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The 48-Pictures Test: A two-alternative forced-choice recognition test for the detection of malingering

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Abstract

We tested the validity of the 48-Pictures Test, a 2-alternative forced-choice recognition test, in detecting exaggerated memory impairments. This test maximizes subjective difficulty, through a large number of stimuli and shows minimal objective difficulty. We compared 17 suspected malingerers to 39 patients with memory impairments (6 amnesic, 15 frontal lobe dysfunctions, 18 other etiologies), and 17 normal adults instructed to simulate malingering on three memory tests: the 48-Pictures Test, the Rey Auditory Verbal Learning Test (RAVLT), and the Rey Complex Figure Test (RCFT). On the 48-Pictures Test, the clinical groups showed good recognition performance (amnesics: 85%; frontal dysfunction: 94%; other memory impairments: 97%), whereas the two simulator groups showed a poor performance (suspected malingerers: 62% correct; volunteer simulators 68% correct). The two other tests did not show a high degree of discrimination between the clinical groups and the simulator groups, except in 2 measures: the 2 simulator groups tended to show a performance decrement from the last recall trial to immediate recognition of the RAVLT and also performed better than the clinical groups on the immediate recall of the RCFT. A discriminant analysis with the latter 2 measures and the 48-Pictures Test correctly classified 96% of the participants. These results suggest that the 48-Pictures Test is a useful tool for the detection of possible simulated memory impairment and that when combined to the RAVLT recall–recognition difference score and to the immediate recall score on the RCFT can provide strong evidence of exaggerated memory impairment. (*JINS*, 1997, *3*, 545–552.)

Keywords: Malingering, Simulation, Memory disorder, Memory testing

INTRODUCTION

In neuropsychology, accurate detection of malingering has important consequences, both to insure correct interpretation of the observed performances and to get a clearer picture of the deficits in cases of litigation (Rogers, 1988; Faust, 1995). The detection of simulators has traditionally depended on the subjective impression of the examinator. However, for memory deficits, detection of simulation by subjective methods alone has been shown to be unreliable (Baker et al., 1993).

In recent years, the increased number of cases where neuropsychologists have been consulted about the possibility of exaggerated memory deficits has compelled investigators to try to develop reliable objective indices of simulation. Many of the behavioral measures proposed have used tasks in which amnesics show some retention of information, such as recognition tests, tests of implicit memory, or tests of explicit memory in which qualitative aspects of performance are examined (Graf et al., 1984; Shimamura & Squire, 1986; Brandt, 1988, 1992; Bernard, 1990; Baker et al., 1993; Martin et al., 1993; Hiscock et al., 1994). These methods differ widely in terms of their practicality and their capacity to discriminate between genuine memory impairments and malingering (for reviews see Brandt, 1992; Nies & Sweet, 1994).

Among the tasks used to detect malingering, those involving two-alternative forced-choice appear to show a superior discriminative power (Brandt et al., 1985; Brandt, 1988, 1992; Pankratz, 1988; Hiscock & Hiscock, 1989; Binder, 1992, 1993; Guilmette et al., 1993; Martin et al., 1993; Prigatano & Amin, 1993; Hiscock et al., 1994). This discriminative power may be due to a number of factors. First, forced-choice recognition can be extremely easy,

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especially with two alternatives. Forced-choice recognition involves a comparison between the associations evoked by two or more items, whereas in yes–no recognition for example, no comparison is possible, and recognition must be based on the absolute strength of the associations of the item presented. In controls, Shepard (1967) reported a mean score of 96.7% correct in the immediate two-alternative forced-choice recognition of 68 pictures from a series of 612 pictures shown one at a time. Following a 1-week delay, recognition was still 87% correct for a different set of 68 pictures from the same series. Also, amnesic subjects generally show a significantly better performance on forced-choice recognition tasks compared to their performance on recall or on yes–no recognition tasks (Huppert & Piercy, 1976; Hirst et al., 1986), a fact that seems to be relatively unknown in the general population, and that may lead to an underestimation of the recognition performance of memory-impaired individuals by malingerers.

Some studies have shown that suspected malingerers can score lower than chance level in forced-choice recognition (Pankratz, 1983; Binder & Pankratz, 1987). In other studies however, only few simulators performed around chance level (Wiggins & Brandt, 1988; Binder & Willis, 1991). Different forced-choice recognition measures can vary on several aspects affecting their clinical usefulness. Besides ease of use, important characteristics of tests aiming to detect malingering are the perceived difficulty of the test, the difficulty of keeping track of one's own responses, and the simplicity of the test, which insures near-perfect performance by both normal and brain-damaged individuals. The first two aspects will tend to decrease the performance of malingerers, and the third characteristic will tend to increase the performance of honestly performing patients.

The present study examined the validity of a forced-choice recognition task containing 48 line drawings of objects or simple scenes. This task, called the 48-Pictures Test, was created by Signoret (1979) for detecting major memory deficits. Despite its imposing appearance (96 pages), it is a short and easy test that can be used with all age groups and all educational levels. The use of stimuli amenable to dual coding (verbal and imagery) maximizes encoding even in patients with language or visual-recognition impairments. The vast majority of non-memory-impaired patients demonstrate an errorless performance on this test. At the same time, the large number of items amplifies the perceived difficulty of the task. The testing procedure involves the presentation of all 48 pictures followed by 24 immediate recognition trials and 24 delayed recognition trials. The large number of responses and the use of a delayed-recognition condition impair the ability of test takers to monitor the number of true or false responses given. Thus, the 48-Pictures Test has characteristics that are seldom present in other two-alternative forced-choice tests, and which may help maximize its discriminative power as a test of detection of malingering. In this study, the performance of suspected malingerers and normal volunteers instructed to simulate memory disorders was compared to that of three groups of patients with significant memory impairments using three measures: the 48-Pictures Test and two standard tests of explicit memory that have previously been used to detect malingering; the Rey Auditory Verbal Learning Test (RAVLT; Rey, 1964) and the Rey Complex Figure Test (RCFT; Rey, 1941).

METHODS

Research Participants

The suspected malingerers included 17 individuals (14 men and 3 women) complaining of memory deficits, with no radiological (skull X-ray, brain CT scan, MRI) or electrophysiological (EEG, evoked potentials) evidence of cerebral lesion or objective neurological deficit at the time of testing. The mean age and education level of the group were respectively 40.3 years ($SD = 11.3$) and 12.2 years ($SD = 3.3$). Thirteen suspected malingerers had sustained minor to moderate head injury 6 months to 6 years before testing. The other 4 participants were diagnosed with multiple sclerosis, possible degenerative disease, headache, and radiation-related illness. All were in a position to receive tangible secondary gain (financial gain from insurance) from poor performance in the neuropsychological evaluation. They were referred for neuropsychological testing by a neurologist and/or neurosurgeon because their neurological or neuropsychological profile was atypical for the etiology. Suspected malingerers were compared to 17 volunteer simulators and 39 patients with memory impairments.

Normal controls included in the study were all volunteers (7 men and 10 women). They were matched to the suspected malingerers group in age ($F < 1$) and education level [$F(1,32) = 3.8$, $p > .05$]. All volunteers were naive about the memory profile expected in brain-damaged individuals. They did not receive any compensation for their participation. In the general presentation of the experiment, they were told that we did not want to evaluate their real performance but that we wanted them to simulate memory problems. They were verbally instructed to act according to the following scenario:

> Two months ago, you visited a friend in his new apartment located in an old building. You fell in the staircase that was in very bad state. You are not sure if you lost consciousness but since that time, you suffered headaches and had cognitive sequelae including concentration difficulties, fatigability, and memory impairments. Moreover, you have not been able to go back to work. You decided to sue the owner of the building for $500,000. Your attorney told you that the only way to win will be to prove memory impairment. Today you have to receive neuropsychological evaluation to show the presence of cognitive deficits related to your accident.

That scenario was used to give a realistic context, and to clarify the reasons for simulating. Following these instructions, if the participant had any more questions, he was told to do his or her best to convince the examiner that he or she had memory problems.

Memory impaired patients included 6 clinically amnesic patients (4 men and 2 women) with the following diagnoses: ruptured aneurysm ($n = 1$), bilateral thalamic vascular lesion ($n = 2$), bilateral hippocampal lesion ($n = 1$), domoic acid intoxication ($n = 1$), and hydrocephalus ($n = 1$); 15 patients with moderate to severe frontal lobe dysfunction associated with memory impairment (8 men and 7 women) with various etiologies (hydrocephalus, brain injury, frontal lobe dementia); and 18 patients with moderate memory impairment (7 men and 11 women) with various etiologies (cerebral neoplasm, cerebrovascular accident, major depression, temporal lobectomy for epilepsy). To be included in the study, the participants had to be able to complete the three memory tests administered.

Table 1 shows the comparison of the five groups of participants on demographic data. The five groups were equivalent in education level [$F(4,61) = 2.3$, $p > .07$]. The three clinical groups did not differ significantly in mean age ($F < 1$). Suspected malingerers were significantly younger than frontal and memory impaired groups [suspected malingerers *vs*. frontals: $p < .04$; suspected malingerers *vs*. memory impaired: $p < .02$] but did not differ significantly from the amnesic group [$p > 0.6$].

Tasks and Procedure

All participants received the three memory tests: (1) the 48-Pictures Test, (2) the RAVLT, and (3) the RCFT.

The 48-Pictures Test involves the sequential presentation of 48 line drawings of objects or scenes (one per page, 8 × 10 cm), with the instruction to name and memorize it for subsequent recognition. When a picture could not be named or was unsuccessfully identified, the correct answer was given to the participant. This was followed by a two-alternative, forced-choice recognition task: Two pictures were presented simultaneously (top and bottom of the page) and the participant was instructed to point to the one he or she had seen before (see Figure 1). When a participant could not answer, he or she was forced to choose any picture. Half of the pictures were tested immediately after the presentation of the 48 pictures, the other half after a delay of 15 min. During this delay, the participant had to perform other short neuropsychological tests, such as the Trail Mak-

Fig. 1. Sample scenes of the 48-Pictures Test recognition stimuli.

Table 1. Comparison of the five groups of subjects on demographic data

Variable	Suspected malingerers ($n = 17$) *M* (*SD*)	Volunteer simulators ($n = 17$) *M* (*SD*)	Amnesic patients ($n = 6$) *M* (*SD*)	Frontal patients ($n = 15$) *M* (*SD*)	MMI* patients ($n = 18$) *M* (*SD*)
Age (years)	40.3 (11.3)	40.3 (10.5)	51.2 (14.2)	55.9 (15.4)	56.4 (16.4)
Education (years)	12.2 (3.3)	14.3 (3.7)	14.0 (4.9)	10.6 (2.9)	11.1 (5.3)

*MMI = moderate memory impairment.

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ing Test and/or the Porteus Maze Test. The percentage of correct responses was recorded.

The RAVLT was administered in the conventional manner with five recall trials of a first list, one trial with a second list, followed by an immediate free recall test of the first list, and an immediate recognition test of the words in a short paragraph. A 30-min delayed recall test and yes–no recognition test were also administered. For the RCFT, the recall test followed the copy immediately, and participants were not informed that they would have to reproduce the picture. The tests were given in the following order: (1) copy of the RCFT, (2) recall of the RCFT, (3) learning of the RAVLT with immediate recall and recognition, (4) 48-Pictures Test–presentation of stimuli and immediate recognition, (5) short nonmemory tests, (6) delayed recognition of the 48-Pictures Test, and (7) delayed recall and recognition of RAVLT.

RESULTS

Table 2 shows the means and standard deviations on the main measures obtained from the 48-Pictures Test, RCFT, and RAVLT. An analysis of variance (ANOVA) on the performances of the five groups on the 48-Pictures Test showed a significant group effect [$F(4,68) = 18.3$, $p < .0001$] with Scheffé multiple comparisons showing no difference between the suspected malingerers and the volunteer simulators ($F < 1$), and no difference between the three clinical groups [amnesics *vs*. memory impaired: $p = .6$; amnesics *vs*. frontals: $F(1,19) = 2.8$, $p = .8$; frontals *vs*. memory impaired: $F(1,31) = 1.1$, $p = .9$]. However, significant differences were found between the three clinical groups and the suspected malingerers [suspected malingerers *vs*. memory impaired: $p < .0001$; suspected malingerers *vs*. frontals: $p < .0001$; suspected malingerers *vs*. amnesics: $p < .04$].

We compared the performance of each group on the immediate and delayed recognition conditions of the 48-Pictures Test. The results were similar to those obtained previously for the total score of the 48-Pictures Test: The group effect was significant [$F(4,68) = 18.2$, $p < .0001$] with multiple comparisons showing that the malingerers obtained scores similar to those of volunteer simulators (immediate: $F < 1$; delayed: $F < 1$) and that the three clinical groups were also similar (all ps $> .4$). Also, scores of suspected malingerers were significantly lower than those of the three clinical groups on immediate and delayed recognition [all ps $< .01$] except for the difference between suspected malingerers and amnesics in delayed recognition [$p > .1$]. A significant effect of condition (immediate *vs*. delayed recognition) was observed [$F(1,68) = 24.8$, $p < .0001$] but no significant interaction effect [$F(4,68) = 1.1$, $p > .3$]. Figure 2 shows the distribution of scores obtained by the various groups on the 48-Pictures Test.

Since there was no difference between the performances of suspected malingerers and volunteer simulators nor among the three groups of clinical patients, we decided to combine the two first groups together and the three last groups together to form two larger groups called respectively the *simulator group* and the *clinical group*. On this measure, 90%

Table 2. Comparison of the five groups of participants on the 48-Pictures Test, the RCFT, and main measures of the RAVLT. Standard deviations are in parentheses

Measure	Suspected malingerers ($n = 17$) *M* (*SD*)	Volunteer simulators ($n = 17$) *M* (*SD*)	Amnesic patients ($n = 6$) *M* (*SD*)	Frontal patients ($n = 15$) *M* (*SD*)	MMI* patients ($n = 18$) *M* (*SD*)
48-Pictures Test					
Total score	62.2% (20.9)	67.6% (18.1)	85.4% (12.4)	93.9% (9.6)	96.6% (5.6)
Immediate recognition	65.2% (21.0)	71.6% (18.7)	90.3% (10.8)	96.4% (6.7)	97.7% (5.6)
Delayed recognition	59.1% (23.1)	63.7% (19.5)	80.6% (14.6)	91.4% (12.9)	95.6% (6.5)
RCFT					
Copy	28.2/36 (5.1)	30.1/36 (6.4)	24.4/36 (9.6)	22.6/36 (9.6)	23.7/36 (10.3)
Immediate recall	14.8/36 (5.0)	13.0/36 (6.7)	7.7/36 (4.1)	9.9/36 (4.2)	8.5/36 (5.5)
RAVLT					
Fifth recall	9.1/15 (2.7)	9.2/15 (3.2)	5.7/15 (2.7)	7.3/15 (3.1)	8.6/15 (3.4)
Immediate recall	5.2/15 (3.1)	6.6/15 (2.9)	3.0/15 (2.0)	3.7/15 (3.0)	4.4/15 (3.9)
Delayed recall	4.7/15 (3.1)	5.6/15 (3.3)	2.2/15 (2.0)	5.0/15 (3.3)	4.6/15 (4.6)
Difference score**	−2.1 (1.9)	−2.1 (2.9)	2.7 (2.0)	3.8 (4.0)	2.4 (2.8)
Immediate recognition (correct resp.)	6.9 (2.9)	7.2 (3.3)	8.3 (3.9)	11.1 (3.1)	11.1 (3.6)
Immediate recognition (false resp.)	1.1 (2.0)	1.2 (1.5)	4.3 (4.4)	4.3 (6.1)	3.2 (4.0)
Total number of words	34.1/75 (8.7)	39.2/75 (10.4)	28.3/75 (13.5)	30.7/75 (11.7)	34.6/75 (11.0)

*MMI: moderate memory impairment.
**Difference score (immediate recognition minus fifth recall).

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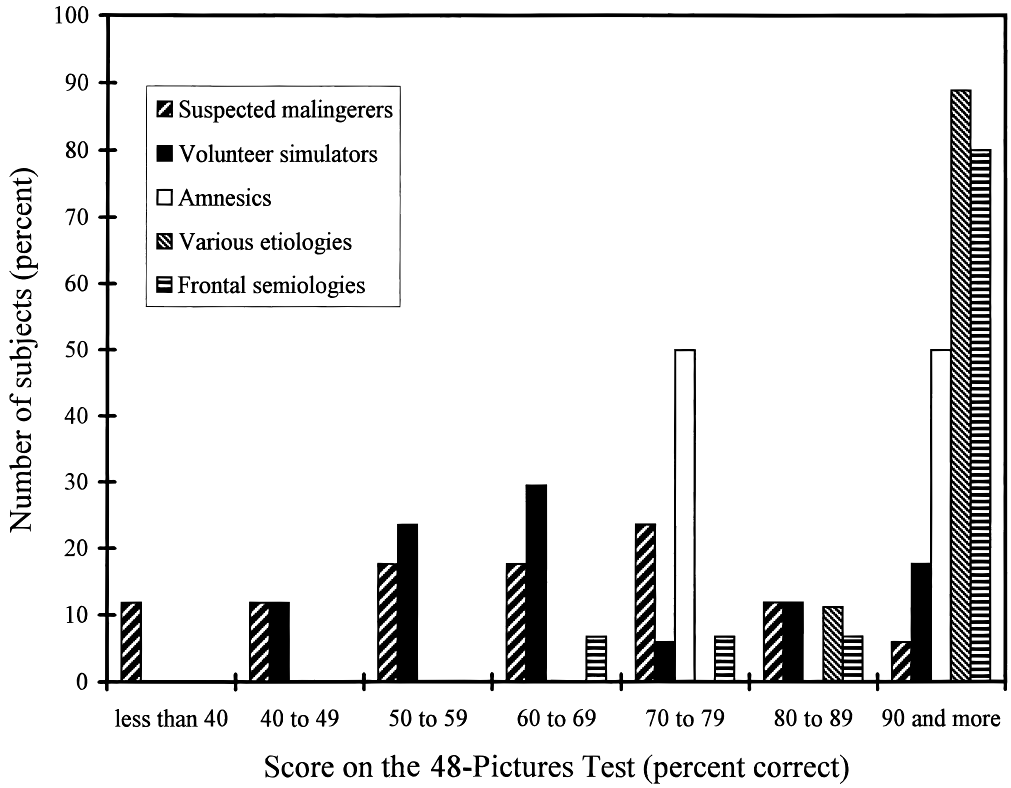

Fig. 2. Distribution of the scores on the 48-Pictures Test in the five groups of participants.

of the patients in the clinical group scored above 77% correct. In contrast, 74% of simulators, scored below 77% correct. The difference between the group means was highly significant [$F(1,68) = 64.0$, $p < .001$; simulators: 65% correct, $SD = 19$; clinical group: 94% correct, $SD = 9$]. The difference in performance between the simulators and patients was comparable in the immediate and delayed recognition as in the total score of the 48-Pictures [$F(1,71) = 68.5$, $p < .001$; simulators: immediate: 68.4%, $SD = 19.8$; delayed: 61.4%, $SD = 21.2$; clinical group: immediate: 96.0%, $SD = 7.2$; delayed: 91.7%, $SD = 11.6$]. The decrement in performance between the immediate and delayed recognition was statistically significant for both the simulator and the clinical groups [$F(1,71) = 24.9$, $p < .001$], but there was no significant interaction [$F(1,71) = 1.3$, $p > .1$].

An ANOVA comparing the performances of the five groups on the RCFT showed a significant group difference [$F(4,68) = 4.4$, $p < .003$]. *Post-hoc* comparisons showed no difference between the suspected malingerers and the volunteer simulators ($F < 1$) and no difference between the three clinical groups (all $ps > .9$). The only significant difference was observed between suspected malingerers and patients with memory impairment [$p < .03$]. Figure 3 shows the distribution of scores obtained by each group on the immediate recall of the RCFT.

Again, it was decided to compare the two simulator groups as a whole to the three clinical groups, since the performance levels of the suspected malingerers and volunteer simulators were comparable, and those of the three patient groups were also comparable. The simulator group scored significantly higher than the clinical group [$F(1,68) = 15.5$, $p < .001$]. Indeed, few simulators showed severe impairment: Only 22% of simulators obtained a score less than 10/36, compared to 61.5% of patients in the clinical group. However, the 90th percentile of the clinical group was 16/36, while the 10th percentile of simulators was 6.5/36. This overlap is substantial, since 85% of simulators obtained a score in the range of the clinical group. This result suggests that the RCFT immediate recall does not show good discriminative power to separate simulators from memory-impaired individuals.

Five variables were derived from the RAVLT: (1) the fifth learning trial, (2) the immediate recall, (3) the delayed recall, (4) the immediate recognition, and (5) the total number of words recalled in the five learning trials. A group difference was observed in immediate recognition only [$F(4,65) = 5.4$, $p < .001$] and not in the other measures (all Fs < 2.4, all $ps > .05$). Suspected malingerers and volunteer simulators both recognized significantly fewer words than memory impaired and frontal groups [suspected malingerers *vs*. memory impaired: $p < .015$; suspected malingerers *vs*. frontals: $p < .02$; volunteer simulators *vs*. memory impaired: $p < .025$; volunteer simulators *vs*. frontals: $p < .04$], all other comparisons being nonsignificant.

We noticed a tendency for simulators to recognize fewer items than they had recalled just before. We thus computed

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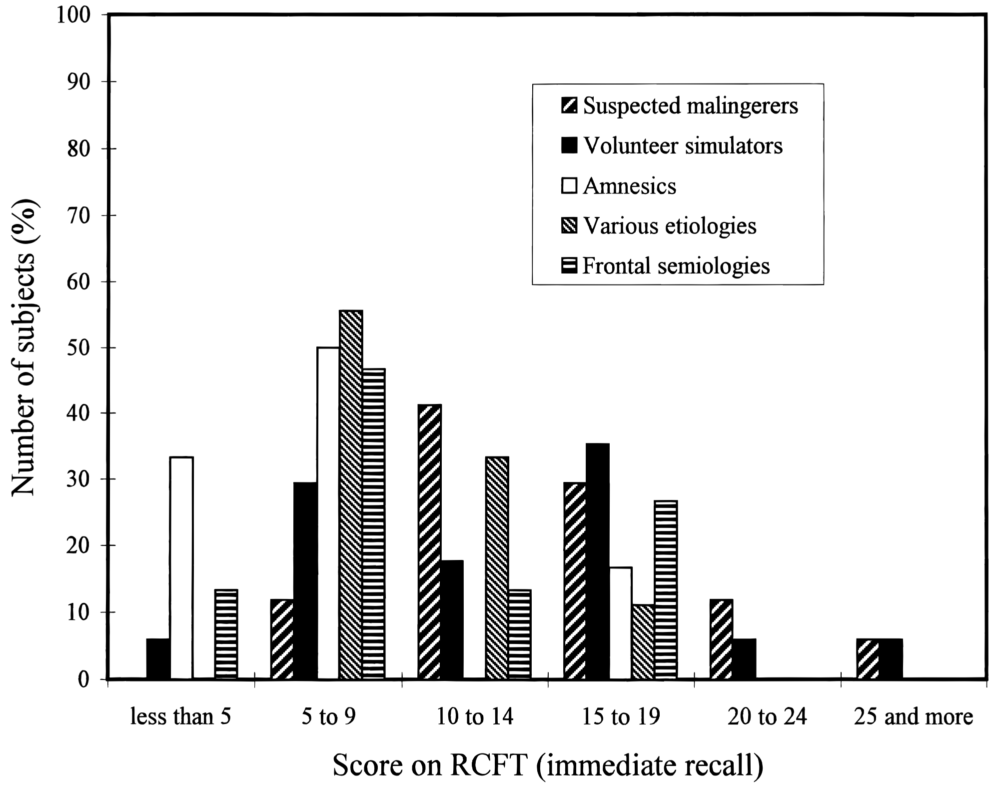

Fig. 3. Distribution of the scores on the immediate recall of the Rey Complex Figure Test in the five groups of participants.

a difference score using the number of words recalled on the fifth learning trial minus the number of words recognized in immediate recognition. Figure 4 shows the distribution of this difference score in the five groups of subjects. An ANOVA comparing the performances of the five groups on that difference score showed a significant group effect [$F(4,68) = 14.5$, $p < .0001$]. Again, the *post-hoc* comparisons showed no difference between the suspected malingerers and the volunteer simulators ($F < 1$), and no difference between the three clinical groups (all $ps > .7$). Also, there were significant differences between all clinical groups and the suspected malingerers [suspected malingerers *vs*. memory impaired: $p < .001$; suspected malingerers *vs*. frontals: $p < .0001$; suspected malingerers *vs*. amnesics: $p < .023$]. These results suggest that the suspected malingerers and the volunteer simulators tended to recognize *fewer* words than they recalled.

We again combined the five groups into simulators (suspected malingerers and volunteer simulators) and clinical groups (amnesics, frontals, and memory impaired) and compared their performances on RAVLT. The overlap between the total number of words recalled in the two groups was substantial: The 10th and 90th percentile of the clinical group were 17 and 47/75, respectively, compared to 23 and 49.5/75, respectively for the simulator group. The difference between the group means was not significant [$F(1,68) = 3.7$, $p > .05$]. As observed above, a majority of simulators (76%; 26/34) showed a decrement in performance from the last recall trial to the immediate recognition (13/17 suspected malingerers and 13/17 volunteer simulators). Only 13% (5/39) of clinical patients showed the same effect (2/18 memory impaired, 3/15 frontals, and 0/6 amnesics). The two groups were significantly different on this difference score [see Table 2; $F(1,68) = 51.3$, $p < .001$].

In a supplementary analysis, we examined the discriminative power of combinations of scores from the three tests used. A stepwise discriminant analysis was performed using group as the dependent variable and the five following variables (the 48-Pictures, the RCFT copy, the RCFT immediate recall, the RAVLT total number of words recalled, and the RAVLT difference score) as predictors. The final function included three predictors: the 48-Pictures test score (standardized coefficient = .76), the RCFT immediate recall score (standardized coefficient = −.45 and the RAVLT difference score (standardized coefficient = .52). This function correctly classified 94.5% of participants, and only 3 simulators (volunteers) and 1 clinical patient (frontal) were misclassified [$F(3,69) = 46.8$, $p < .0001$]. This analysis indicates that, although the 48-Pictures Test is the most discriminating variable, its combination with the RCFT immediate recall and the RAVLT difference score can further increase this discriminative power, and strengthen a hypothesis of exaggerated memory deficit.

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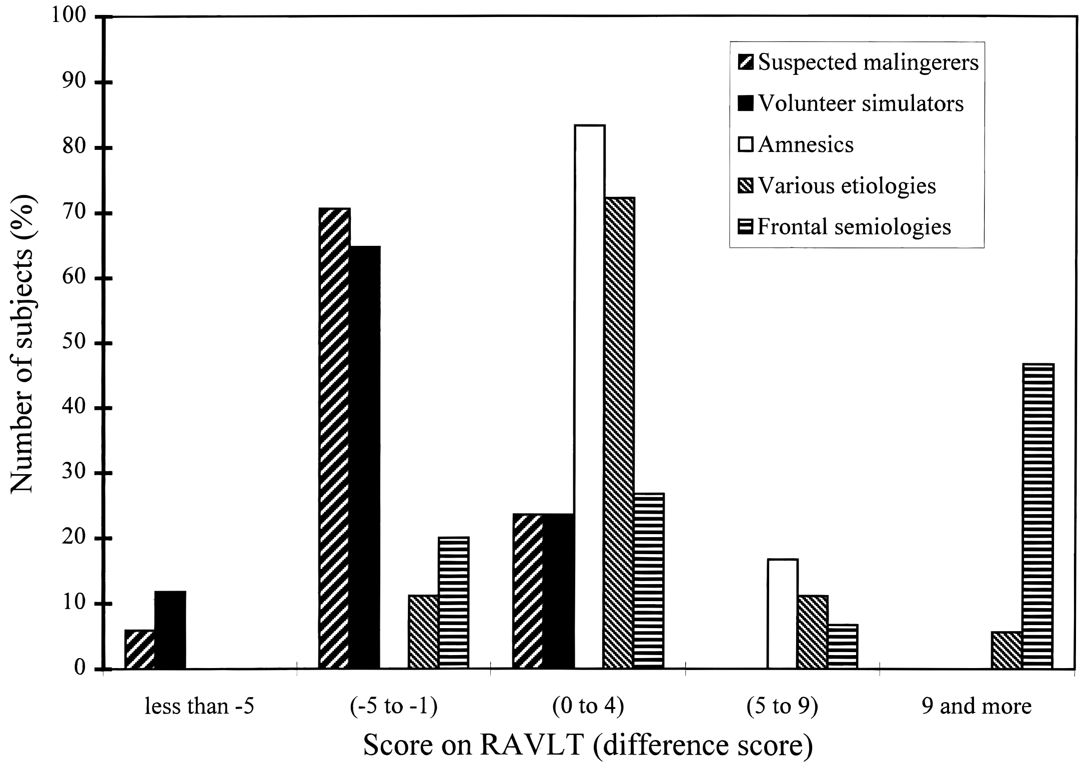

Fig. 4. Distribution of the difference scores of the Rey Auditory Verbal Learning Test in the five groups of participants.

DISCUSSION

The present results suggest that the 48-Pictures Test is a very efficient test to distinguish between real memory impairments and malingered performances. A large percentage of simulators performed near chance level whereas none of the memory-impaired patients showed performance around chance level. This level of discrimination is important in view of the consequences of suspicion of malingering in the clinical evaluation, and has been obtained with few forced-choice measures (Brandt, 1988; Baker et al., 1993). This discriminative power is probably partly due to the fact that the test is extremely easy even for amnesics. Despite its impressive appearance, the test incorporates very salient and discriminable stimuli amenable to visual and verbal coding. The difference between immediate and delayed recognition was similar for all groups. One explanation may be related to the fact that the test is very easy: Simulator groups performed so poorly on the immediate recall that they couldn't imagine performing more poorly on delayed recognition, a floor effect. Another possibility is that participants could not keep track of their performance, and simply performed slightly worse than in the immediate performance.

The discriminative power of RCFT and RAVLT was not as good as that of the 48-Pictures Test. The performance of simulators overlapped significantly with those of the three memory-impaired patient groups. Nevertheless, confirming previous reports (Brandt et al., 1985; Wiggins & Brandt, 1988; Bernard, 1990), we observed some patterns of performance in simulators that may help support a suspicion of malingering. The recall-to-recognition decrement in the RAVLT seems to show some discriminative power, although 5 of the 39 memory-impaired patients showed the same phenomenon in our sample. Also, contrary to memory-impaired patients, few simulators demonstrated severe impairment on the immediate recall of the RCFT and most of them adequately reproduced the external structure of the figure and its internal organization. As suggested by the discriminant analysis, the combination of the 48-Pictures Test, the RAVLT difference score, and the immediate recall score on the RCFT provides strong evidence to strengthen a hypothesis of exaggerated memory impairment.

In our clinical practice, we have seen very few patients who performed below 65% on the 48-Pictures Test. The patients who did were so heavily handicapped that they were absolutely unable to perform adequately in most neuropsychological tests. For example, a group of 8 patients diagnosed with probable dementia of the Alzheimer type (DAT), who can very rarely be mistaken for simulators on classic neuropsychological measures, averaged 82% on the 48 Pictures test (range = 69–94%).

The fact that these measures detect simulators does not mean that negative findings can be used as evidence against malingering. Like many measures, these tests have an asymmetric sensitivity, and very good simulators may well simulate selectively on the numerous tests given to them. Another cautionary note is that some simulators exaggerate memory impairments that are real, and the detection of simulation cannot be considered as evidence for a lack of memory impairment, but only of noncooperation or of motivations other than giving the best performance. Sometimes the behavior of simulation can be a cry for help, as when the patient perceives that further medical attention will follow from poor performance on neuropsychological tests.

The neuropsychological evaluation of memory can only be based on several measures considered simultaneously and in the context of associated perceptual, attentional, or motivational problems. However, the present data suggest that forced-choice tests that appear difficult because of the amount of information presented, and which are well performed by memory-impaired patients, appear to be valuable tools in memory evaluation, in that near-chance-level performance should seriously raise the possibility of malingering.

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