Malingering, coaching, and the serial position effect

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Abstract

The normal pattern of performance on list-learning tasks is to recall more words from the beginning (primacy) and end (recency) of the list. This pattern is also seen in patients with closed head injury, but malingerers tend to recall less words from the beginning of word lists, leading to a suppressed primacy effect. The present study examined this pattern on both learning trials and delayed recall of the Auditory Verbal Learning Test (AVLT) in 34 persons performing with normal effort, 38 naive malingerers, 33 warned malingerers, and 29 head-injured patients. Both malingering groups had lower scores on the primacy portion of the list during learning trials, while normals and head-injured patients had normal serial position curves. During delayed recall, normals and head-injured patients did better than the two malingering groups on middle and recency portions of the list. Findings suggest that the serial position effect during learning trials may be a useful pattern of performance to watch for when suspicious of malingering. © 2001 National Academy of Neuropsychology. Published by Elsevier Science Ltd.

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1. Introduction

The serial position effect in list-learning tasks is a well-established finding. In those with normal memory, items at the beginning and end of a word list are recalled better than items in the middle. The better recall of items at the beginning of a word list is called the primacy effect and the better recall of items at the end of a word list is called the recency effect. Together, the primacy and recency effects create a U-shaped performance curve on list recall tasks, which is seen in healthy individuals of all ages (Carlesimo, Sabbadini, Fadda, & Caltagirone, 1997; Craik, 1970; Rundus, 1971).
Rundus (1971), who was among the first to explore this effect, suggested that the primacy effect occurs because words at the beginning of the list get more rehearsal and are, thus, consolidated into long-term memory, while the recency effect occurs because the words at the end of the list are still being held in short-term memory. Although this explanation is subject to debate, evidence from clinical populations is more or less supportive of the idea that the primacy and recency effects represent different and dissociable memory processes. For example, patients with Alzheimer’s dementia, Huntington’s dementia, and patients with severe amnesia secondary to Korsakoff’s or bilateral media temporal lobe resection tend to show impaired primacy, with normal recency (Baddeley & Warrington, 1970; Bigler, Rosa, Schultz, Hall, & Harris, 1989; Burkart, Heun, & Benkert, 1998; Carlesimo, Sabbadini, Fadda, & Caltagirone, 1995; Gibson, 1981; Massman, Delis, & Butters, 1993) (though note lack of impaired primacy in amnesics in Carlesimo et al., 1995; Hermann et al., 1996). However, studies suggest that closed head injury of varying severity does not affect the primacy effect (Bernard, 1991; Bigler et al., 1989; Suhr, Tranel, Wefel, & Barrash, 1997), though at least one study found that patients with closed head injury have an impaired recency effect, suggestive of attention/short-term memory difficulties (Bernard, 1991).

A few studies have examined the use of the serial position curve in the detection of malingering. Bernard (1991) compared the Auditory Verbal Learning Test (AVLT) performance of undergraduate students asked to malinger head injury to patients with acute severe closed head injury and to healthy controls. Neither the malingering students nor the closed head-injured groups showed a normal serial position curve. However, the malingerers were impaired on the first third of the list (primacy effect), while the closed head-injured patients were impaired on the last third (recency effect). In a second study (Bernard, Houston, & Natoli, 1993), malingering undergraduates showed a normal U-shaped curve (there was no head-injured comparison group). Suhr et al. (1997) used the same method to assess the serial position curve in multiple patient groups, including (1) head-injured patients who were a priori defined as probable malingerers, (2) mild head-injured patients who were in litigation but did not meet a priori criteria for malingering, (3) mildly to moderately head-injured patients not in any litigation, (4) severely head-injured patients not in any litigation, and (5) psychiatric patients without history of head injury (somatization, depression). Results showed that all groups except those identified as probable malingerers showed the normal serial position curve. The malingering group had suppressed performance on the first third of the list and the middle part of the list. Thus, consistent with Bernard, the malingering pattern involved a suppressed primacy effect. The differences in findings on the recency effect with head-injured patients may be because head-injured patients in the Suhr et al. study were not in the acute stages of recovery and most were not as severely impaired. However, closed head-injured patients in both samples showed a normal primacy effect.

Thus, the few studies assessing the effects of malingering on serial position suggest that malingerers suppress the primacy effect, a pattern not seen in closed head injury, though one that does inconsistently appear in other neurological disorders, particularly severe amnesia. The present study sought to replicate this finding and further test its specificity to malingering. The present study also examined whether the serial position pattern seen in malingerers is robust to coaching. Some research suggests that sophisticated malingerers, who are either coached about how to malinger on tests or about specific symptoms seen in
head injury, may perform differently than naive malingerers on malingering and other neuropsychological tests (Martin, Bolter, Todd, Gouvier, & Niccolls, 1993; Martin, Gouvier, Todd, Bolter, & Niccolls, 1992; Rose, Hall, Szalda-Petree, & Bach, 1998; Youngjohn, Lees-Haley, & Binder, 1999), although there is some evidence that some neuropsychological tests, or patterns of performance on such tests, may be more robust to sophisticated malingering (Martin, Hayes, & Gouvier, 1996; Suhr & Gunstad, 2000).

A final goal of the present study was to explore the effects of malingering on the serial position effect in delayed recall. Early research established that, even when the primacy and recency effects are seen in learning or immediate recall, after a delay, the recall and recognition of primacy words is still superior to the middle words, while recency words are no longer better recalled (Baddeley & Warrington, 1970; Craik, 1970; Rundus, Loftus, & Atkinson, 1970). However, there may be differences in the pattern of primacy and recency in recall, based on age or neurological impairment. For example, Carlesimo et al. (1997) demonstrated that both young individuals (ages 20–35) and older persons (ages 60–80) showed the characteristic drop in recency items during delayed recall, the memory loss in the recency items was greater for the older group than for the younger. Massman et al. (1993) demonstrated that patients with Alzheimer’s disease showed impaired primacy and recency during delayed recall of the CVLT, while patients with Huntington’s disease showed only impaired recency. In another study (Carlesimo et al., 1995), patients with Alzheimer’s disease showed only impaired recency, consistent with healthy controls, while patients with amnesia showed impairments in both primacy and recency.

The present study examined the serial position curve over the learning trials and the delayed recall on the AVLT in three groups: normal controls, simulators, and head-injured patients similar in age and education. The goals were: (1) to examine the stability of malingering findings of differences in serial position curve and their specificity to malingering relative to closed head injury, (2) to see whether the malingering findings are robust (i.e., can withstand the effects of general coaching), and (3) to explore the differences in delayed serial position effect in head injury and malingering. It was hypothesized that malingerers would show less primacy effect than healthy controls or head-injured patients, and that this pattern would be seen regardless of coaching.

2. Method

2.1. Participants

Four groups of participants took part in the study. The first group consisted of 34 undergraduates who were asked to perform their best (Normal Effort; M 19.2 years of age, M 13.7 years education). The second group included 38 undergraduates asked to simulate head injury (Naive Malingerers; M age 19.6 years, M years education 13.8). The third group consisted of 33 undergraduates asked to simulate head injury but also given information about head injury and a general warning about the possibility of malingering detection (Warned Malingerers; M age 19.9 years, M years education 13.8). The final group included 29 patients with moderate to severe head injury (Head-injured; M age 25.4 years, M years education 13.8).
education 12.9 years, $M$ days posttraumatic amnesia 10.93 (S.D. = 11.6), $M$ days hospitaliza-

tion 44.2 (S.D. = 40.4)). None of the head-injured patients were involved in litigation and none showed signs considered consistent with malingering (as defined by Suhr et al., 1997). There was no difference in education among the four groups, but the head-injured group was significantly older than the undergraduate groups ($F = 13.3, P < .001$).

2.2. Procedure

Undergraduates participated in a 2-h neuropsychological evaluation which included the Rey AVLT. The battery of tests consisted of the following (in the order given): WAIS-III Digit Span, AVLT learning trials, Complex Figure Test, Portland Digit Recognition Test, 30-min delayed recall of the AVLT, 30-min delayed recall of the Complex Figure Test, Recognition Memory Test, Visual Retention Test, and the Wisconsin Card Sorting Test.

Prior to their participation, undergraduate participants were asked to read a scenario, given to them in an envelope to keep the examiner unaware of the participant’s instructions. Undergraduates in the normal effort group were simply asked to perform to their best ability. Undergraduates in the Naive Malingering group were given the following scenario to read:

Imagine that you were in a car accident in which another driver hit your car. You were knocked unconscious, and woke up in the hospital. You were kept overnight for observation. The doctors told you that you experienced a concussion. Try to imagine that a year after the accident, you are involved in a lawsuit against the driver of the other car. If you are found to have experienced significant injuries as a result of the accident, you are likely to receive a bigger settlement. You have decided to fake or exaggerate symptoms of a brain injury in order to increase the settlement you will receive. As a part of the lawsuit, you are required to undergo cognitive testing to determine whether or not you have experienced a brain injury. If you can successfully convince the examiner that you have experienced significant brain damage, you are likely to get a better settlement. If the examiner detects that you are faking, you are likely to lose the lawsuit.

You are about to take a series of cognitive tests that would be used in such a situation. I would like you to simulate brain damage, but in a believable way, such that your examiner cannot tell that you are attempting to fake a brain injury.

Undergraduates in the Warned Malingering group read the same scenario, but, in addition, were given nonspecific information about common head injury symptoms and also received a nonspecific warning that malingering detection may occur during testing. Their additional instructions appear below:

Below is a list of common problems following brain injury, which may help you in your simulation of head injury: frequent headaches, being easily fatigued, problems with memory, difficulty attending and concentrating, slowed responses, irritability, anxiety, and depression.

Warning: at least one of the tests you will be given is designed to catch you faking, because it’s easier than it looks. Be careful.

All three groups were instructed not to reveal the details of their instructions to their examiner. At the end of the evaluation, students were asked to rate their recall of
the instructions given and the level of effort with which they followed instructions, to ensure compliance.

Head-injured patients were referred for clinical evaluation and received the AVLT as part of their neuropsychological work up. All patients were seen at least 6 months following their injury (mean, 2.4 years).

3. Results

To examine the serial position effect during learning, we compared the first 1/3 of the list, the second 1/3 of the AVLT list, and the third 1/3 of the list summed over the five learning trials of the AVLT (as per Bernard, 1991; Bernard et al., 1993; Suhr et al., 1997). Repeated measures analysis of covariance (age as a covariate) with one between-subjects factor (the four groups) and one within-subjects factor (the three sections of the AVLT list) showed significant differences among groups when assessed across trials ($F=39.11, P<.001$) and among trials when assessed across groups ($F=6.85, P<.001$) as well as a significant group by trial interaction ($F=4.67, P<.001$), which was expected. Age was not a significant factor ($F=3.27, P=NS$).

To examine the nature of the interaction, follow-up repeated measures ANOVAs were conducted separately for each group. All groups showed a significant effect of portion of the list. Post hoc contrasts showed that all groups reported fewer words from the middle portion

![Fig. 1. Performance on 3 parts of the AVLT learning trials by the four groups.](image-url)
of the list relative to the first 1/3 and the last 1/3 of the list. However, both malingering groups had lower performance on the first 1/3 of the AVLT relative to their performance on the last 1/3 of the AVLT, suggestive of suppression of the primacy effect, while both the normal effort subjects and the head-injured patients did not have differences between their first 1/3 and last 1/3 performance (see Table 1 and Fig. 1).

To examine the serial position effect during the delay trial, the delay trial was divided into the first 1/3 of the list, the second 1/3, and the third 1/3. Repeated measures analysis of covariance (age as a covariate) with one between-subjects factor (the four groups) and one within-subjects factor (the three sections of the delay trial) showed significant differences among groups when assessed across trials ($F=35.25$, $P<.001$) and a significant group by trial interaction ($F=3.19$, $P<.005$). Age ($F=2.06$) and trials across groups ($F=1.57$) were not significant.

Follow-up ANOVAs were conducted separately for each group to evaluate the nature of the significant interaction. For all groups, the effect of list position was significant. Follow-up contrasts showed that the normal effort group lost the recency effect, with recall of the last 1/3 of the list significantly lower than recall of the first 1/3 or the middle 1/3. The head-injured group demonstrated equal recall across all three parts of the list. Both malingering groups showed a drop after the first 1/3 of the list, with the first 1/3 being better than the second 1/3, but no different than the third 1/3. For the first part of the list, the effort group performed better than all other groups. For the other parts of the list, the effort and the head-injured groups performed better than the malingering groups (see Table 2 and Fig. 2).

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**Table 2**

Data from the delayed recall trial (means, standard deviations) among the four groups

<table>
<thead>
<tr>
<th>Group</th>
<th>First 1/3 of list</th>
<th>Middle 1/3 of list</th>
<th>Last 1/3 of list</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naive malingerers</td>
<td>2.1 (1.2)</td>
<td>1.5 (1.3)</td>
<td>1.9 (1.2)</td>
</tr>
<tr>
<td>Warned malingerers</td>
<td>2.0 (1.5)</td>
<td>1.5 (1.3)</td>
<td>1.9 (1.5)</td>
</tr>
<tr>
<td>Normal effort</td>
<td>4.2 (1.0)</td>
<td>4.1 (1.0)</td>
<td>3.1 (1.3)</td>
</tr>
<tr>
<td>Head-injured patients</td>
<td>2.6 (1.2)</td>
<td>2.5 (1.1)</td>
<td>2.7 (1.4)</td>
</tr>
</tbody>
</table>

- a Between-group differences — All groups less than Effort.
- b Between-group differences — Malingering groups less than Effort and Head-injured.
- c Within-group differences — First better than middle and last.
- d Within-group differences — Last worse than first and middle.
4. Discussion

Results showed that, during the learning trials of the AVLT, both malingering groups had lower than expected scores on the primacy part of the list, while normal controls and head-injured patients showed a normal serial position curve. This finding is consistent with prior studies (Bernard, 1991; Suhr et al., 1997) and further suggests that the alteration to serial position is robust to general warnings about malingering detection. It appears that persons attempting to simulate head injury behave like patients with severe amnesia and do not present a pattern more consistent with head injury and mild to moderate memory problems.

For this pattern of performance to be useful clinically, one would need to examine the use of a flattened primacy effect in correctly identifying malingerers as well as head-injured patients. Using the data from the study, a flattened primacy effect index was created (number of words recalled from the first 1/3 of the list over the five learning trials, divided by the total number of words recalled from the whole list over the five learning trials). Scores of 25% or less on the index correctly identified 13% of the malingerers, with only a 3% false positive rate ($\chi^2 = 1.94$, NS). Clearly, only a minority of the simulators in the present study show the flattened primacy pattern, but, most importantly, it is not a pattern commonly seen in head-injured patients. Obviously, such a cutoff score requires replication, particularly with clinical malingerers. Data from Suhr et al. (1997) were reevaluated using the index; 16% of the patients who were probable malingerers in that sample were identified as malingerers, while 4% of the mild to moderately head-injured patients were misidentified as malingering ($\chi^2 = 3.57$, $P < .05$).

Overall, it appears that the primacy index is not particularly sensitive to malingering, but is relatively specific. These findings should be replicated in larger samples of mild head-injured patients and probable malingerers. Of course, such an index should be used in the context of other potential indicators of malingering and the facts of the individual case. However, this may be one within-test pattern of performance that is somewhat useful in the detection of malingering, and the index does appear to be robust to general warnings about malingering detection.

It is important to note that the “warned” malingerers in the present study were just warned to be careful and were not coached specifically about how to avoid detection as a malingerer. Other studies of coaching and malingering have provided subjects with detailed information about the specific types of symptoms they should display on tests to simulate head injury, or have provided test-specific information on how to avoid detection as a malingerer (Martin et al., 1992, 1993, 1996; Rose et al., 1998). It is possible that providing task-specific information about the classic serial position effect would have changed the performance of the warned malingerers in the present sample, so that it was less likely that they would be detected as malingering. However, task-specific information does not always alter performance on neuropsychological tests (Martin et al., 1996); it may be difficult for persons simulating head injury to appear impaired, but demonstrate a believable pattern of impairment on standard neuropsychological tests.

During the delay, subjects performing with normal effort showed the classic drop in recall of recency items that has been demonstrated in prior studies. The head-injured group did not show this drop, primarily because of worse performance than the normal effort group in
delayed recall of the primacy part of the list. This likely reflects true memory consolidation difficulties secondary to head injury. Malingerers basically “bottomed out” on delayed recall, performing worse than both normal effort and head-injured groups on recall of words from the second 1/3 and third 1/3 of the list. Thus, this preliminary look at using delayed recall serial position patterns to detect malingering is less than promising.

Acknowledgments

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References


