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Effort Testing in Patients with Fibromyalgia and Disability Incentives

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ABSTRACT. ***Objective.*** To examine whether symptom exaggeration is a factor in complaints of cognitive dysfunction using 2 new validated instruments in patients with fibromyalgia (FM).

Methods. Ninety-six patients with FM and 16 patients with rheumatoid arthritis (RA) were administered 2 effort or symptom validity tests designed to detect exaggerated memory complaints as part of a battery of psychological tests and self-report questionnaires.

Results. A large percentage of patients with FM who were on or seeking disability benefits failed the effort tests. Only 2 patients with FM who were working and/or not claiming disability benefits and no patient with RA scored below the cutoffs for exaggeration of memory difficulties.

Conclusion. This study illustrates the importance of assessing for exaggeration of cognitive symptoms and biased responding in patients with FM presenting for disability related evaluations. (J Rheumatol 2001;28:1892–9)

Key Indexing Terms:
FIBROMYALGIA RHEUMATOID ARTHRITIS EXAGGERATION
MALINGERING DISABILITY NEUROPSYCHOLOGY

Fibromyalgia (FM) is a chronic pain disorder of unknown etiology characterized by the presence of multiple tender points combined with widespread musculoskeletal pain. The prevalence of this disorder is estimated to be 2.0–3.3% of the North American population, and up to 36% of patients with FM may become work disabled, accounting for 9% of all disability insurance payments in Canada[1]. White and Harth[2] reported that patients with FM claim greater work disability than patients with chronic generalized pain, with 31% being work disabled and 26% receiving a disability pension. McCain and colleagues[3] determined that longterm disability claims for FM cost private insurers in excess of $200 million annually in Canada alone. Pain, fatigue, and weakness are the symptoms most frequently claimed to compromise patients' ability to work[2].

Patients with FM also frequently report a variety of psychological symptoms, including depression, anxiety, and cognitive impairment[4]. High lifetime and current prevalence of major depression and other psychiatric disorders and psychological distress have been found in patients with FM[5,6] and cognitive complaints are included in the DSM-IV diagnostic criteria for depression[7]. Patients seeking medical disability often claim impaired memory or other cognitive problems as factors in their disability[5]. Psychological or neuropsychological assessment of these complaints, and other psychological or pain related symptoms, is commonly requested as part of the disability assessment process. However, assessment of both physical and cognitive aspects normally reflects the subjective perception of the patient. Thus, if a patient has too much pain to lift or memory deficits impair function, an assessor, in this as in other disorders[8], generally has to accept these descriptions at face value, although some tests for consistency of effort can be included. The assessment process can be complicated by the presence of symptom exaggeration in some patients, particularly when litigation or the pursuit of financial benefits is involved.

Grace, *et al*[9] reported that people with FM performed more poorly on tests of memory and sustained auditory concentration than controls, noting that the perceived memory deficits of the FM cases were disproportionate to their objective deficits. Schnurr and MacDonald[10] found that patients with chronic pain with medico-legal incentives reported significantly more memory impairment than psychotherapy patients or patients with medical or dental problems. However, Kay and Morris-Jones[11] reported a very high rate of exaggeration of disability in litigating patients with chronic pain. In a metaanalysis of the literature, Rohling and colleagues[12] concluded that compensation status is one factor influencing symptom presentation, accounting for 6% of the variance in the pain experience of patients with chronic pain. Similarly, Binder and Rohling[13] found more abnormality and disability in patients with financial incentives despite less severe injuries.

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FM is a diagnosis relying primarily upon symptoms, which are typically disproportionate to the physical findings, which indeed are also in a sense subjective. It would be helpful, therefore, to have objective verification of symptoms and alleged disability, especially where external incentives, such as financial benefits, are present. In neuropsychological assessments, so-called forced-choice symptom validity tests or effort tests are commonly used to detect response bias associated with exaggerated cognitive problems[14-18]. Hart, *et al*[19] in a review of neuropsychological functioning in people with chronic pain, concluded that tests of response bias and motivation should be used in evaluating such patients involved in litigation or seeking wage replacement benefits. We used tests previously used in normal controls and people with various diagnoses, including severe brain injury and neurological illness[20-23]. These tests, the Computerized Assessment of Response Bias (CARB)[24,25] and the Word Memory Test (WMT)[26], appear complex but are very easy. The standardization and clinical studies found that healthy volunteers on the CARB scored 99% correct and individuals with severe traumatic brain injury were still able to achieve 98% correct. Similarly, on the WMT, healthy controls scored 97% correct and patients with severe brain injuries produced a mean score of 96%. Sophisticated controls, who were asked to fake memory impairment on the WMT without being detected, were unable to produce the profile of people with genuine memory impairment[23]. It was hypothesized that patients with FM on disability, or who were seeking medical disability, would show greater evidence of response bias and suboptimal effort than patients with FM not seeking disability or patients with rheumatoid arthritis (RA).

MATERIALS AND METHODS

Participants. The participants were 96 patients with FM and 16 patients with RA who were self-selected from an RA followup clinic after reading a summary of the study. Only female patients with RA were used. They had to live in the Edmonton region and fulfill American College of Rheumatology (ACR) diagnostic criteria for RA. The patients with FM (95 female, one male) were recruited by telephone from a list of about 198 patients who had participated in a previous therapeutic study and also by interview and discussion with some 30 patients referred to one of us in consultation. Slightly more than 50% of the patients in both samples agreed to participate in the study. Those who declined cited an inability to drive due to the severity of their condition, work commitments, or distance involved as reasons for not participating. A total of 17 patients failed to attend their scheduled assessment appointment or withdrew prior to the study, leaving a final sample of 96 patients with FM. The patients with RA had a written description and the patients with FM were also told it was a study to assess memory function and if it was abnormal, to assess the underlying mechanisms involved. No financial compensation or incentive was offered for participation in the study. Participants were free to discontinue the study at any time. The patients who agreed to participate in the study were scheduled for a 90 min appointment with the examiner. All patients were diagnosed with FM or RA by a rheumatologist according to ACR criteria and this was a required entry criterion, as was residence in the Edmonton area and willingness to participate in the study.

All patients either spoke English as a first language or rated themselves as fluent in English. One patient was excluded from the RA group as she was unable to use the computer keyboard due to arthritis related hand impairment. Three patients reported a history of alcohol abuse and 8 reported a history of head injury. They were retained in the study because the effort measures of the CARB and WMT were originally developed and standardized on patients with severe head injuries and neurological impairments and these measures are insensitive to the effects of these conditions.

The patients with FM were divided into 2 subgroups depending upon disability status. The first subgroup (FM No Disability, n = 50) was composed of patients who were not involved in any form of disability claim for their condition. All the patients in the second subgroup (FM Disability, n = 46) were either receiving medical disability benefits, or were in the process of applying for benefits at the time of assessment.

Assessment methods. Participants were administered 2 effort tests, the CARB[24,25], and the WMT[26]. They also completed a battery of psychological tests, self-report symptom rating scales, and demographic questionnaires. These included the symptom checklist-90-revised (SCL-90-R)[27], the memory complaints inventory (MCI)[28], the vocabulary subtest of the Wechsler adult intelligence scale-revised (WAIS-R)[29], and the FM Impact Questionnaire (FIQ)[30].

The CARB employs a digit recognition format designed to detect incomplete effort associated with exaggeration of memory problems. In a recent review, Iverson and Binder[31] described the CARB as one of the best validated forced-choice symptom validity tests. The patient is presented with 3 sets of 25 5-digit numbers on the computer screen. Each 5-digit number is followed by a message to count backwards from 20. After a brief delay, 2 5-digit numbers, one of which was the original number, appear on the left and right sides of the computer screen. The patient must choose which of the 2 numbers was originally displayed by selecting either the left or the right shift key. This task is extremely easy and even a random choice provides a 50% chance of being right on each test item. If the person obtained a score of 100% correct, the early termination feature of the software program discontinued the test after the first set of 25 numbers. If less than perfect performance was detected, the program administered the second and third sets of 5-digit numbers. For reasons of test security, it is conventional not to specify the cutoffs for symptom validity tests in publications. We used the cutoff score for biased responding recommended in the clinical manual. This is set conservatively at a total score 3.5 standard deviations (SD) below the mean score of 98.3% (SD = 2.6) seen in 57 patients with moderate to severe brain injury[20]. The results from people with moderate/severe brain injury are consistent with the fact that CARB is virtually insensitive to actual cognitive impairment and does not measure memory.

The WMT is a computerized wordlist learning task, which measures verbal learning and memory as well as biased responding[18,21-23,26,31]. It involves the successive presentation of 20 word pairs, such as dog-cat, on a computer screen. After 2 presentations of the list, the first response bias or effort measure is administered, in which the person sees each original word paired with a new word (e.g., dog-rabbit) and has to select the word previously seen on the list (i.e., dog). This is the immediate recognition (IR) trial. After 30 min, the delayed recognition (DR) trial is presented — the person again sees each of the words from the list paired with new words and has to select the original words (e.g., dog, from the pair dog-rat). The consistency of responses from IR to DR is calculated (Cons). As with the CARB, there is a 50% probability of being correct on each item by chance alone. The 4 measures of memory follow the effort measures. These include the multiple choice (MC) subtest in which the person is shown the first word from each pair and is asked to choose the matching word from 8 options; paired associates (PA), in which the person is given the first word from each pair by the tester and is asked to tell the tester the second word; delayed free recall (DFR), in which the person is asked to recall as many words as possible from the list; and long delayed free recall (LDFR), which involves recall of words from the list after a further 20 min delay.

Iverson and Binder[31] provide a detailed review of the WMT and the studies supporting its validity as a measure of effort. In a recent study of

298 consecutive patients with head injury, 64 with moderate to severe brain injury scored a mean of more than 90% correct on all of the WMT effort measures[18]. The cutoff for failure on the WMT effort measures in the current study was defined by an IR or DR score nearly 3 standard deviations below the mean IR and DR scores obtained by patients with moderate to severe brain injuries and neurological patients assumed to be making a satisfactory effort (IR: mean 95.5%, SD 5.1; DR: mean 96.1%, SD 3.9)[21,22]. Failure on either the CARB or the WMT effort measure is usually interpreted as evidence of response bias or incomplete effort and it raises questions about the validity of the patient's test results, self-reported symptoms, and claimed disability.

The memory complaints inventory (MCI)[28] is a 58 item computer administered self-report inventory of memory problems ranging from common to implausible. The instrument contains 9 scales designed to identify specific types of reported memory problems: general memory problems (GMP), numeric information problems (NIP), visuospatial memory problems (VSP), verbal memory problems (VMP), pain interferes with memory (PIM), memory interferes with work (MIW), impairment of remote memory (IRM), amnesia for complex behavior (ACB), and amnesia for antisocial behavior (AAB). The first 6 scales contain items describing the most plausible memory complaints, whereas the last 3 scales describe the least plausible memory problems, which are rarely found in patients with bona fide memory impairment of organic origin. These include complaints such as the following: there are big gaps in my memory of my childhood (remote amnesia); minutes or hours pass by and I have no idea of what I have been doing (ACB); and I have hit someone and had no memory of doing it (AAB).

Procedures. Our study was approved by the Health Research Ethics Board of the Faculty of Medicine of the University of Alberta. Prior to testing, all patients were given a brief description of the study and signed an informed consent form acknowledging that they were participating in a study to examine memory and concentration abilities in patients with FM and RA.

The psychological tests, including the CARB and WMT, were individually administered under standardized conditions by one of us (SP). The average testing time was about 90 min, but testing could require up to 3 h depending upon the work speed of the patient. The effort tests and the WAIS-R Vocabulary subtest were administered in a consistent sequence, interspersed with the other self-report measures. The computerized tests were automatically scored by the administration software. The examiner scored the remaining tests and questionnaires.

RESULTS

The average age of patients with FM was 46.9 years (SD 10.5) and of patients with RA 49.6 years (SD 18.5). The average education was 13.3 years (SD 2.2) for patients with FM, and 14.3 years (SD 2.4) for patients with RA. The average duration of pain was 11.0 years (SD 9.5) for the FM group and 13.9 years (SD 8.8) for the RA group. These were not significantly different.

On a 6 point scale, with zero representing no pain and 5 representing unbearable pain, the FM Disability group mean score of 2.9 (SD 1.0) was not different than the FM No Disability rating of 2.5 (SD 1.0). The pain severity scores of both FM groups were higher than the RA group mean score of 1.1 (SD 1.0, $p < 0.0005$). On a similar 6 point scale rating perceived memory problems, with zero representing no memory problem and 5 indicating severe memory problem, the FM Disability score of 3.0 (SD 0.7) and the FM No Disability score of 2.6 (SD 0.8) did not differ. However, both were higher than the RA group (mean 1.1, SD 1.0; $p < 0.0005$).

The Vocabulary subtest of the WAIS-R was administered to provide an estimate of general verbal cognitive ability. The FM Disability group obtained a lower mean WAIS-R Vocabulary scaled score of 9.4 (SD 1.8) than the FM No Disability score of 10.5 (SD 1.9, $p < 0.05$) and the RA score of 11.6 (SD 2.1, $p < 0.0005$). This difference is not considered clinically significant as the scores for all 3 groups were within the average range, suggesting normal intelligence. The demographics of the 2 FM subgroups and the RA group are given in Table 1.

The means and standard deviations for the 2 FM subgroups and the RA group on the CARB and WMT effort measures are presented in the first part of Table 2. The mean effort measure scores obtained by groups of 57 patients with moderate to severe traumatic brain injuries (STBI), 64 patients with documented memory impairment, and 247 people with normal memory are provided for contrast[26]. Since the scores on the CARB and the WMT are not normally distributed, nonparametric Kruskal-Wallis tests were used to compare the means between the 3 groups. Significant between-groups differences were noted on the CARB (chi-square 13.31, $p = 0.001$) and WMT effort measures (IR, chi-square 31.90; DR, chi-square 16.07; Cons, chi-square 28.85, $n = 112$, degrees of freedom = 2, $p < 0.0005$). The FM Disability group scored significantly lower than the FM No Disability group on the CARB ($n = 96$, $df = 1$, chi-square 10.16, $p = 0.001$) and the WMT effort measures (IR, chi-square 22.43, $p < 0.0005$; DR, chi-square 11.60, $p = 0.001$; Cons, chi-square 19.92, $p < 0.0005$).

No patient in the FM No Disability and RA groups scored below the effort cutoff on the CARB, in contrast to 11 (24%) of the FM Disability group. Only 2 (4%) of the FM No Disability group scored below the cutoff for any one of the 2 WMT effort measures (IR or DR) compared to 14 (30%) of the FM Disability group. In total, 16 (35%) of the FM Disability group scored below the cutoffs for one or both tests (likelihood ratio = 22.5, $df = 2$, $p < 0.0005$). No patient reporting a history of alcohol abuse scored below the effort cutoffs. Five of the 8 patients reporting a history of head injury passed both the CARB and WMT effort measures.

Table 1. Demographic characteristics of the FM and RA groups.

	FM Dis, n = 46 mean (SD)	FM N/Dis, n = 50 mean (SD)	RA, n = 16 mean (SD)
Age	47.1 (10.3)	46.7 (10.8)	49.6 (18.5)
Education, yrs	13.3 (2.1)	13.3 (2.3)	14.3 (2.4)
Pain duration	10.3 (10.0)	11.7 (9.1)	12.8 (8.4)
Memory problem	3.0 (0.7)	2.6 (0.8)	1.1 (0.9)**
How much pain	2.9 (1.0)	2.5 (1.0)	1.1 (0.9)**
Verbal score	9.4 (1.8)*	10.5 (1.9)	11.6 (2.1)

Bonferroni correction made for multiple comparisons. FM Disability group scored lower than FM No Disability group, *$p < 0.05$. RA group scored lower than both FM groups, **$p < 0.0005$. No other comparisons are significantly different.

Table 2. Mean (SD) CARB and WMT scores in Study and Reference Groups.

	Study Groups			Reference Groups		
	FM Disability, n = 46	FM No Disability, n = 50	RA, n = 16	STBI, n = 57	Impaired Memory, n = 64	Normal Memory, n = 247
Effort Tests						
CARB	93.3 (11.6)**	99.4 (1.6)	99.6 (1.1)	98.3 (2.6)	98.3 (2.0)	99.0 (1.4)
WMT-IR	89.0 (13.0)***	97.5 (4.7)	98.8 (2.0)	98.5 (5.1)	95.1 (4.0)	96.8 (4.0)
WMT-DR	88.9 (13.8)**	97.6 (3.8)	98.8 (2.0)	96.1 (3.9)	95.9 (4.0)	97.3 (3.5)
WMT-Cons	85.1 (14.0)***	95.7 (6.1)	98.0 (3.0)	92.8 (6.4)	92.0 (5.5)	95.1 (5.2)
Memory Tests						
WMT-MC	77.8 (19.6)*	88.4 (14.9)	96.9 (4.0)	85.4 (16.1)	83.0 (15.1)	90.7 (11.1)
WMT-PA	74.2 (18.3)*	84.0 (17.1)	94.1 (7.8)	78.3 (19.8)	76.3 (18.2)	86.5 (13.8)
WMT-DFR	46.1 (14.9)*	56.0 (14.6)	58.6 (13.8)	45.4 (15.2)	43.1 (13.0)	56.5 (14.9)
WMT-LDFR	49.4 (16.1)**	61.5 (17.2)	63.4 (11.6)	45.7 (15.7)	40.9 (16.6)	56.0 (16.3)

STBI: severe traumatic brain injury.
*p < 0.005; **p < 0.001; ***p < 0.0005.

A secondary analysis was conducted to determine if there was an association between type of disability status at the time of assessment and failure on the CARB or the WMT. Of the 16 patients seeking disability, 5 (31%) failed the CARB compared with 6 of the 30 patients (20%) already receiving disability. The rates of WMT failure also showed a similar pattern, with 44% of patients pursuing disability scoring below the cutoff, in contrast to 23% of patients already on disability. A total of 44% of patients with FM applying for disability failed either or both of the WMT and CARB, compared with 30% of failures among patients with FM who were already receiving disability at the time of assessment. Although there was a trend toward greater rates of CARB or WMT failure in the patients with FM seeking disability compared with those patients already receiving disability, the failure rates of the 2 subgroups were not statistically significant (likelihood ratio = 0.86, df = 1, p > 0.35). The failure rates in the CARB and WMT are presented in Table 3.

The FM Disability group also obtained significantly lower scores on the other subtests of the WMT, i.e., the measures of memory alone (MC, PA, DFR, LDFR), when contrasted with the FM No Disability and RA groups (p < 0.005). Indeed, the FM Disability group had scores as low as or lower than the scores produced by the brain injury (STBI) and impaired memory reference groups[21]. The mean scores and standard deviations for the various memory measures of the WMT obtained by the FM groups and the RA group are presented in the second part of Table 2.

The greater incidence of failure of the FM Disability group on the CARB and the effort components of WMT suggests that overreporting or exaggeration of cognitive and other symptoms might be present in this group. This was investigated further by dividing the FM Disability group into 2 subgroups: those who scored below the cutoff for biased responding on the CARB and/or WMT (n = 16) and those who scored above the cutoffs for both the CARB and the WMT (n = 30). ANOVA revealed that the FM Disability group who failed either or both of the CARB or WMT scored significantly lower, not only on all the effort measures (p < 0.0005) but also on the memory measures, than the FM Disability group who passed the CARB and WMT (MC, PA, p < 0.0005; DFR, LDFR, p = 0.001). The FM Disability group who passed both the CARB and WMT still scored lower than the FM No Disability patients on 2 of the 3 WMT effort measures, the IR (p < 0.01) and Consistency (p < 0.05) subtests, but not on DR (p > 0.05). They were not different from the FM No Disability group on any of the WMT memory measures (MC, PA, DFR, LDFR) or on the CARB (p > 0.05). These results suggest a marked response bias or exaggeration of memory problems in the proportion of the FM Disability group who failed the CARB and/or WMT, and generalized inconsistency of effort in the remainder of the group who passed both tests. This is clearly illustrated by the observation that the mean CARB scores of the FM Disability patients who failed the CARB and/or WMT were 6.1 SD lower than the mean of the brain injury (STBI) reference group and 8.0 SD lower than the impaired memory group (Table 2). On the WMT IR and WMT DR they scored 3.6 SD and 5.9 SD below the brain injury group means, and 4.5 SD and 5.7 SD below the impaired memory group means, respectively. Their consistency score was 3.7 SD below the brain injury group and 4.1 SD below the

Table 3. Failure rates on CARB and WMT (%).

Group (n)	CARB	WMT	CARB/WMT
RA (16)	0	0	0
FM No Disability (50)	0	4	4
FM Disability	24	30	35
FM Disability (30)	20	23	30
FM seeking award (16)	31	44	44

impaired memory group. On the WMT memory measures they scored 1.6 SD below the means from the brain injury and impaired memory groups on MC and 1.1 SD below on PA (Table 4).

Review of the other psychological instruments and self-report inventories in our study revealed a consistent pattern of greater symptom endorsement, distress, or reported memory dysfunction in the FM Disability and FM No Disability patients who failed the CARB and/or the WMT, compared with those who passed these measures (SCL-90-R, $p < 0.01$; MCI, $p < 0.0005$). On the FIQ, higher distress or impairment scores were produced on 5 of the 10 scales by the patients who scored below the CARB and/or WMT cutoff scores ($p < 0.05$). These patients also produced higher memory problem ($p < 0.0005$) and pain rating ($p < 0.01$) scores on the demographic questionnaire. This pattern of higher symptom reporting was also consistently observed in the FM Disability group, which obtained significantly higher scores than the FM No Disability and RA groups on all SCL-90-R scales except Paranoid Ideation ($p < 0.05$), and on all MCI scales except AAB ($p < 0.0005$). The FIQ (female patients only) revealed significantly more perceived impairment in the FM Disability group than the FM No Disability group ($p < 0.002$). On the symptom intensity scales, the FM Disability group reported significantly more distress or difficulty than the FM No Disability group on all scales except tiredness, morning fatigue, stiffness, and anxiety ($p < 0.05$).

The FM Disability group who failed the CARB and/or WMT effort measures produced significantly higher scores than those who passed on 7 of the 12 SCL-90-R scales, including the global severity index, positive symptom total, obsessive-compulsive, depression, and psychoticism scales ($p < 0.05$). They did not differ on the somatization, anxiety, hostility, paranoid ideation, or the positive symptom distress index. Similarly, on the MCI, the FM Disability group who scored below the failure criteria on the CARB and/or WMT reported significantly more memory complaints than those who passed on 6 of the 9 scales (GMP, VSP, PIM, MIW, ACB, AAB) and on a composite global memory complaints scale derived from the mean of the 9 MCI scales ($p < 0.05$). Of particular note are their higher scores on 2 scales containing the most implausible memory complaints (ACB and AAB). The 2 subgroups were not significantly different on the FIQ, except for the physical functioning scale ($p < 0.05$). These findings support an association between failure on the CARB and/or WMT effort measures and a general overreporting of symptoms, especially in the area of implausible memory and cognitive complaints.

Table 4. Mean (SD) CARB and WMT scores in the FM Disability group passing and failing CARB or WMT.

	Pass, n = 30	Fail, n = 16	Fail Group Mean vs STBI	Fail Group Mean vs Impaired Memory
Effort tests				
CARB	99.1 (1.7)	82.4 (14.3)**	–6.1	–8.0
WMT-IR	95.3 (4.3)	77.0 (15.4)**	–3.6	–4.5
WMT-DR	97.4 (3.0)	73.0 (11.6)**	–5.9	–5.7
WMT-Cons	93.4 (5.6)	69.4 (11.1)**	–3.7	–4.1
Memory tests				
WMT-MC	88.2 (11.1)	58.4 (17.4)**	–1.6	–1.6
WMT-PA	83.2 (11.9)	57.5 (16.5)**	–1.1	–1.1
WMT-DFR	51.2 (13.2)	36.8 (13.7)*	–0.6	–0.5
WMT-LDFR	55.1 (12.9)	38.8 (16.5)*	–0.4	–0.1

STBI: severe traumatic brain injury.
ANOVA, F (1, 44), *p = 0.001, **p < 0.0005.

DISCUSSION

As predicted in the hypothesis, the patients in the FM Disability group obtained lower scores on the CARB and WMT effort measures than the FM No Disability and the RA groups. Further, not only did the patients in the FM Disability group score lower than the other 2 groups, they also produced the only instances of failure on the CARB, and the overwhelming majority of WMT failures on the effort tests (IR or DR). A total of 35% of the patients in the FM Disability group scored below the cutoffs for biased responding on the CARB and/or WMT, in contrast to only a 4% failure rate in the No Disability group and no failures at all in the RA group. The failure criteria for the CARB and the WMT were set at more than 3.5 SD and nearly 3 SD, respectively, below the mean achievement of individuals with moderate to severe traumatic brain injuries or neurological diseases, which is a very conservative approach. Had we required only a deviation of 2 SD, and based the comparison on normals, then 46% of the FM Disability group as a whole and 56% of those seeking disability would have scored less than the normal mean minus 2 SD on the WMT and/or the CARB. With these more liberal cutoffs only 2 (4%) of the FM No Disability group scored below the cutoff on the CARB and 5 (10%) failed the WMT. No failures were observed in the RA group. This would suggest that a significant proportion of the patients in the FM Disability group (at least 35%) demonstrated incomplete effort, a behavior associated with overreporting and exaggeration of cognitive difficulties, at the time of assessment and would probably produce invalid results on ability tests. While the reasons for this apparent exaggeration are not evident, the association between failure on the CARB and WMT and the presence of medical disability claims in the FM Disability group is notable. These findings are consistent with the literature on chronic pain and litigation that documents a link between compensation incentives and greater reports of pain and disability[11-13,32]. It should also be emphasized that the majority of the patients with FM in this study demonstrated full effort on the symptom validity tests regardless of disability status, and there were no concerns regarding their reported memory problems. We believe that this is probably representative of the FM population in general. However, further research is needed into the interpretation of effort test failure in patients with FM, particularly when this occurs in the context of a disability claim.

The greater degree of symptom reporting in the FM Disability group, compared to the FM No Disability and RA groups, on the SCL-90-R, MCI, and FIQ might be interpreted as suggesting that their lower CARB and WMT scores and 35% failure rate resulted from more severe depression or emotional distress. However, when members of the FM Disability group who passed the symptom validity tests were contrasted with those who failed, there was no difference in their FIQ pain, fatigue, depression, and anxiety scores, or in their SCL-90-R somatization or anxiety scores. Although the 2 subgroups differed on the SCL-90-R depression scale and a number of other scales, this suggests overreporting of symptoms associated with symptom validity test failure, and not the effect of depression or emotional distress. Rohling, *et al*[33], in a study of neuropsychological test results from a clinical sample of 420 outpatients who passed the CARB and WMT, found that depression had a negligible to nonexistent effect on objective memory test scores or on other neurocognitive or psychomotor test scores. However, the patients who were excluded from the study due to symptom validity test failure scored significantly higher than the traumatic brain injury reference group on the Beck Depression Inventory (BDI)[34], suggesting exaggerated reports of depression. Although the patients in the FM Disability group who failed the CARB and/or WMT obtained lower WAIS-R Vocabulary scale scores than the patients in this group who passed (probably also a reflection of effort), their estimated verbal IQ was still within the average range. These findings suggest that the lower scores and observed failures on the CARB and WMT were not a function of depression, anxiety, intellectual capacity, or other symptoms of general life disruption and distress, such as pain or fatigue. Rather, the lower scores and failures on the CARB and WMT suggest incomplete effort and potential exaggeration of cognitive difficulties and other symptoms in some members of the FM Disability group, particularly those who scored below the CARB and/or WMT cutoffs for biased responding.

It might also be argued that members of the FM Disability group who failed on the effort tests had some subtle visual or verbal memory or attention problems that were not identified. However, as amply illustrated by the normative data on the CARB and WMT, even moderate to severe brain injuries and neurological diseases have a negligible effect on test performance. Green and Allen[22] showed that there were no differences on the CARB or on the effort subtests of the WMT between neurological patients with impaired verbal memory and those with normal verbal memory. It is our opinion, therefore, that while the patients in the FM Disability group might have had some undetected subtle memory or attention problems, this would not significantly affect CARB or WMT effort measures and it would not explain their effort test failures. It should also be noted that, while identification of response bias does not rule out the possibility of actual cognitive problems, such bias does indicate that the test scores obtained are of questionable validity and cannot be used to corroborate patient claims of cognitive impairment.

The MCI was administered to provide a detailed self-rating of 9 specific types of memory complaints, 6 plausible and 3 implausible. The FM Disability group scored higher than the FM No Disability group on all MCI scales except AAB. This indicates a greater rate of subjective memory complaints in the patients with FM who were on or were seeking disability. Compared with those who passed the effort measures, the patients in the FM Disability group who scored below the effort cutoffs on the CARB and the WMT claimed more general memory problems, visuospatial problems, pain interfering with memory, and memory problems interfering with work. They also scored higher on the composite global memory problem scale and on the 2 most implausible memory scales, ACB and AAB. Their higher scores on the latter 2 scales, in particular, are consistent with overreporting of memory problems that was not detected by the nonspecific 6-point self-rating memory scale on the demographic questionnaire. The interpretation of exaggerated memory impairment is also supported by their scores on the WMT memory measures, which were not only lower than those of the FM Disability group who passed the CARB and WMT, but were even lower than the scores of the brain injury, neurological, and impaired memory reference groups. In contrast, the patients with FM who passed the effort measures obtained higher scores on the memory measures than the latter groups.

It should be noted that the value of using response bias tests based on a forced-choice format is that they appear cognitively challenging but are actually trivial in difficulty. This characteristic makes it possible to detect individuals who demonstrate various degrees of response bias ranging from subtle to blatant. In our study, the FM Disability group who scored below the effort cutoffs did not blatantly overreport symptoms in every aspect of the assessment, but their less obvious or subtle tendency to underperform on the effort measures was evident. Without such measures to identify suboptimal effort on cognitive tests, invalid test results would probably be produced and used to support questionable claims of cognitive impairment.

The patients with FM had all been referred to a tertiary care hospital and were undoubtedly a selected group. Thus, the actual proportion of patients seeking or on disability may well have been higher than in other settings, and indeed in the population at large the majority of individuals with chronic pain syndromes do not seek specialist attention. Further selection may have taken place in the interviews. They were told specifically that the program was to study memory in patients and to assess if there was actual evidence of memory impairment. Some of the more severely symptomatic patients declined (e.g., because they could not sit for an hour, computers made them feel worse, etc.). Others, at work, felt they could not spare the time. A number of other patients, for reasons unknown, failed to present for their scheduled assessment appointments, or withdrew from the study before their appointment. It might be argued that the wording of the RA recruitment letter, indicating that these patients are unlikely to have memory problems, might have introduced a bias by influencing how these patients reported their cognitive functioning. Clinically, RA is not associated with cognitive difficulties and we intended the letter to be as informative as possible and not worry patients that some new problem was to be investigated. In reality, therefore, the recruitment letter would probably have selected patients who believed they do have memory problems, rather than excluding them.

It is also recognized that the test administrator (SP) was not blind to the experimental hypothesis or with regard to patient group membership. She was, however, blind to the pass or fail status of each patient on the effort tests until after the assessment session had been completed. The authors acknowledge that any contact between the experimenter and the subject can introduce a bias effect[35]. However, the fact that the key effort tests were administered and scored on computer in an automated, interactive manner with the participants greatly minimized any possible bias effect.

Our results clearly indicate that tests of effort designed to detect incomplete effort and potential exaggeration of cognitive deficits have a role to play in the assessment of patients with FM, particularly where eligibility for medical disability benefits owing to claimed cognitive impairment is an issue. Any disability related assessment or other investigation of the neuropsychological status of patients with FM that does not employ formal effort testing procedures to screen for exaggeration of memory or other cognitive problems runs the risk of drawing conclusions based on invalid test data or questionable self-reported symptoms and limitations. The utilization of effort testing methods in the assessment of patients with FM offers the potential for more accurate and objective evaluation of their reported symptoms and claimed disability, and a more effective and equitable allocation of limited financial resources for treatment, rehabilitation, and disability support. It is important that the reader should not falsely conclude that this study shows that FM is strongly associated with symptom exaggeration, response bias, or suboptimal effort. On the contrary, response bias was almost nonexistent in the FM group not claiming disability. What this study does show is that disability claims are associated with response bias and potential symptom exaggeration in a significant minority of cases. Response bias in a proportion of cases seeking disability would be expected in many different diagnoses and not only FM[25]. The response bias tests utilized in this study do not provide any information regarding the person's reasons for responding in a biased or unbiased manner; they only indicate the presence or absence of biased responding. The motivations for biased responding continue to be debated[36]. Further research is needed to understand the factors that contributed to the biased responding observed in our study. Finally, we also provide some evidence that, in the majority of patients with FM, who showed no evidence of response bias (81% of cases), there was no objective evidence of impaired verbal memory.

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REFERENCES

1. Gordon DA. Chronic widespread pain as a medico-legal issue. Ballières Clin Rheumatol 1999;13:531-43.
2. White KP, Harth M. The occurrence and impact of generalized pain. Ballières Clin Rheumatol 1999;13:379-89.
3. McCain GA, Cameron R, Kennedy JC. The problem of longterm disability payments and litigation in primary FM: The Canadian perspective. J Rheumatol 1989;16 Suppl:174-6.
4. Wolfe F, Ross K, Anderson J, Russell IJ, Hebert L. The prevalence and characteristics of fibromyalgia in the general population. Arthritis Rheum 1995;38:19-28.
5. Bennett RM. Fibromyalgia and the disability dilemma. Arthritis Rheum 1996;39:1627-34.
6. Epstein SA, Clauw D, Klein D, Kuck J, Masur D, Waid R. Psychiatric disorders in patients with fibromyalgia: A multicenter investigation. Psychosomatics 1999;40:57-63.
7. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington: American Psychiatric Association; 1994.
8. Smythe HA, Gladman A, Mader R, Peloso P, Abu-Shakra M. Strategies for assessing pain or pain exaggerating: Controlled studies. J Rheumatol 1997;24:1622-9.
9. Grace GM, Nielson WR, Hopkins M, Berg MA. Concentration and memory deficits in patients with fibromyalgia syndrome. J Clin Exp Neuropsychol 1999;21:477-87.
10. Schnurr R, MacDonald M. Memory complaints in chronic pain. Clin J Pain 1995;11:101-11.
11. Kay NRM, Morris-Jones H. Pain clinic management of medico-legal litigants. Injury 1998;29:305-8.
12. Rohling ML, Binder LM, Langhinrichsen-Rohling J. A meta-analytic review of the association between financial compensation and the experience and treatment of chronic pain. Health Psychol 1995;14:537-47.
13. Binder LM, Rohling ML. Money matters: A meta-analytic review of the effects of financial incentives on recovery after closed-head injury. Am J Psychiatry 1996;153:7-10.
14. Hiscock M, Hiscock CK. Refining the forced-choice method for the detection of malingering. J Clin Exp Neuropsychol 1989;11:967-74.
15. Binder LM, Willis SC. Assessment of motivation after financially compensable minor head trauma. Psychol Assess 1991;3:175-81.
16. Slick DJ, Hopp G, Strauss E, Hunter M, Pinch D. Detecting dissimulation: profiles of simulated malingerers, traumatic brain-injury patients, and normal controls on a revised version of Hiscock

and Hiscock's forced choice memory test. J Clin Exp Neuropsychol 1994;16:472-81.
17. Pankratz L, Binder LM. Malingering on intellectual and neuropsychological measures. In: Rogers R, editor. Clinical assessment of malingering and deception. New York: Guilford; 1997:223-6.
18. Green P, Iverson GL, Allen L. Detecting malingering in head injury litigation with the Word Memory Test. Brain Inj 1999;13:813-9.
19. Hart RP, Martelli MF, Zasler ND. Chronic pain and neuropsychological functioning. Neuropsychol Rev 2000;10:131-49.
20. Green P, Iverson GL. Validation of the Computerized Assessment of Response Bias in litigating patients with head injuries. Clin Neuropsychol, in press.
21. Allen LM, Green P. Severe TBI sample performance on CARB and the WMT (Supplement to the CARB '97 and Word Memory Test manuals and CARB/WMT scoring software). Durham, NC: CogniSyst, Inc.; 1999.
22. Green P, Allen LM. Performance of neurological patients on the Word Memory Test (WMT) and Computerized Assessment of Response Bias (CARB) (supplement to the CARB '97 and Word Memory Test manuals and CARB/WMT scoring software). Durham, NC: CogniSyst, Inc.; 1999.
23. Iverson GL, Green P, Gervais R. Using the Word Memory Test to detect biased responding in head injury litigation. J Cogn Rehabil 1999;17:4-8.
24. Conder R, Allen L, Cox D. Manual for the Computerized Assessment of Response Bias. Durham, NC: CogniSyst, Inc; 1992.
25. Allen LM, Conder RL, Green P, Cox DR. CARB '97 manual for the Computerized Assessment of Response Bias. Durham, NC: CogniSyst, Inc.; 1997.
26. Green P, Allen LM, Astner K. The Word Memory Test: A user's guide to the oral and computer-administered forms, US version 1.1. Durham, NC: CogniSyst, Inc.; 1996.
27. Derogatis LR. Symptom Checklist-90-Revised. Minneapolis, MN: National Computer Systems, Inc.; 1994.
28. Green P, Allen LM. Memory Complaints Inventory. Durham, NC: Cognisyst, Inc.; 1997.
29. Wechsler D. Wechsler Adult Intelligence Scale-Revised. Cleveland: Psychological Corporation; 1981.
30. Burckhardt CS, Clark SR, Bennett RM. The Fibromyalgia Impact Questionnaire: development and validation. J Rheumatol 1991;18:728-33.
31. Iverson GL, Binder LM. Detecting exaggeration and malingering in neuropsychological assessment. J Head Trauma Rehabil 2000;15:829-58.
32. Schmand B, Lindeboom J, Schagen S, Heijt R, Koene T, Hamburger HL. Cognitive complaints in patients after whiplash injury: the impact of malingering. J Neurol Neurosurg Psychiatry 1998;64:339-43.
33. Rohling ML, Green P, Allen LM, Iverson GL. Depressive symptoms and neurocognitive test scores in patients passing symptom validity tests. Arch Clin Neuropsych, in press.
34. Beck AT, Steer RA. Beck Depression Inventory. San Antonio, TX: Psychological Corporation; 1993.
35. Carroll KM, Rounsaville BJ, Nich C. Blind man's bluff: effectiveness and significance of psychotherapy and pharmacotherapy blinding procedures in a clinical trial. J Consult Clin Psychol 1994;62:276-80.
36. Frederick RI, Crosby RD. Development and validation of the Validity Indicator Profile. Law Hum Behav 2000;24:59-82.