# The WMS Assistant: A Windows Program to Aid in Writing WMS-III Reports

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**Abstract:** The WMS Assistant can facilitate reporting the results of testing with the Wechsler Memory Scale-Third Edition. The Assistant encourages editing and merging the computer-generated draft report with additional information. The program is available to qualified psychologists at no charge upon certification that they meet rules for its use, including professional status and appropriate training.

## INTRODUCTION

The WMS Assistant is a new tool to aid in reporting testing with the Wechsler Memory Scale, a test frequently used by psychologists [1-4]. Given the substantial portion of psychologists' time spent on interpretation and report writing [5], a program to assist with these tasks offers the potential for saving considerable assessment time.

The publisher of the Wechsler Memory Scale – Third Edition or WMS-III [6] sells a computer program to assist with interpretation and report writing for that test and two related scales [7]. In contrast, the program described in this paper aids in these tasks only for the WMS-III, but is available at no cost.

## TARGET AUDIENCE

The Assistant is available to psychologists licensed at the independent practice level who report competence with the WMS-III. The program encourages editing its draft reports and merging them with other test and interview data. This is intended to safeguard against uncritical acceptance by inadequately trained professionals who fail to recognize the limitations of computer-generated material [8-12]. This is consistent with guidelines issued by the American Psychological Association, as well as current assessment practices and conclusions from a review of the validity of computer-generated reports [13-15]. However, psychologists are almost evenly divided on the ethics of incorporating computer-generated text in psychological reports [14].

To encourage good practice, the program contains a prominent warning that it will function correctly only when all of the WMS-III scores are entered. It is not to be used with abbreviated forms of the WMS because of the decreased reliability of short forms of tests [16]. In addition, the Assistant produces statements based upon the statistical significance of differences between complete subtests. Those statements will not be accurate when subtests are abbreviated.

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## USE OF THE PROGRAM

The user enters patient identifying data along with scaled scores, index scores, confidence intervals and some percentiles. The user must obtain these standard scores from the WMS-III manual [6] because they are based upon copyrighted normative data. The psychologist also selects the level of significance to use when examining differences between scores, and the confidence level to be used when determining the interval likely to contain the examinee's true as opposed to obtained scores.

Fig. (**1**) shows the information entered for a 63-year-old man. The hypothetical subject obtained Auditory Age-Scaled scores ranging from 7 to 14 and Visual Age-Scaled scores ranging from 4 to 12. He obtained an Immediate Memory Index of 86 with a 90% confidence interval of 81 to 94, a General Memory Index of 78 with a confidence interval of 73 to 87 and a Working Memory Index of 96 with a confidence interval of 89 to 104.

Fig. (**1**) shows the default 5% significance level and 90% confidence interval selected. The Assistant sets a more stringent default value for the significance of the difference between scores than for confidence intervals surrounding individual indexes, because difference scores are less reliable than the individual scores in the difference [17]. Users may choose to set more restrictive levels of 1% and 95%.

When the psychologist clicks on the report menu a standard Windows file save dialog appears. The program saves the output to a file indicated by the psychologist. That file may then be read and edited with any word processor able to read rich text files.

Fig. (**2**) shows the unedited report opened in Microsoft Word XP for this sample patient. The scores are organized in a traditional manner, with parenthetical letters identifying scores that represent a relative strength (S) or weakness (W) for the patient based upon the 5% significance level previously selected. For example, Mr. Smith's scaled score of 14 on Verbal Paired Associates I is significantly stronger than the mean of his auditory tests, while his scaled score of 12 on Spatial Span is significantly stronger than the mean of his

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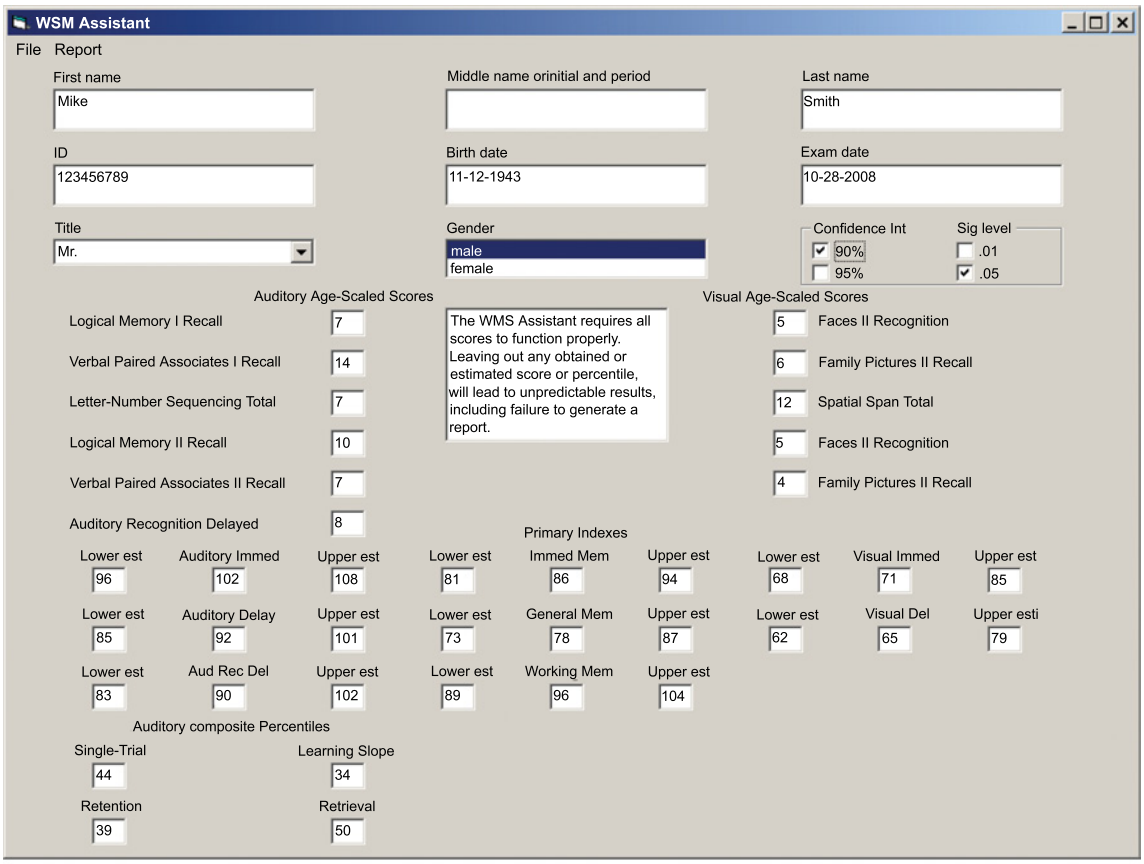



**Fig. (1).**

Draft WMS-III Draft

| Aduditory Tests | Scaled Score | Visual Tests | Scaled Score |
|---|---|---|---|
| Logical Memory I | 7 | Faces I | 5 |
| Verbal Paired Associates I | 14 - S | Family Pictures I | 6 |
| Letter-Number Sequencing | 7 | Spatial Span | 12 - S |
| Logical Memory II | 10 | Faces II | 5 |
| Verbal Paired Associates II | 7 | Family Pictures II | 4 |
| Auditory Recognition Delayed | 8 | | |

Primary Indexes

| | | | | | |
|---|---|---|---|---|---|
| Immediate Memory | 86 | General Memory | 78 | Working Memory | 96 |
| Auditory Immediate | 102 | Auditory Delayed | 92 | Aud Rec Delay | 90 |
| Visual Immediate | 71 | Visual Delayed | 65 | | |

Auditory Composite Percentiles

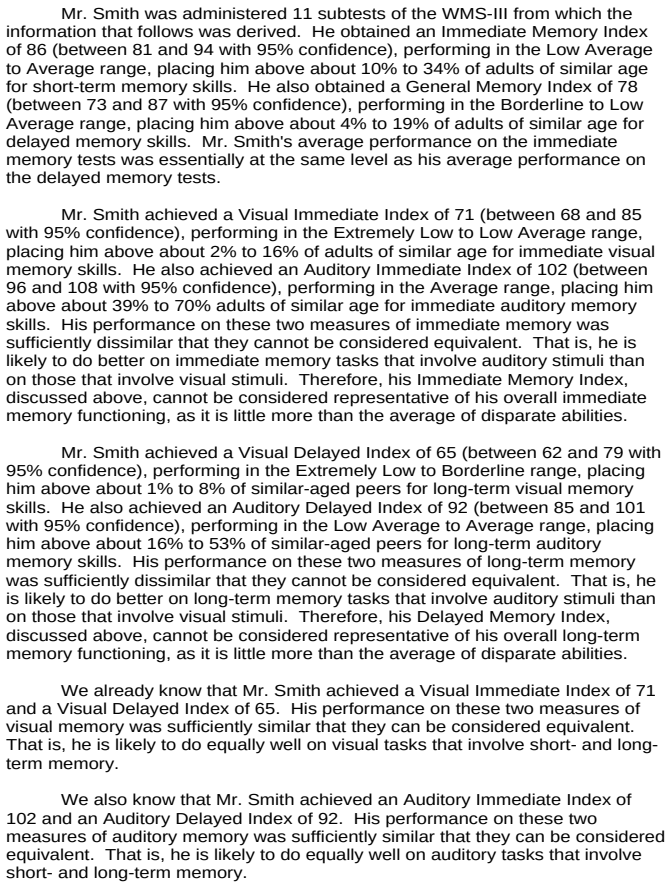
| | | | |
|---|---|---|---|
| Single-Trial Learning | 44 | Learning Slope | 34 |
| Retention | 39 | Retrieval | 50 |

The Wechsler Memory Scale - Third Edition (WMS-III) is an individual test of memory skills. While the WMS-III is a good measure of memory skills, it is not a perfect measure. Fortunately, because we know precisely how well it measures memory, we can assign probability levels to its scores. This allows us to state with a given probability the range within which a person's scores fall, e.g., "between 95 and 105 with 95% confidence." This is because a person who scored 100 today might not get exactly 100 the next time he takes the WMS-III. However, we can be quite confident, 95% confident in fact, that, all things being equal, he would score between 95 and 105 the next time.

In our analysis of Mr. Smith's performance on the WMS-III, we will start by examining the two most global scores on the test, the Immediate Memory Index and the General Memory Index. Immediate (or short-term) memory involves remembering information for only a few seconds, e.g., repeating a phone number right after hearing it. General (or delayed or long-term) memory requires retaining information for 20 minutes or longer, e.g., hearing a phone number, paying bills for 20 or 30 minutes, and later recalling that phone number. We will determine if these two aspects of his memory are at equivalent or dissimilar skill levels.

Then we will examine his immediate and delayed memory performance by the type of input, looking at the Auditory Immediate, Visual Immediate, Auditory Delayed and Visual Delayed Indexes. If immediate and delayed memory are consistent across auditory and visual input, then the Immediate and General Memory Indexes are useful ways of summarizing Mr. Smith's performance. However, if immediate (or delayed) memory differs significantly depending on whether input is auditory or visual, then the Immediate (or General) Memory Index is little more than the average of disparate abilities and is not a very useful score. This analysis also provides us with information regarding Mr. Smith's relative strength with auditory versus visual stimuli. If there is no meaningful difference, then he handles the two types of input equally well, while if there is a

**Fig. (2).**



Mr. Smith was administered 11 subtests of the WMS-III from which the information that follows was derived. He obtained an Immediate Memory Index of 86 (between 81 and 94 with 95% confidence), performing in the Low Average to Average range, placing him above about 10% to 34% of adults of similar age for short-term memory skills. He also obtained a General Memory Index of 78 (between 73 and 87 with 95% confidence), performing in the Borderline to Low Average range, placing him above about 4% to 19% of adults of similar age for delayed memory skills. Mr. Smith's average performance on the immediate memory tests was essentially at the same level as his average performance on the delayed memory tests.

Mr. Smith achieved a Visual Immediate Index of 71 (between 68 and 85 with 95% confidence), performing in the Extremely Low to Low Average range, placing him above about 2% to 16% of adults of similar age for immediate visual memory skills. He also achieved an Auditory Immediate Index of 102 (between 96 and 108 with 95% confidence), performing in the Average range, placing him above about 39% to 70% adults of similar age for immediate auditory memory skills. His performance on these two measures of immediate memory was sufficiently dissimilar that they cannot be considered equivalent. That is, he is likely to do better on immediate memory tasks that involve auditory stimuli than on those that involve visual stimuli. Therefore, his Immediate Memory Index, discussed above, cannot be considered representative of his overall immediate memory functioning, as it is little more than the average of disparate abilities.

Mr. Smith achieved a Visual Delayed Index of 65 (between 62 and 79 with 95% confidence), performing in the Extremely Low to Borderline range, placing him above about 1% to 8% of similar-aged peers for long-term visual memory skills. He also achieved an Auditory Delayed Index of 92 (between 85 and 101 with 95% confidence), performing in the Low Average to Average range, placing him above about 16% to 53% of similar-aged peers for long-term auditory memory skills. His performance on these two measures of long-term memory was sufficiently dissimilar that they cannot be considered equivalent. That is, he is likely to do better on long-term memory tasks that involve auditory stimuli than on those that involve visual stimuli. Therefore, his Delayed Memory Index, discussed above, cannot be considered representative of his overall long-term memory functioning, as it is little more than the average of disparate abilities.

We already know that Mr. Smith achieved a Visual Immediate Index of 71 and a Visual Delayed Index of 65. His performance on these two measures of visual memory was sufficiently similar that they can be considered equivalent. That is, he is likely to do equally well on visual tasks that involve short- and long-term memory.

We also know that Mr. Smith achieved an Auditory Immediate Index of 102 and an Auditory Delayed Index of 92. His performance on these two measures of auditory memory was sufficiently similar that they can be considered equivalent. That is, he is likely to do equally well on auditory tasks that involve short- and long-term memory.

**Fig. (3).**

visual tests. Mr. Smith's profile contains no significant relative weaknesses.

The report provides a brief introduction to the WMS-III after the listing of the scores. This is followed by a description of the subject's performance on the test, generally following the interpretive steps described by Lichtenberger, Kaufman & Lai [18]. It goes from the general to the specific, beginning with the Immediate and General Memory Indexes, then looking at the Auditory and Visual, Immediate and Delayed Indexes, as well as the Working Memory Index, and finally the individual subtests.

If the Immediate and General Memory Indexes differ significantly, the report indicates that the subject's short-term and delayed memory functioning are not equivalent. Significant differences between these indexes occur in less than 15% of the standardization sample, and are automatically large enough to be considered abnormal [18]. Next, the Assistant analyzes the subject's immediate and delayed memory performance by the type of input, comparing the Auditory Immediate, Visual Immediate, Auditory Delayed and Visual Delayed Indexes. If immediate and delayed memory performance is consistent across auditory and visual input, the Immediate and General Memory Indexes are meaningful ways of summarizing the person's immediate and delayed memory skills. If either type of memory differs significantly depending on mode of input, that index is little more than the average of disparate abilities and the input modality measures should be emphasized rather than the temporal measures. That is, the psychologist should emphasize the Auditory Immediate, Visual Immediate, Auditory Delayed and Visual Delayed Indexes rather than the Immediate and General Memory Indexes. The Assistant also compares the Working Memory Index with the individual's Immediate and General Memory Index, determining if either or both of these differences are statistically significant.

The Assistant also examines the subject's relative facility in handling auditory and visual input in their own right. A significant difference between these measures occurs relatively more often in the general population, so that a statistically significant difference is not necessarily abnormal in the sense of infrequency. Therefore, the Assistant will identify whether or not a significant difference is also abnormal.

Finally, the Assistant analyzes differences among the subtests, at the most specific level of the WMS-III. It compares individual subtests to the auditory or visual test average for the subject in order to determine that person's relative auditory and visual strengths and weaknesses. That is, a given score may be above average for the standardization sample, but a relative weakness for the high performing individual [19]. This section of the report also describes the tasks involved in the subtest and the skills believed to be required for these tasks.

Fig. (**3**) shows page 2 of the sample report in Word. The first paragraph compares Mr. Smith's Immediate Memory and General Memory Indexes and points out that these temporal measures of memory are essentially equivalent. The next paragraph deals with the two factors making up his Immediate Memory Index and concludes that these two meas-

ures are not equivalent. The report points out the implications of this finding for the utility of his Immediate Memory Index.

## REQUIREMENTS

The Assistant is written in Microsoft Visual Basic 6, and the executable file requires less than 200 KB of drive space. The program has been tested only with Windows XP and Vista, but may run with older versions of Windows.

Interested psychologists should request the WMS Assistant by e-mail. They should state whether they hold an earned degree in psychology and if they are licensed at the independent practice level in the location where they will use the program. They must also state if they have been trained in the administration and interpretation of the WMS-III and are competent in the use of the test. They must agree that the Assistant will be used only for patients who have been administered the standard WMS-III and that all output from the program will be rewritten by them or under their supervision to include additional information about the patient. They must agree not to use the Assistant for "blind" interpretation of other healthcare providers' patients. Deviations from this may be allowed only for research projects approved by the requestor's Human Investigation Committee. Although they may copy the program for allowed use under their personal supervision, they may not distribute it to other persons, may not modify the program and may not include any or all of it in other programs.

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Received: November 3, 2008 Revised: January 17, 2009 Accepted: January 30, 2009