Schizophrenia Research xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

Schizophrenia Research

journal homepage: www.elsevier.com/locate/schres

Psychomotor assessment as a tool to differentiate schizophrenia from other psychotic disorders

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ARTICLE INFO

Article history:
Received 29 April 2017
Received in revised form 20 June 2017
Accepted 23 June 2017
Available online xxxx

Keywords:
Psychotic disorder
Schizophrenia
Substance-induced psychotic disorder
Psychosis not otherwise specified
Psychomotor
Neurological soft signs

ABSTRACT

Goal: The aim of this study is to assess to what extent psychomotor assessment can aid the clinician in differentiating between schizophrenia and other psychotic disorders.
Methods: Enrolled subjects were recent in remission patients (n = 304), who all met DSM-IV (APA, 2013) criteria for either schizophrenia (Sz; n = 117), schizoaffective disorder (SaD; n = 36), psychotic disorder not otherwise specified (P-NOS) (n = 86), substance/medication-induced psychotic disorder (SIPD; n = 33) or major depressive disorder with psychotic features (MDD-p; n = 32). The patients were submitted to a psychomotor test battery.
Results: Patients with schizophrenia generally perform worse on most tests. Using cluster analysis a combination of three tests, namely the sensory integration subscale of the Neurological Evaluation Scale (NES), a Figure Copying Task (FCT) and the finger tapping test (FTT), came out to be useful to clinically differentiate between schizophrenia and substance-induced psychotic disorder (SIPD) or psychosis not otherwise specified (P-NOS). When comparing schizophrenia only to a group of patients with SIPD, the differentiation potential becomes even greater with a 76.1% chance to correctly diagnose patients with schizophrenia and 75% chance for patients with SIPD.
Conclusion: A combination of NES, FCT and FTT shows promising results as a clinical tool in daily practice to differentiate schizophrenia from other psychotic disorders. Future prospective studies to confirm these results are necessary.

1. Introduction

Schizophrenia is a severe psychiatric disorder which affects about 1% of the population and is characterized by positive, negative, cognitive and psychomotor symptoms. Psychomotor symptoms such as psychomotor slowing, neurological soft signs, diminished activity and catatonic symptoms (Docx et al., 2012; Walther et al., 2009; Walther and Strik, 2012; Morrens et al., 2014) are present irrespective of antipsychotic treatment (Peralta et al., 2010; Peralta and Cuesta, 2011) and have been demonstrated to be predictive for functional and clinical outcome (Morrens et al., 2007).

Schizophrenia is part of what sometimes is considered as a spectrum of psychotic disorders including schizoaffective disorder, mood disorders with psychotic features and substance induced psychosis (Mørch et al., 2016). Importantly, the phenotypical presentation of these illnesses may be very similar, especially in the acute phase when psychotic features dominate the clinical symptomatology. As pharmacological therapeutical strategies can differ substantially between different psychosis spectrum disorders, difficulties in making differential diagnoses gravely endanger adequate patient treatment. An easy to use tool that aids the clinician in the diagnostical process would thus be of value.

More stable schizophrenia-related deficits as cognitive and motor symptoms might prove an interesting strategy towards correct differentiation in diagnosis. However, only a handful of studies (Stip et al., 2005; Patiny et al., 2015) explored the relevance of these symptoms as diagnostical tools. Stip et al. (2005) compared schizophrenic and schizoaffective patients on cognitive and motor symptom assessment and demonstrated that these disorders mainly differed in patient performance on a motor task of the Cambridge Neuropsychological Test Automated Battery (CANTAB). Gorynia et al. (2003) compared performance on a finger tapping test of schizophrenic patients to that of patients with schizoaffective disorder and substance-induced psychosis and healthy controls. They found schizophrenia patients to have significantly lower scores than all three other comparison groups and suggested that the tool may have a place in the clinical investigation of acute psychotic inpatients. Along this line, Rigucci et al. (2014) were able to discriminate schizophrenia from bipolar disorder using neurological soft signs (NSS). Neurological soft signs contain deficits in sensory integration, motor coordination and motor sequencing (Morrens et al., 2007). Finally, Krüger et al. (2003) clearly showed differential

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http://dx.doi.org/10.1016/j.schres.2017.06.047
0920-9964/

catatonic presentations between schizophrenia, mania, mixed mania and major depression. As such, the motor syndrome thus could contribute in differentiating schizophrenia from other psychotic disorders.

In the present study, the performance of schizophrenic patients on a psychomotor test battery will be compared to that of patients with other psychotic disorders (schizoaffective disorder, major depressive disorder with psychotic features, substance induced psychosis and psychosis not otherwise specified). We will evaluate to what extent psychomotor assessment can aid the clinician in differentiating schizophrenia from other psychotic disorders.

2. Methods

2.1. Participants

Enrolled subjects were recent in remission patients with a psychotic disorder (n = 304). All patients met DSM-IV (APA, 2013) criteria for either schizophrenia (Sz; n = 117), schizoaffective disorder (SaD; n = 36), psychotic disorder not otherwise specified (P-NOS) (n = 86), substance/medication-induced psychotic disorder (SIPD; n = 33) or major depressive disorder with psychotic features (MDD-p; n = 32). In the total dataset, 22 bipolar patients were included. Nevertheless, this sample consisted of several subgroups depending on illness phase (manic, depressed, mixed episode, with/without psychotic features). As none of these groups were large enough to enter analyses (all n < 6), we chose to omit bipolar patients from the analyses.

Patients were recruited from the University Department of Psychiatry, Campus Psychiatric Hospital Duffel, Duffel, Belgium. All patients entering the hospital were tested within 5 weeks after admission, when remission of the psychotic episode was reached. All motor assessments were performed by the same person (HM). Diagnosis was made based on a semi-structured interview by the psychiatrists attached to the unit (FV, MM). Patients underwent psychomotor assessment as part of standardized clinical care. Data were analyzed retrospectively. The study was approved by the ethical committee of the University hospital of Antwerp.

2.2. Psychomotor tasks

2.2.1. The Neurological Evaluation Scale (NES)

The NES (Buchanan and Heinrichs, 1989) is a frequently used instrument for the assessment of neurological soft signs (NSS), which examines 26 of these signs. A validated dutch translation of the NES (NES-d) was used. The scale generates three subscales: sensory integration (NES-SI), motor coordination (NES-MC) and motor sequencing (NES-MS). NES-SI includes audiovisual integration, stereognosis, graphesthesia, extinction and right/left confusion. The NES-MC subscale includes the following items: tandem walk, rhythm tapping parts A and B, and finger-thumb opposition. Finally, NES-MS includes the fist-ring, fist-edge-palm and Ozeretski tests. Total scores of these subscales were used as severity measures.

2.2.2. Finger tapping test (FTT)

The finger tapping test, a simple but well validated tool to assess psychomotor speed, was administered according to its conventional protocol (Reitan and Wolfson, 1993). The tasks yields two separate scores for both the dominant (FTT-d) and the non-dominant hand (FTT-nd).

2.2.3. Copying tasks

The Line Copying Task (LCT; Bervoets et al., 2014; Docx et al., 2013) is a computerized copying task developed by our lab, which was designed to delineate slowing in the initiation of movement from slowing in the execution of movement. The stimuli used in this task are simple, straight lines that can be oriented in four directions (vertical, horizontal, and diagonal in both directions). The participant is asked to copy these lines as fast as possible on a sheet of paper divided in 3 by 4 cm squares and placed on a digitizer. Stimulus presentation starts as soon as the participant touches the 'start' circle with the digitized pen and ends when the participant starts drawing the line. The task consists of 24 trials.

The outcome measures used are initiation time (IT), being the time between the stimulus presentation and the start of the first drawing movement, and execution time (ET), the time the participant is actually drawing. This task has been used in our research group since the mid 90s in numerous studies investigating the symptomatology and pathogenesis of motor disturbances in schizophrenia, mood disorders, substance use disorders, and eating disorders.

The Figure Copying Task (FCT; Morrens et al., 2008, Docx et al., 2014) is another task that is assessed according to the same protocol as the LCT. The FCT offers 12 stimuli to be copied, consisting of three types of figures: letters, familiar figures and unfamiliar patterns.

Similar to the LCT, variables are the initiation time (FCT-IT) and the execution time (FCT-ET). Additionally, the reinspection time (FCT-REIN) is also calculated, which refers to the time the subjects take to reinspect the stimulus, by replacing the pen in the start circle, which made the stimulus reappear on the screen. The mean average velocity while completing the figure was also calculated (FCT-v).

2.2.4. Stereotypy test apparatus

The stereotypy test apparatus (STA; Hoffman et al., 2003; Morrens et al., 2006) is a device featuring nine randomly distributed buttons. The test comprises 200 trials in each of which the subjects need to press one of the buttons with their index finger after an acoustic signal (1/s) while applying the most random order possible. Whereas redundancy, i.e. the complement of relative entropy, is represented by the chance of total chaotic randomness, redundancy of context (STA-RC) is used as a measure for stereotypy (Guttmann and Kranner, 1960). A STA-RC score of 0.000 denotes a perfectly random response or the complete absence of any pattern, and 1.000 the presence of a fixed repetitive response pattern and thus a lack of randomness.

2.3. Statistical analyses

The software package SPSS 23.0 was used for the statistical analyses.

Multivariate analyses were used to compare the patient groups in their psychomotor performance, with contrast analyses comparing schizophrenia to other diagnostical groups. In order to evaluate whether psychomotor performance could differentiate schizophrenia from other patient groups, we used hierarchical cluster analyses (Ward's method). All significant variables from the multivariate GLM analysis (see Table 2) entered the cluster analysis (single solution, predefined number of clusters n = 5). Non-parametric correlations were calculated using Spearman's rho.

3. Results

3.1. Demographic variables

Demographic variables of the five patient groups are presented in Table 1. Significant group differences were present for sex, age and duration of illness (DOI; defined as time between the start of illness as determined by the first admission in a psychiatric hospital and psychomotor assessment). All patient groups were matched for study level, weight and chlorpromazine (CPZ) equivalents of antipsychotic treatment. Age differences were driven by significant differences between schizoaffective disorder group on one hand and schizophrenia ($p = 0.008$) and SIPD group ($p = 0.013$) on the other. Post-hoc analyses only reveal a significant difference between schizoaffective and SIPD group ($p = 0.019$) for DOI. As can be expected, the MDD group were significantly more treated with antidepressants compared to other groups.

Please cite this article as: Janssens, S., et al., Psychomotor assessment as a tool to differentiate schizophrenia from other psychotic disorders, Schizophr. Res. (2016), http://dx.doi.org/10.1016/j.schres.2017.06.047