

Simple Real-Time Computerized Tasks for Detection of Malingering Among Murderers with Schizophrenia

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Abstract: It is our contention that computer-based two-alternative forced choice techniques can be useful tools for the detection of patients with schizophrenia who feign acute psychotic symptoms and cognitive impairment as opposed to patients with schizophrenia with a true active psychosis. In our experiment, Visual Simple and Choice Reaction Time tasks were used. Reaction time in milliseconds was recorded and accuracy rate was obtained for all subjects' responses. Both types of task were administered to 27 patients with schizophrenia suspected of having committed murder. Patients with schizophrenia who were clinically assessed as malingerers achieved significantly fewer correct results, were significantly slower and less consistent in their reaction time. Congruence of performance between the Simple and Choice tasks was an additional parameter for the accurate diagnosis of malingering. The four parameters of both tests (accuracy of response, reaction time, standard deviation of reaction time and task congruency) are simple and constitute a user-friendly means for the detection of malingering in forensic practice. Another advantage of this procedure is that the software automatically measures and evaluates all the parameters.

Malingering has been defined as the “intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives” (1). Malingering is not considered a mental disorder, but rather a state that may become the focus of clinical attention, especially in forensic settings (2). People trying to avoid responsibility or punishment for criminal behavior often feign psychosis or severe cognitive impairment. In criminal defendants referred for pretrial evaluation, malingering of cognitive impairments and psychosis was found in 12.1% of cases (3). Mental health professionals must employ the same degree of thoroughness in the assessment of malingering as they would in the establishment of any other diagnosis (4). To do this, psychiatrists base their expert conclusions on clinical interviews and on collateral sources such as psychological tests (5).

Since the 1980s, there has been a rapid increase in interest by clinicians in the use of neuropsychological tools in the detection of malingering in forensic psychiatric examinations (6, 7). As a rule neuropsychological tools designed to detect feigned

cognitive deficits have been based on measures of sub-optimal effort (8, 9), using a forced-choice paradigm. Two-alternative forced-choice paradigms evaluate the ability of the examinee to distinguish between two stimuli. Performance which is statistically significantly lower than what would be expected by chance (50% correct responses) provides the strongest evidence of the subject's motivation to perform poorly (10, 11). Recent computerized assessments have been found helpful in recording any single behavioral act in real time regime and, therefore, may be used for “online” documentation of examinee's behavior during performance (12).

In spite of a growing body of research, important questions related to the performance of malingerers in real-time situation of psychiatric forensic evaluation still remain unanswered.

Firstly, in most studies, the authors recruited students who were instructed to simulate malingering. Obviously, healthy students may perform a feigned test in a different manner than defendants charged with severe offenses, whereas results obtained from forensic settings can help to identify more useful

“candidate variables” for the purpose of diagnosing malingering (13).

Secondly, it cannot be assumed that different variations of tasks have equal sensitivity, since the characteristics of the stimuli may influence performance results (14). Thus, tests which used digits, pictorial or verbal stimuli produced widely different failure rates. For example, more than twice as many examinees failed in procedures which used verbal stimuli than in those which used pictorial or digit stimuli. This suggests that, while tests for detecting malingering may be highly specific, they may vary substantially in their sensitivity (15).

The aim of the present study was to identify patients with schizophrenia who feigned active psychosis with impaired cognitive functioning using simple psychomotor tasks. Due to difficulties in achieving the patients' cooperation and their complaints about illiteracy we devised extremely simple computerized tasks that did not require verbal or numerical ability.

Methods

This was a retrospective study. The research group consisted of 27 male patients with schizophrenia suspected of having committed murder or who had committed murder, in an impulsive way. Subjects were recruited from consecutive admissions of inpatients hospitalized in the Forensic Psychiatry Department of Beer-Yaakov Regional Mental Health Center (Maximum Security Department, “Magen” Prison, Ramla) over a period of three years. All subjects were referred for hospitalization by the Courts for the evaluation of criminal responsibility and fitness for trial. All subjects had undergone neurocognitive testing and had met the DSM-IV criteria for schizophrenia (1). Senior psychiatrists had established the diagnoses after an interview conducted according to the guidelines of the Structured Clinical Interview for the DSM-IV, and a review of all hospital and criminal records. Criteria for inclusion in the study were: a) age — over 18, b) no detection of significant abnormalities in comprehensive physical and neurological examinations and laboratory routine tests. Exclusion criteria were: a) a past history of mental retardation or other documented cognitive impairments; b) a known history of neurological im-

pairment (e.g., epilepsy, stroke, multiple sclerosis, dementia, Parkinson's disease). At the time the tests were administered the subjects were not receiving any regular pharmacological treatment apart from benzodiazepines (up to 30 mg/day of diazepam or equivalent dose of other benzodiazepines). A team of four fully-trained psychiatrists (H.G., M.B., N.S. and Y.A.) made the clinical diagnosis of malingering. The conclusion of malingering was arrived at after cross checking the data from the neuropsychological tests with the clinical data collected from extensive observations by the evaluating team in the department where the patients were hospitalized and by the police. These observations, which independently established the diagnosis of malingering, included: video recording of behavior in the ward, other psychological tests performed during hospitalization, past medical documentation, material from the police interrogation interviews and the Court protocols. The clinical evaluation was done independently from the neuropsychological testing (S.K., who performed the neuropsychological testing, was incognizant of the clinical evaluation results).

The sample consisted of two groups: The first group ($n=12$) consisted of patients with schizophrenia suspected of having committed murder who were in partial remission and who feigned acute disturbances of global mental functioning in order to convince psychiatrists of their incompetence to stand trial and of their insanity. The mean age was 33.4 ± 16.2 years. The mean duration of illness was 9.7 years, and age of onset was 22.7 years. In this malingering group, which was in a pretrial situation, antipsychotic treatment was not given during the first week of the observation period which was the week during which the neuropsychological tests were performed.

The second group consisted of patients with schizophrenia suspected of having committed murder or who had committed murder. All the patients in this group presented clinical manifestations of acute psychosis which were evaluated as authentic ($n=15$). The mean age was 33.1 ± 14.7 years, the mean duration of illness was 11.9 years, and age of onset was 21.1 years.

The Helsinki Committee approval was waived since this neuropsychological test was used as part of

the routine evaluation of every patient admitted to the Division of Forensic Psychiatry.

Neuropsychological Assessment

For this study, a test was developed which comprised two very simple real-time computerized tasks (Visual Simple Reaction Time and Visual Choice Reaction Time) (AnimaScan Ltd, Ashdod, Israel, 2000 [16]). Reliability of these tasks was calculated for a normal adult sample, controlled for age and gender. The subtests are described below, with their test-retest (time interval of one month) reliability coefficients (Pearson product moment coefficients).

Apparatus and Procedure

Stimuli were displayed on the monitor (frame rate, 100 Hz) of an IBM-compatible personal computer (Pentium 4) using the experimental software (Anima-Scan Ltd.) and the operating system used was Windows 2000. The viewing distance was 60 cm from the screen.

All stimuli were squares, and were displayed centrally on the screen for 250 milliseconds each. Between stimuli time intervals were pseudo-random and ranged from 850 milliseconds to 4,000 milliseconds. Time intervals were fixed for every test administration, i.e., every examinee was exposed to the same time intervals. A one-target parameter (color) was used: red in first presentation and red versus black in second. Both tasks are very simple for the visual system, as its receptors are essentially shared by color. Ability to discriminate the colors is basic because color is perceived by subjects in a passive way and the target may be easily identified without mental effort (17). Therefore, our two-alternative forced choice task was simple with no extensive requirement of working memory, word or number reading ability or intensive perceptual processing.

In the first experimental task (Visual Simple Reaction Time), the examinee was asked to react each time a red square was displayed by pressing a red key. Twenty red squares were displayed. In the second task (Visual Choice Reaction Time), the examinee was asked to respond to a red or a black square displayed on the screen. If a red square was displayed, the participant was asked to press the red key and if a

black square was displayed, the patients was asked to press the black key. Ten red and ten black squares were displayed in random order.

Participants were instructed to keep their fingers over the key in order to be ready to respond. The testing session began with the following instructions: "Your task is to identify the color of the square and then press the corresponding key as accurately and quickly as possible. Accuracy is important in this task."

Two parameters were used in the analysis of the responses: mean reaction time (in milliseconds) of correct reactions and accuracy — number of items (20) minus number of commissions, minus number of omissions, divided by 20, and multiplied by 100.

The software program automatically measured the reaction time and the accuracy level and also determined mean reaction time and standard deviations. In the Visual Simple Reaction Time Task the test-retest reliability for correct reaction time (in milliseconds) and for accuracy (in percent) were $r=.87$ and $r=.88$, respectively. In the Visual Choice Reaction Time Task the test-retest reliability for correct reaction time (in milliseconds) and for accuracy (in percent) were $r=.80$ and $r=.79$, respectively (sample of 109 healthy subject, 16).

Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 11.5. The mean reaction time of correct responses and corresponding standard deviation (SD) of correct reaction times were calculated for each condition (congruent, incongruent and neutral). Errors were defined as the number of incorrect responses and were calculated for each condition. Two-tailed t-tests were used to compare both groups for each of the three characteristics of the two tasks, with Bonferroni corrections for multiple t-tests establishing individual test alphas at 0.009, for the standard level of significance 0.05.

Results

No significant differences were found between malingerers and control groups for age ($t(25)=-0.06$, $p=.954$) and education ($t(25)=1.81$, $p=.09$). Mean results of both groups are detailed in Table 1. Patients with schizophrenia who did not feign in the situation

of evaluation of criminal responsibility and fitness for trial were able to perform both computerized tasks with a high correct response rate. They performed statistically significantly better than patients with schizophrenia who feigned their cognitive impairment (as measured by percent of correct responses). In addition, in Visual Simple Reaction Time task malingers performed significantly less accurately (65.6% correct detections) than patients with schizophrenia with true active psychosis (93.5% rate). In the more difficult Visual Choice Reaction Time task patients with schizophrenia with real psychosis performed less accurately (76.5%). Yet, they still performed significantly better than patients with schizophrenia with feigned psychosis (63.8% accuracy level). Accuracy of VCRT fell short of statistical significance after Bonferroni correction. In the malingers, accuracy rate in simple and more complex tasks were the same 65.6% and 63.8%, respectively. This pattern of performance is in contrast to that of the group of patients with schizophrenia with true acute psychotic symptoms: their accuracy in the simple task was higher than in the difficult task (93.5% versus 76.5%).

Malingers were significantly slower (as measured by reaction time) and significantly less consistent in their performance (as measured by SD results). In our sample of malingers, the average reaction time for the more complicated task was, paradoxically, shorter than the average reaction time of the easier tasks resulting in a negative mental effort cost (-23 ms). In the truly psychotic patients this pattern was positive: the average reaction time for the more complicated task was longer than the average reaction time of easier tasks (+93 ms, Table 1).

Moreover, in malingers, standard deviations were greater in the simple task than in the more complicated one, despite the latter requiring more decision time in relation to the number of choices. As can be seen in Table 1, patients with exaggerated clinical presentation were significantly less consistent in their performance (as measured by SD of reaction time) in the detection of stimuli (simpler task) than in the selection of stimuli (more complex task). In control patients we found inverse results: a more stable performance (lower SD) on simple task and less consistent performance on more complex task.

Table 1. Row data of the performance on the Visual Simple Reaction Time and Visual Choice Reaction Time Tasks.

		Malingers	Control	t (df=25)	P
VSRT					
Reaction Time (Milliseconds)	M	710.3	318.1	-4.739	0.001*
	SD	312.9	67.9		
Standard Deviation of RT	M	406.1	115.8	-4.041	0.002*
	SD	244.4	120.5		
Accuracy (Percent Correct)	M	65.6	93.5	3.886	0.001*
	SD	24.9	11.3		
VCRT					
Reaction Time (Milliseconds)	M	686.7	410.8	-4.698	0.001*
	SD	209.9	80.3		
Standard Deviation of RT	M	353.6	151.5	-3.714	0.001*
	SD	180.0	98.9		
Accuracy (Percent Correct)	M	63.8	76.5	2.360	0.026
	SD	16.3	11.5		
N		12	15		

* Significant after Bonferroni correction ($p < 0.009$).

Discussion

Our study is the first to use two-alternative forced task performance for the detection of grossly exaggerated psychotic symptoms and cognitive impairment in patients with schizophrenia who committed or were accused of committing murder. One of the main findings of our study was that patients with schizophrenia with feigned acute psychosis demonstrated not only significantly worse performance but a *different pattern of results* than patients with schizophrenia with true psychosis. More specifically, we found that four parameters may help to diagnose feigned psychosis with severe “cognitive” compliance in this population. These are: average reaction time, standard deviation of average reaction time, accuracy rate and inverse pattern of relation between these parameters in comparison between simple and more complicated tests (effort cost).

Slowness of reaction time

Our results are consistent with previous studies in non-schizophrenic populations which show that extreme slowness of responses can be useful for the detection of malingerers (18). In our study patients with schizophrenia with feigned symptoms performed significantly slower on both experimental tasks than the patients with schizophrenia with true psychosis, indicating that a voluntary manipulation affected their performance more significantly than the schizophrenic disorder itself (Table 1). The slowness of reaction time in the two-alternative forced choice task can identify nearly of 70% of the malingerers (19, 20).

Moreover, in our sample of malingerers the average reaction time on the more complicated task was, paradoxically, shorter than the average reaction time of easier tasks, resulting in a negative effort cost effect (-23 ms). Conceptually, more complex tasks require more time for their performance. The selection of response to two stimuli is associated with a higher load of information processing than simple detection of stimulus. According to Hick's law, reaction time increases linearly depending on the number of stimuli to be scanned during processing (21). Not surprisingly, patients with schizophrenia who did not exaggerate their clinical presentation showed increased reaction time in more complicated task com-

pared to simpler one (+93 ms, Table 1) as would fit in with theoretical expectations. This paradoxical “inverse” pattern of slowness of performance may be seen as an additional parameter for the detection of malingering because the examinee did not know which task was the simpler of the two and, therefore, could not to perform accordingly.

Variability of reaction time during performance

The high variability of performance may be a sign of malingering due to lack of motivation (22). The greater standard deviations of reaction time observed in such cases may be attributed to difficulty in maintaining fabricated slowness of performance during the test period. The high variability of the malingerers' reactions could be thought to be related to lapses of attention, or to the effects of medication and, therefore, the diagnosis of malingering might seem debatable (23). However, in malingerers fluctuations in reaction time during performance were greater in the simpler tasks than in the more complex task. Therefore, this inverse pattern of performance could not be an expression of lapses in attention, fluctuations in executive control, or sedative side effect of treatment.

Accuracy

Patients with schizophrenia with true acute psychosis were not capable of performing with the same high correct response rate as is suggested in brain injured patients. In our sample this rate was only 76.5%. In studies with neurological patients it has been reported that the cutoff point of less than 90% of correct response should raise suspicion of poor effort (malingering) (24, 25). Even moderately brain-damaged patients (with frontal dysfunction or with amnesic syndromes) routinely answer the questions correctly 94% and 85% of the time respectively (26, 27). In fact, the majority of malingerers in neurology clinics were not detected based on a chance performance (50% correct), but detected by a cutoff score of 90% correct (28). Thus, even true psychotic patients with schizophrenia in forensic situations performed on a “malingering” level if we accept neurological 90% cut off points. Yet in our sample this poorer correct rate, for all that, was significantly higher than that of the feigning group. In our sample,

patients with schizophrenia who feigned cognitive impairment and acute psychosis exhibited the accuracy rate (63.8%) in two-alternative forced choice performance, which previously was reported for suspected malingerers in neurology setting (62%) (27). Our results are partially consistent with the observation made about malingerers in neurological settings that they usually overestimate the impairments associated with brain injury and perform more poorly on neuropsychological tests than real patients (29–31). In our sample, the examinees had no knowledge about the association between psychosis and cognitive functioning and, therefore, feigned performance in an obvious and naive manner (as patients with feigned “brain injury”). This indicates that patients with schizophrenia when malingering may make an erroneous assessment of the impact of disease on neuropsychological performance as do malingering individuals in neurological clinics.

Schizophrenia defendants awaiting trial may make stronger efforts to simulate cognitive impairment than students in experimental laboratory situation, and consequently their performance was more deviant. Healthy students recruited for simulation studies usually performed on the level of 68% correct answers (27), while patients with schizophrenia with exaggeration of acute psychosis performed on the level of 63.8% correct answers.

Conclusion

We found significant differences in neuropsychological performance between patients with schizophrenia feigning psychopathological symptoms and patients with schizophrenia with true acute psychotic symptoms in pretrial psychiatric examinations. In the light of the current data, simple computerized neuropsychological assessment may help to detect malingerers. Although the results of our study cannot be widely generalized to all patients in different clinical situations, they may contribute to the further development of simple measures useful for the detection of malingering. Additional studies are required.

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