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Partial validation of a French version of the ADHD-rating scale IV on a French population of children with ADHD and epilepsy. Factorial structure, reliability, and responsiveness

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ABSTRACT

Objective: Attention deficit hyperactivity disorder (ADHD) is a well-known comorbidity in children with epilepsy. In English-speaking countries, the scores of the original ADHD-rating scale IV are currently used as main outcomes in various clinical trials in children with epilepsy. In French-speaking countries, several French versions are in use though none has been fully validated yet. We sought here for a partial validation of a French version of the ADHD-RS IV regarding construct validity, internal consistency (i.e., scale reliability), item reliability, and responsiveness in a group of French children with ADHD and epilepsy.
Method: The study involved 167 children aged 6–15 years in 10 French neuropediatric units. The factorial structure and item reliability were assessed with a confirmatory factorial analysis for ordered categorical variables. The dimensions' internal consistency was assessed with Guttman's lambda 6 coefficient. The responsiveness was assessed by the change in score under methylphenidate and in comparison with a control group.
Results: The results confirmed the original two-dimensional factorial structure (inattention, hyperactivity/impulsivity) and showed a satisfactory reliability of most items, a good dimension internal consistency, and a good responsiveness of the total score and the two subscores.
Conclusion: The studied French version of the ADHD-RS IV is thus validated regarding construct validity, reliability, and responsiveness. It can now be used in French-speaking countries in clinical trials of treatments involving children with ADHD and epilepsy. The full validation requires further investigations.

1. Introduction

Attention deficit hyperactivity disorder (ADHD) is a well-known comorbidity in children with epilepsy. Its prevalence in these children is nearly 30%; that is, five to ten times higher than in the general population [1]. However, unlike what is seen in the general population, nearly half of children with ADHD and epilepsy have ADHD-I subtype (i.e., with predominance of attention deficit) [2–4].

One of the most robust and frequently used tools in clinical trials on children with ADHD without epilepsy is the ADHD-rating scale IV (ADHD-RS IV) [5]. This tool was initially developed in the English

Abbreviations: ADHD, attention deficit hyperactivity disorder; ADHD-RS IV, ADHD-rating scale IV; ANCOVA, analysis of covariance; CFA, confirmatory factor analysis; CFI, comparative fit index; CI, confidence interval; CS-EPC, completely standardized expected parameter change; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders — Fourth edition; MI, modification index; RMSEA, root mean square error of approximation; SD, standard deviation; SRM, Standardized Response Mean; TLI, Tucker–Lewis index; VCI, Verbal Comprehension Index; PRI, Perceptual Reasoning Index; WISC-IV, Wechsler Intelligence Scale for Children — Fourth edition; WLSMV, mean- and variance-adjusted weighted least squares; WRMR, weighted root mean square residual.

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language and has undergone various investigations of its psychometric properties [6,7]. To date, only the total score was validated for use in multicentric clinical trials in American and European populations [7]. This validation concerned internal coherence, interrater coherence, test–retest reliability, convergence and divergence validity, discriminant validity, and responsiveness under treatment.

The English version of the ADHD-RS IV has been already used as the main outcome in various clinical trials on children with ADHD and epilepsy [8]. However, the properties of this scale might not be suitable for all ADHD contexts, of such as ADHD in epilepsy, where its use might have introduced a methodological bias. Indeed, attention deficit being predominant vs. hyperactivity/impulsivity in children with epilepsy and ADHD [3], the discriminant abilities of the ADHD-RS IV total score or subscores may differ vs. children from the general population. Actually, the attention deficit subscore may be less sensitive than the hyperactivity/impulsivity subscore.

Furthermore, despite the presence of several French versions already in use, none of these versions has been validated yet.

The present study investigated some psychometric properties of a French version of the ADHD-RS IV in children with ADHD and epilepsy and assessed the validity of its total score and subscores in this population. This partial validation focused especially on the scale construct validity, internal consistency of the dimensions, reliability of the items, and responsiveness (i.e., sensitivity to change) in children with and without pharmacological treatment for ADHD.

2. Material and methods

2.1. The study population

Between November 2011 and September 2014, 168 children were screened in 10 French neuropediatric units (the PERENE network). Of these, 167 (55 girls and 112 boys) were included in the present study and one excluded on medical decision.

The inclusion criteria for the present study were: age between 6 and 15 years 11 months, diagnosis of epilepsy (any type), diagnosis of ADHD (inattentive or combined type according to the Diagnostic and Statistical Manual of Mental Disorders — Fourth edition (DSM-IV) criteria), and agreement to comply with the study protocol (children and parents).

The exclusion criteria were: the diagnosis of ADHD of exclusively hyperactivity/impulsivity type (according to the DSM-IV criteria), the use of pharmacological treatment for ADHD initiated before inclusion (methylphenidate, amphetamine, atomoxetine, or antidepressant), the presence of mental retardation (either clinically or neuropsychologically determined with the Wechsler Intelligence Scale for Children — Fourth edition (WISC-IV)), and the presence of a psychiatric comorbidity (pervasive developmental disorders, including autistic disorders, psychotic disorders, and bipolar disorders according to the DSM-IV criteria).

2.2. The questionnaire

The 18-item French version of the ADHD-RS IV is shown in Table 1 (for the original English version, please visit http://www.healthchoiceaz.com/docs/providers/screeningtools/child%20adhd%20rating%20screener.pdf). In each neuropediatric unit, all and entire questionnaires were administered by the same physician at the inclusion visit and at the follow-up visit 12 to 16 weeks later. Sixteen questionnaires were missing at the follow-up visit (5 lost to follow-up in the group without pharmacological treatment for ADHD). Thus, the records of 151 patients were kept for responsiveness analysis.

2.3. The data

The data were the scores for the 18 items that quantify the two dimensions of the French version of the ADHD-RS IV: i) Inattention; i.e., impair items 1 to 17 and ii) Hyperactivity/impulsivity: i.e., pair items 2 to 18. Each item was rated on a 4-point Likert scale: 0 for "Jamais ou rarement" (Never or rarely) to 3 for "Très souvent" (Very often) (see Table 1).

2.4. The statistical analysis

2.4.1. The confirmatory factor analysis

A Confirmatory Factor Analysis (CFA) [9] checked the four hypotheses of the baseline CFA model (or Model 1) applied to the French ADHD-RS IV: i) ADHD responses can be explained by two factors (also called, latent variables, or dimensions): inattention and hyperactivity/impulsivity; ii) each item has a nonnull coefficient of regression on the dimension it was designed to measure (factor loading) and null factor loadings on the other dimension; iii) the two factors are correlated; and iv) the residual errors associated with each item are uncorrelated.

As the items are ordinal variables, the parameters of the CFA models were estimated from polychoric correlation matrices [10] using mean- and variance-adjusted weighted least squares (WLSMV).

Items and latent variables were standardized to provide standardized parameters, thus standardized factor loadings. Such an approach enables interpreting and comparing these factor loadings as correlations.

Several indexes (with their distinct rules for good fit) were used to assess the fit of the CFA models: i) the Comparative Fit Index (CFI)

Table 1
The French version of the ADHD-RS IV used for the study.

Cochez la case qui décrit le mieux le comportement de l'enfant pendant la semaine	Jamais ou rarement (0 point)	Parfois (1 point)	Souvent (2 points)	Très souvent (3 points)
1. Ne fait pas attention aux détails ou fait des fautes d'inattention en classe	☐	☐	☐	☐
2. Agite les mains ou les pieds ou se tortille sur sa chaise	☐	☐	☐	☐
3. A du mal à rester attentif pendant le travail ou le jeu	☐	☐	☐	☐
4. Se lève en classe ou dans d'autres situations où il aurait dû rester assis	☐	☐	☐	☐
5. Ne semble pas écouter lorsque l'on s'adresse à lui directement	☐	☐	☐	☐
6. Court dans tous les sens ou grimpe partout dans des situations où il ne devrait pas faire cela	☐	☐	☐	☐
7. N'exécute pas complètement les instructions et ne finit pas son travail	☐	☐	☐	☐
8. A du mal à jouer ou à faire autre chose tranquillement	☐	☐	☐	☐
9. A du mal à organiser ses tâches et ses activités	☐	☐	☐	☐
10. Semble toujours "sous tension" comme s'il "fonctionnait sur piles"	☐	☐	☐	☐
11. Evite les tâches qui nécessitent un effort mental soutenu (travail scolaire, devoirs, …)	☐	☐	☐	☐
12. Parle trop	☐	☐	☐	☐
13. Perd des objets nécessaires à son travail ou à ses activités	☐	☐	☐	☐
14. Lance des réponses avant que l'on ait fini de poser la question	☐	☐	☐	☐
15. Est facilement distrait	☐	☐	☐	☐
16. A du mal à attendre son tour	☐	☐	☐	☐
17. Oublie des choses dans ses activités de tous les jours	☐	☐	☐	☐
18. Interrompt les autres ou s'impose à eux	☐	☐	☐	☐