than IQ score (aOR = 0.45; 95% CI: 0.24-0.84; $P = .01$), and a lower gestational age significantly increased the likelihood of having a higher GSA than IQ score (for children born between 24 and 28 weeks of gestation: aOR = 2.70; 95% CI: 1.23-5.92; $P = .01$).

**Conclusions** The GSA score is a simple, inexpensive, and reliable screening tool for assessing neurodevelopment in very preterm children at 5 years of age. *(J Pediatr 2013;163:460-4)*.

Preterm birth is a major risk factor for adverse neurodevelopmental outcomes, and learning difficulties in children tend to increase with decreasing gestational age (GA).[1-7] Thus, very preterm children should be monitored in order to provide them with adapted care.[4] This monitoring should be maintained over time; assessment at the age of 2 years is critical[8,9] but insufficient.[10] Learning disabilities tend to appear shortly after starting school, when demands on cognitive performance increase. Many studies have shown that assessment at 5 or 6 years of age is more reliable.[11-14] Longitudinal follow-up studies of preterm infants has shown that in addition to major neurologic impairment, approximately one-half of very low and extremely low birth weight infants have cognitive disorders and require educational assistance and repetition of school years between the ages of 8 and 11 years.[15]

The IQ score is a well-known reference for cognitive assessment in very preterm children.[16] The full-scale IQ test can be administered by psychologists from the age of 5 years to test cognitive abilities. However, this assessment requires time and a team of trained specialists. In France, compulsory schooling begins at the age of 6 years, although public schools are free and allow children to enroll from the age of 3 years. From a child's first years at school, teachers are required to follow a predetermined educational program and to develop preventive actions based on their own evaluations and the results of national assessments at the age of 5 years. The Global School Adaptation (GSA) score is computed based on a teacher-completed questionnaire and previously validated in a longitudinal study of 700 children monitored from the age of 4 to 9 years.[17,18] The results from the GSA score correlated significantly with those obtained with several standardized cognitive, comprehension, and language tests,[17] including the Kaufman Assessment Battery for Children.[19] The GSA score also correlated significantly with school achievement at the age of nine, as assessed through national evaluations in language and mathematics.[18,20] It is currently used in research by the French Ministry of Education.[21]

The aim of the present study was to determine the consistency between teachers' assessments by using an appropriate standardized test of the cognitive ability of very preterm children. The final purpose was to evaluate the validity of this questionnaire as a screening tool for adverse neurodevelopmental outcomes in very preterm children.

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| GA | Gestational age |
| GSA | Global School Adaptation |
| LIFT | Loire Infant Follow-up Team |
| WPPSI | Wechsler Preschool and Primary Scale of Intelligence |

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## Methods

All surviving children born between January 2003 and December 2004 before 35 weeks of gestation and enrolled in the Loire Infant Follow-Up Team (LIFT) Network of 24 maternity facilities (Pays de la Loire, France) were included in the study. Written consent was obtained from parents before children were included in the LIFT cohort, which was registered with the French National Commission for Information Technology and Civil Liberties (Commission Nationale de l'Informatique et des Libertés, (CNIL no. 851117) ethics committee for clinical data collection from patient records.

### Cognitive Assessment at 5 Years of Age

The cognitive abilities of the children in the cohort were assessed individually by a LIFT psychologist using the Wechsler Preschool and Primary Scale of Intelligence (WPPSI)-revised test at the age of 5 years ± 2 months for verbal IQ, performance IQ, and full-scale IQ scores. The reference norms of the test were used (mean 100, SD 15), and mental retardation was defined as an IQ score below 85.

### GSA Score

The GSA score was designed by P.G. and A.F.[17,18] It was originally defined as a tool for use by teachers to assess children's abilities and behavior in the classroom. In this study, however, the questionnaire was tested as a potentially useful tool for the early detection of learning disabilities in preschool children. At the age of 5 years ± 2 months, the questionnaire was given to parents of children followed up by the network, who then passed it on to teachers (**Appendix**; available at www.jpeds.com). Six questions investigate linguistic competence (school conversation, participation, pertinence, vocabulary, syntax and pronunciation, and understanding), and 5 questions investigate non-verbal abilities (memory, arithmetic, logical capacities, manual ability, and gross motor coordination) (**Appendix**). Eight questions address children's behavior in the classroom (respect of classroom rules, attention, independence when confronted with a task, speed of task execution, work organization, self confidence, the ability to keep up with classroom rhythm, and tiredness). The final question invites the teacher to give his or her prognosis for the child's future adaptation to school life. Each question was given a score between 1 and 3, with the higher mark representing the best result. The total score was calculated by addition of the points from the 20 questions, resulting in a possible range from 20-60. A score over 45 was defined as a positive evaluation of the child's adaptation to school life.

### Statistical Analyses

Quantitative variables are presented as median (25th-75th percentiles) or mean ± SD, and qualitative variables are presented as numbers of subjects (n) and percentages (%). The differences were analyzed with a $\chi^2$ test or Fisher exact test for discrete variables with expected values of less than 5. Student *t* test and the non-parametric Mann–Whitney U test were used to compare continuous variables.

Socioeconomic status and maternal education were treated as 2-level categorical variables. The socioeconomic variable took into account the parent with the better status and was evaluated according to job type on a scale ranging from blue-collar to white-collar worker. A mother's education level was considered high when her education was maintained for more than 2 years after graduation from high school.[9]

To compare the 2 tests, the scores from the IQ and GSA tests were expressed in quintiles. For each score, the first quintile consisted of the children with the lowest results, and the 5th quintile of those with the highest results. Children were considered well classified if their results were in the same quintile or in 2 adjacent quintiles for both scores, and misclassified if there was a difference of more than 2 quintiles between their 2 scores. In other cases, children were considered intermediately classified. Children determined to be misclassified or intermediately classified were further grouped according to whether their GSA scores were higher or lower than their full-scale IQ scores.

External factors that could affect consistency between IQ and GSA scores were evaluated by logistic regression. ORs and 95% CIs were determined by comparing intermediately-classified and misclassified children with well-classified children. The Hosmer–Lemeshow test was performed to validate the model. Non-aORs were determined with a simple logistic regression; aORs were determined with a multivariate logistic regression. A $P$ value <.05 was considered significant. All analyses were performed with SPSS v.19.0 (SPSS Inc, Chicago, Illinois).

## Results

Of the 883 children enrolled in the Loire Infant Follow-up Network, 648 (73%) attended a medical examination at the age of 5 years. As described in the cohort profile (**Figure 1**), data from 445 children were included in the analysis. The subpopulation of preterm children who were unable to complete the WPPSI test or the GSA score because of moderate or severe cognitive impairment was very small and involved only few evaluations (6 WPPSI and 7 GSA tests). No significant differences were noted between these 445 children and the other children enrolled in the network with respect to GA (31.6 ± 2.3 vs 31.7 ± 2.3 weeks of gestation; $P$ = .41), birth weight (1660 ± 522 g vs 1680 ± 477 g; $P$ = .58), cerebral lesions (9% vs 11%; $P$ = .24), high maternal education level (51% vs 43%; $P$ = .1), or high socioeconomic level (52% vs 47%; $P$ = .32).

Full-scale IQ scores were calculated for 372 of the 445 children evaluated by the WPPSI-revised test; only verbal and/or performance IQ scores were available for the remaining 73. The characteristics of the study population are summarized