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A self administered executive functions ecological questionnaire (the Behavior Rating Inventory of Executive Function - Adult Version) shows impaired scores in a sample of patients with schizophrenia

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Abstract

Subjective measurements of cognition have seldom been used in schizophrenia. This is mainly due to the assumption that such measurements lack sensitivity in a disorder characterized by poor insight. We investigated the capacity of BRIEF-A (Behavior Rating Inventory of Executive Function - Adult Version: a self-administered, ecological questionnaire) to identify executive deficits in adults with schizophrenia. The global score and each domain-specific score was significantly lower in patients than in healthy controls. BRIEF-A could be a useful complement to objective measurements, providing a subjective assessment of everyday consequences of executive dysfunction in patients with schizophrenia.

Introduction

Cognitive deficits have been consistently found in individuals suffering from schizophrenia.[1] They are considered to be a core feature of this disorder,[2] and are correlated with functional outcome.[3,4]

Executive functions (EF) refer to a large set of control processes involved in goal-directed complex behaviour (selection, initiation, execution and monitoring of behavioural and emotional responses). They are among the most impaired cognitive domains in schizophrenia.[5] This is consistent with the involvement of the prefrontal cortex and the basal ganglia in this disorder.[6]

Cognitive performance can be assessed either through classical neuropsychological tests or cognition interviews and questionnaires. Although objective tasks are useful in providing a standardized evaluation, they have been criticized on several grounds: absence of ecological relevance, existence of a practice effect when the same measures are given repeatedly to the same individual, and a large number of confounding factors that lower the test-retest reliability. For these reasons, the use of complementary measures has been advocated.[7]

Cognition questionnaires seem to better reflect everyday situations, the complexity of which cannot be reduced to a series of cognitive tests. In this sense, they resemble *ecological* measurements. Such measurements not only assess the potential ability of patients (*disability*), but also the way the subjects use their cognitive capacities in everyday life (*handicap*). Indeed, in some cases, despite having necessary skills (or cognitive potential), the subjects are unable to use them in real-life situations.[8]

Several scales and questionnaires have been designed to measure cognitive abilities in subjects with schizophrenia, *e.g.* CGI-CogS,[9] SCoRS,[10] and SSTICS.[11] They provide useful assessment of global cognition but lack detail in the evaluation of specific cognitive domains. For example, EF are assessed using only a few items which seems insufficient to provide a clear picture of executive deficits. Furthermore, although they could be useful in research settings, the first two measures are less suited as routine clinical evaluation tools because they are time consuming and require the availability of additional informants.

The Behaviour Rating Inventory of Executive Function - Adult Version (BRIEF-A) is a seventy-five item Likert-type self-report questionnaire exploring everyday behaviour in which EF are implicated.[12] Nine scales issued from a factor analysis in a normal population offer an overview of cognitive fields:[13] Inhibit, Shift, Emotional Control, Self-Monitoring, Initiate, Working Memory, Plan/Organize, Task Monitoring, and Organization of Materials. The Global Executive Composite (GEC) summarizes all of the above-mentioned scales. Both Self-Report and Informant Report Forms are available.

The clinical utility of the BRIEF-A self-report has been demonstrated in various diagnostic groups associated with executive impairment: Traumatic Brain Injury,[12] Mild Cognitive Impairment,[14] Attention Deficit/Hyperactivity Disorder etc.[15]

No studies have been conducted in subjects with schizophrenia, but Niendam *et al*.[16] reported that the BRIEF informant form was a useful measurement for behavioural dysexecutive syndrome in adolescents presenting a high risk of psychosis. This research aims to investigate the interest of using the self-administered form of BRIEF-A as a measurement of executive deficits in adult patients with schizophrenia. Although deficits in EF in subjects with schizophrenia have been repeatedly demonstrated, their capacity to identify these deficits has been questioned. Our hypothesis is that item formulation based on concrete examples of daily activities, as is the case of the BRIEF-A, takes into account a possible abstract thinking deficit of the assessed person and helps subjects identify their deficits. Our secondary aim is to underline the importance of a careful assessment of EF which should combine the use of both neuropsychological tests and subjective cognition questionnaires.

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Materials and Methods

Participants

Thirty-one outpatients diagnosed with schizophrenia or schizoaffective disorder, in a stable state of full or partial remission for at least one month, were recruited within a larger cohort study conducted by our team (in a university-affiliated hospital Chenevier-Mondor, Créteil, France). To establish the diagnosis, all subjects were interviewed by an experienced clinician using the Diagnostic Interview for Genetic Studies (DIGS).[17] The control group included thirty-four healthy subjects without a personal history of any psychiatric disorder (Axis I or II of the DSM-IV). Written informed consent was obtained from all participants.

Measurements

All participants completed the BRIEF-A self-report form. The French translation and adaptation of the questionnaire was undertaken by the authors. It was approved, after back-translation, by the publisher of the BRIEF-A, (Psychological Assessment Resources, Inc.). A brief assessment of EF was conducted using classical tests sensitive to dysexecutive syndrome: Verbal Fluency, Wisconsin Card Sorting Test, Trail Making Test, Stroop Test and Digit Span forward and backward.[18]

Statistical methods

We compared demographic characteristics of the two groups of subjects using the Student's t-test for age, and the χ^2 test for education level and sex. To test for the influence of diagnosis on the various domains of EF, as measured by the BRIEF-A, we used a stepwise, backward regression. In the regression model, cognitive measurements were tested as the dependent variable. Group membership was the independent variable of interest, and was, as such, forced in the final solution. Finally, to estimate the group effect on BRIEF-A scores, we used the Hedges unbiased estimator of the standardized mean difference (g_U).[19]

Results

Differences in education level and age did not reach significance. There were significant differences for sex between the two groups (Table 1).

Group membership significantly predicted the scores for both specific global measurements derived from the BRIEF questionnaire (Table 2). The GEC and all domain-specific scores were significantly lower in subjects with schizophrenia than in normal controls.

All standardized mean differences were sig-

nificant and, according to Cohen's classic conventions, were large (*i.e.* greater than 0.8). The most impaired domain was *initiation* (estimated group effect of 2.3, 95% CI 1.7-2.9) and the least impaired domain was *self monitoring* (estimated group effect of 1.0, 95% CI 0.5-1.5) (Table 2).

Correlations between BRIEF-A results and neuropsychological measures were with two exceptions within the small/medium range. Using the usual level of significance (P<0.05), uncorrected for multiple testing, only one significant negative correlation was present in both patient and control samples: inhibition scale *versus* digit span backwards (further details are available upon request).

Discussion and Conclusions

The BRIEF-A self-report form is a sensitive and widely accepted measurement for executive deficit. Considering that BRIEF-A questionnaire assesses executive functioning as reflected in concrete examples of daily activities, our results suggest that patients with schizophrenia were at least partially aware of their executive impairment.

Medalia *et al.*[20] have not been able to differentiate between patients diagnosed with schizophrenia and controls using self-reports of cognitive function. The questionnaire used in their study (MIC-SR) relies on abstract meta-cognitive abilities of subjects (for example their ability to identify *attention*, *forgetfulness* or a *lack of organization* as a cause of their difficulties), whereas the approach in BRIEF-A uses a more concrete and ecological analysis of daily activities and behaviours. Further studies using informant forms and objective cognitive measurements may help to understand this difference.

The lack of significant correlation between BRIEF-A scores and neuropsychological measures is consistent with previous findings.[21] These tests were developed from a neuroanatomical perspective and thus may not be a sufficient marker of real-life executive functioning. For example, Trail Making Test is sensitive to frontal lobe damage but not necessarily correlated with *cognitive flexibility* deficits in real life situations.

The use of ecological questionnaires has several advantages over the objective assessment of cognition and thus could represent a valuable tool to complement currently used cognitive batteries. Along with being less time-consuming, more readily accepted by the subjects, and less subjected to confounding factors and practice effects, they can also measure domains that are difficult to assess in a labora-

Table 1. Demographic variables in subjects with schizophrenia and controls.

	Subjects with schizophrenia	Normal controls	P value
Sex (% males)	81	38	<0.01*
Educational level (% with high school completed)	35	59	0.06*
Age (mean ± SD)	39.7±10.0	45.1±12.8	0.06°

*χ^2 test; °student t-test.

Table 2. Comparison of BRIEF-A scores between subjects with schizophrenia and normal controls.

Executive domain	Subjects with schizophrenia (mean ± SD)	Normal controls (mean ± SD)	F (P)	Effect estimate (CI)
Inhibit*	13.4 (2.5)	10.4 (2.6)	25.96 (<0.0001)	1.2 (0.6-1.7)
Shift	12.3 (2.8)	8.0 (1.8)	57.36 (<0.0001)	1.9 (1.2-2.4)
Emotional control*	19.0 (5.3)	13.3 (3.3)	31.53 (<0.0001)	1.3 (0.7-1.8)
Self monitor	10.2 (2.5)	7.9 (1.9)	17.13 (0.0001)	1.0 (0.5-1.5)
Initiate°	16.4 (3.6)	10.0 (1.7)	77.78 (<0.0001)	2.3 (1.7-2.9)
Working memory*,°	15.3 (3.5)	9.9 (1.8)	59.25 (<0.0001)	1.9 (1.4-2.5)
Plan/organize	18.9 (3.9)	12.6 (2.4)	61.09 (<0.0001)	1.9 (1.3-2.5)
Task monitor°	11.2 (2.5)	7.8 (1.5)	36.28 (<0.0001)	1.6 (1.0-2.2)
Organization of materials	14.8 (3.6)	10.9 (2.4)	27.30 (<0.0001)	1.3 (0.7-1.8)
CEG	129.2 (23.1)	90.8 (13.4)	67.68 (<0.0001)	2.1 (1.4-2.7)

SD, standard deviation; CI, confidence interval. Variables retained in the final model (*sex; °study level).

tory (*e.g.* initiation). The use of subjective scales may also provide helpful guidelines for cognitive rehabilitation programs.

However, cognition questionnaires, like objective measurements, also have some limitations (such as the liability to insight problems, social desirability, cognitive bias, misperception of items, etc.), that can potentially be a source of error or a lack of precision. Thus, we advocate the use of subjective, ecological measurements as a complement to and not a replacement of objective, laboratory, neurocognitive measurements. Further research is needed to determine the test-retest reliability of this measurement in individuals with schizophrenia, and to study the link between BRIEF-A self report results and informant evaluation and between BRIEF-A scores and objective measurements. Future research should assess the sensitivity of questionnaires designed to evaluate other cognitive domains in patients diagnosed with schizophrenia.

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