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DIAGNOSTIC SCREENING BATTERIES: ADOLESCENT, ADULT, AND CHILD

James J. Smith and Joseph M. Eisenberg. Towson, Maryland: Reason House.

Introduction

The Diagnostic Screening Batteries (Smith & Eisenberg, 1986/1989) are computer-assisted questionnaires designed to help clinicians collect patient evaluation information consistently and then determine appropriate diagnoses of mental or emotional disorders. The overall system comprises three sets of age-appropriate questionnaires: Adolescent (ages 13 to 17), Adult (ages 18 and older), and Child (ages 2 to 17). Although these packages are sold individually to users working with the discrete target populations, each shares much in common with the other two (manuals, developmental history, format, reports, etc.); thus, this review will primarily address the system as a whole, directing specific information or remarks to the individual batteries when appropriate.

The batteries screen a range of clinical areas, identifying diagnostic criteria for the disorders listed in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III; DSM-IIIR). The original software was developed in 1986 and drew on the diagnostic criteria of the DSM-III (American Psychiatric Association, 1980); later, when the program was revised in 1989, the developers used the newer diagnostic criteria of the DSM-IIIR (American Psychiatric Association, 1987).

The batteries have two separate and different questionnaires, one that is administered to the patient or parent and the other for the clinician to complete. Both questionnaires can be administered by one of two methods, either on the computer or as a paper-and-pencil procedure. If the latter method is used, the responses must be entered subsequently into the computer for scoring. The computer program then compares the reported symptoms, derived from the patient's answers to the questionnaires, to either the DSM-III or DSM-IIIR taxonomy, depending on whether one uses the 1986 or 1989 version of the battery. The system then generates a list of all the diagnostic possibilities that match the client-generated symp-

toms. It is the clinician's responsibility to decide which diagnosis is the most accurate, given the rest of the information he or she has gathered from other sources.

Educated at the University of Alberta in Canada, Joseph Eisenberg is currently in private practice in Maryland. James Smith was educated at the University of Maryland and also maintains a private practice. As practitioners themselves, the authors report that their goals in creating these three packages were to help clinicians collect and organize assessment data as well as formulate accurate diagnoses.

Computer-assisted programs designed to aid in the determination of DSM diagnoses have been available for more than 20 years. The two most widely used programs, and those that scientists have researched extensively, are the DIAGNO series (DIAGNO, DIAGNO II, DIAGNO III) developed by Spitzer and Endicott (1968) and the National Institute of Mental Health–Diagnostic Interview Schedule (NIMH-DIS) constructed by Robins, Helzer, Croughan, and Ratcliff (1981). Because computers were originally expensive and cumbersome, early such diagnostic programs were not widely used. However, the debut of the affordable personal computer, teamed with the variety of currently available software, has caused the potential for computer-assisted diagnostic programs to be examined with more interest.

The Diagnostic Screening Batteries, as well as the DIAGNO series and NIMH-DIS, use a logical decision tree model of program analysis. Older programs utilized statistical methods. Briefly, the logical decision tree method is similar to the differential diagnostic approach. A series of questions is presented, and to each the respondent replies negatively or affirmatively. This response then rules out one or more diagnoses and determines which question is presented next. The logical decision tree model operates basically as a flowchart and is an a priori method, identifying diagnoses from a descriptive rather than an etiological perspective. It has been found to be the most accurate computer method for predicting clinical diagnoses (Fleiss, Spitzer, Cohen, & Endicott, 1972).

By comparison, the statistical model employs either Bayesian classification or discriminant function analyses to identify clinical diagnoses. A developmental sample is drawn from a large number of previously diagnosed subjects. With these data in place, the computer matches new patient information to the developmental sample to determine an appropriate diagnosis. For more information about the statistical model and the logical decision tree approach, the reader is directed to Erdman, Greist, Klein, and Jefferson (1987); Robins et al. (1981); Fleiss et al. (1972); and Spitzer and Endicott (1968).

The concept of using computer programs for diagnostic evaluation began when scientists realized the advantages of the computer's reliability, accessibility, and efficiency. Researchers have identified specific computer functions as having significant value to the clinician. Barron, Daniels, and O'Toole (1987) state that the accuracy of the computer gives it perfect memory for both questions and answers. Additionally, the computer's methodical consistency with presenting questions to the patient is an important feature of this approach to diagnosing disorders (Mathisen, Evans, & Meyers, 1987; Barron et al., 1987). Others praise the computer's inexhaustible thoroughness of covering a topic (Erdman, Klein, & Greist, 1985; Mathisen et al., 1987). Erdman et al. (1985) also cite the dependability and avail-

ability of computer time as an advantage. Greist, Klein, Erdman, and Jefferson (1983), Mathisen et al. (1987), and Erdman et al. (1985) all consider the decreased cost of using a computer as compared to human hours as another important feature of the computer approach.

The computer-assisted Diagnostic Screening Batteries differ from other diagnostic programs in that the components do not identify one primary diagnosis. Rather, each will generate a list of diagnostic possibilities for as many disorders as meet the criteria of identified symptoms. The software was specifically designed to be overinclusive; therefore, the clinician has the responsibility of eliminating all diagnoses that do not apply and making the final decision.

This software is available for use with either Apple/Apple-compatible computers (with at least 64K memory and an 80-column card in slot 3) or IBM/IBM-compatible computers (with at least 128K memory and 2 floppy drives or a hard drive) (Eisenberg & Smith, 1986, 1989). Separate instructions for both systems are provided in the 1989 manual (used with the DSM-IIIR version), whereas separate manuals were produced for Apple and IBM systems for the older DSM-III version (1986). Although each of the three Diagnostic Screening Batteries is sold as a separate package, the format is essentially the same and therefore separate manuals are not needed; the instructions for running each Diagnostic Screening Battery program do not vary from the other two.

The program for each Diagnostic Screening Battery generates a Main Menu and a Utilities Menu. The Main Menu provides the following on-screen choices:

1. Run patient questionnaire
2. Run clinician questionnaire
3. Run diagnostic determination/retrieve data
4. Run patient "quick entry"
5. Run utilities
6. End program; exit to DOS

The Utilities Menu also offers several choices:

1. Print out for patient questionnaire
2. Print out for clinician questionnaire
3. Print out answer sheet for patient
4. Print out answer sheet for clinician
5. Erase old patient data
6. Create new patient file
7. Return to main menu

Depending on the package one is using, the patient questionnaire is designed to be answered by the patient or a parent/guardian. If it is more appropriate for a parent or guardian to respond, the Child Diagnostic Screening Battery becomes the preferred form as it is written in the third person. (The 1989 version has added a line for respondent's name, which is not provided for the 1986 version.) The clinical questions cover a wide range of areas, such as current and chronic medical concerns, work/school-related activities, friendships, self-attitudes and perceptions, family relationships, thought processes, mood and affect, psychosocial stressors, sexual activity/experience/attitudes, and drug use. The frequency and duration of these problems may also be noted on some questions.

The authors report that items on the Adolescent Diagnostic Screening Battery

are written at about the seventh-grade reading level. However, some of the same questions also appear on the Adult Diagnostic Screening Battery, which is reportedly written at the 10th-grade level. Prout and Chizik (1988) have found that because many teenage patients also present with other problems (e.g., academic difficulties sometimes due to reading problems), assessment instruments for this group should be written at a fifth-grade level for valid readability and completion. They warn that an individual test item might be invalidated if it contains even a single word at a higher level (Prout & Chizik, 1988).

Both the patient questionnaire and the clinician questionnaire use a yes/no and multiple-choice format. Some of the questions allow multiple answers, some include "does not apply"/"none of the above," and some offer a multiple-choice option of "other," which permits the respondent to type an original answer using up to 55 characters. The DSM-III and DSM-IIIR versions of the questionnaires are identical. The Adolescent patient questionnaire has 50 primary questions and 14 subquestions; the Adult, 37 primary questions and 14 subquestions; the Child, 44 primary questions and 13 subquestions. Subquestions are additional items presented to the respondent only if primary questions need to be clarified with additional information (e.g., frequency, duration, and severity of a symptom). On the printouts these questionnaires are titled "Adolescent Questionnaire," "Adult Questionnaire," and "Child Questionnaire" rather than "Patient Questionnaire" as designated on the program menus.

The "Clinician Questionnaire," as it is identified on the Main Menu, is entitled "The Clinician's Response Form" on the printouts. Written for professionals familiar with psychological terminology, its questions cover ground pertaining to intellectual functioning, organicity, dissociative disorders, and factitious disorders. This component also provides minimal information relating to psychosis, substance abuse, and personality features. The clinician questionnaire for the Adolescent Diagnostic Screening Battery (both DSM versions) contains 13 primary questions and 15 subquestions; for the Adult battery (both versions), 13 primary questions and 12 subquestions; and for the Child battery (both versions), 9 primary questions and 6 subquestions. All serve to provide information needed for DSM Axes III, IV, and V. The two DSM versions in each battery are identical save for the wording of questions pertaining to Axes IV and V, reflecting only the differences in the reporting on these axes. The clinician questionnaire alone is not sufficient to supply a diagnosis; it presents merely an adjunct process for recording supplementary patient data.

The diagnostic determinations for each of the three batteries can be printed in two formats, the "Standard Report" and the "Short Form," both of which report information for all five DSM axes. The printout of the "Standard Report" begins with one page of patient responses and one page of clinician responses; both lists are printed by question number and letter answer. Next follows a list of critical questions and answers printed in sentence form, obtained from information gathered on both the patient and clinician questionnaires. The user next sees a page of diagnostic possibilities, which lists all five DSM axes (including all possible Axis I and II diagnoses that apply). If no information exists for any of the axes, the printout states this fact.

The "Short Form" differs from the "Standard Report" only by omitting the list

of critical questions and answers in sentence form. Both options also add a page of "Refined Diagnoses," which is a list of fewer diagnostic possibilities (less under Axes I and II) and reportedly only those that relate more closely to specific pathology. The revised (1989) program printouts also include diagnostic code numbers next to each of the listed diagnoses.

If a printer is not available, or should one wish to review the results quickly, the data can be viewed on screen at the terminal. However, when output is directed thus to the screen, it runs continuously with no way to pause or stop the information flow.

Currently there is no way to hand score the questionnaires as no templates or answer keys are available. Also, this program has not been adapted for any special populations. Respondents who are blind, manually handicapped, not literate in English, or who cannot read at the required grade level would need help in answering the questionnaires.

Practical Applications/Uses

The Diagnostic Screening Batteries have been designed for use by psychiatrists, psychologists, and licensed clinical social workers in any clinical setting where DSM-III or DSM-IIIR diagnoses are applied. This type of program can be utilized not only in private practice, community mental health centers, and hospitals but also in university settings. With respect to the latter, this software can serve as a learning aid and/or in research, as with other computer-assisted diagnostic programs (Barron et al., 1987; Greist et al., 1987; Greist et al., 1983; Mathisen et al., 1987; Swartz & Pfohl, 1981; Spitzer, Endicott, Cohen, & Fleiss, 1974; Spitzer & Endicott, 1968).

The questionnaires are administered on an individual basis, and no real computer knowledge is necessary for respondents to answer the questions on-line. Also, neither an examiner nor a clinician is needed for the administration of the client questionnaire. However, the authors suggest that an assistant be present to instruct the respondent in using the keyboard and cursor key and to address potential problems. Studies conducted with other programs have identified patient populations that experience difficulties using computer-assisted self-report questionnaires, including those with special needs as noted above and those with acute psychotic disorders (Klein, Greist, & VanCura, 1975). Patients with mania, organic dysfunctions, and antisocial personality disorder may also show problems with this type of task (Greist et al., 1983). Even though these studies included adult populations, similar problems conceivably may arise with respect to particular adolescent populations. Hence, this should be addressed in future research.

The program begins as individual questions and possible answers appear on the screen sequentially. The respondent may choose as many answers as apply. Also, throughout the program, instructions appear on the screen that explain how to select an answer, change it, forward the program to the next question, or return to a previous question. The time estimated to complete the questionnaire is about 15 minutes; however, with all the subquestions a respondent may need to answer, a more realistic estimate might be 20–30 minutes, especially if the respondent experiences reading problems.

possibilities that this software program identified on its printout. However, these findings were never published, and when Eisenberg inquired at the hospital, the data could not be found.

Eisenberg, as others (Erdman et al., 1987; Erdman et al., 1985; Fleiss et al., 1972), contends that computer-generated diagnostic programs have perfect reliability, in that the same answers given to the same questions will always produce the same diagnoses. There is a problem with this contention, though. Program errors can occur that could affect the scoring and/or the results. Software developers need to experiment with their own programs and report their findings, thus assuring themselves and their users of accurate program consistency. Even then, program consistency can be assumed only if a program is not tampered with or changed. Erdman et al. (1985) are concerned additionally that reliability studies conducted on computer-based instruments should not focus exclusively on the program. Rather, they suggest that studies of computer interviewing be geared also to include other variables, such as nonverbal language and clinician acceptance.

As described previously, this program has two administration alternatives, on-line or paper-and-pencil formats. These two different forms need to be examined closely and carefully, as the paper-and-pencil self-report provides more room for variability with responding than the computer questionnaire. Therefore, as recommended by the American Psychological Association (AERA, APA, & NCME, 1985), Anastasi (1982), and Ferguson (1981), separate studies need to be conducted and reported to assure parallelism. Moreland (1985, p. 222) warns, "computer-linked factors may change the nature of a task so dramatically that one cannot say the computer-administered and the conventional versions of a test are measuring the same construct"; further, statistical properties "cannot be generalized" from one form to the other. Erdman et al. (1985) compared computer and paper-and-pencil questionnaires, finding the two methods comparable. However, their study used only an adult population and limited the subjects to substance abusers. Furthermore, Erdman et al. advocate the small-scale interview, using questions pertaining to a single topic (e.g., alcohol, drugs, sex). They report the programs are more likely to be successful because, at this time, the computer's strength lies in the narrower task.

Validity studies using the DIAGNO and NIMH-DIS programs primarily have compared clinician diagnoses with program diagnoses. Greist, Klein, and Erdman (1976) have found on-line psychiatric diagnoses by computer as good as those patients obtain from admitting clinicians in a hospital setting. However, Spitzer et al. (1974) report that expert clinicians show low agreement among each other, and note that as long as there is a variance among clinicians, any software program designed by an expert will naturally reflect the same variance. These studies have identified inherent problems with computer-assisted diagnostic programs; however, further research with each Diagnostic Screening Battery needs to be conducted to identify specific areas of concern.

Eisenberg (personal communication, April 14, 1989) acknowledges this program has face validity. Although this may be helpful to define particular behaviors, empirical measures of this program's validity are never formally addressed; consequently, its validity cannot be presumed at this time.

possible Axis I diagnosis of "Identity Disorder" along with an Axis II diagnosis of "Borderline Personality Disorder." According to the DSM-III this should not happen, because the criteria for "Borderline Personality Disorder" clearly state that this diagnosis may be given if the patient is under 18 years old but does not meet the criteria for "Identity Disorder" (American Psychiatric Association, 1980, p. 323). However, the DSM-IIIR criteria for assigning these diagnoses have changed enough to allow for both these diagnostic possibilities (American Psychiatric Association, 1987, p. 336).

With a fourth trial, a 13-year-old male patient denied the use of alcohol and cannabis. However, when completing the clinician questionnaire for this patient, Diston (1989) chose to add both alcohol and cannabis abuse in an attempt to discover what diagnostic changes would occur. When utilizing both programs, the printout of "Diagnostic Possibilities" stated "No condition on Axis I" but went on to list 12 diagnostic choices. Further, "Alcohol Personality Disorder" and "Cannabis Personality Disorder" were listed among the Axis I diagnostic choices. Obviously, neither the DSM-III nor the DSM-IIIR has either of these diagnoses in its text; in addition, personality disorders are listed on Axis II, not on Axis I. Further, personality disorders generally are not assigned to patients under the age of 18. Perhaps, in a revision of the software, it might be better to list these symptoms as personality "traits" or "characteristics."

Adult Diagnostic Screening Battery. On one trial, a 32-year-old male had selected suicidal attempts as a symptom. With both DSM versions, the list of diagnostic possibilities did not select "Depression" as a choice. Furthermore, both versions' lists of diagnoses printed "No condition on Axis I." In addition, when the short form was generated (i.e., a list of only letter answers), the clinician then had no way of knowing that this patient admitted to being suicidal.

In a second trial, a 30-year-old male patient answered affirmatively to auditory and visual hallucinations. The DSM-III version listed an Axis I diagnosis of "R/O Schizophrenia" but eliminated it on the "Refined Diagnoses" printout. The revised program was changed, however, inasmuch as both diagnostic lists included "Psychotic Disorder NOS."

For another patient, the DSM-III version's printout of "Diagnostic Possibilities" listed an Axis I diagnosis of "Adjustment Disorder with Academic Inhibition." This, however, was a 47-year-old male who did not identify academics as an activity, much less a problem. The revised software simply listed "Adjustment Disorder NOS." In addition, this same patient was assigned a DSM-III diagnosis of "Atypical Paranoid Disorder" and a DSM-IIIR diagnosis of "Psychotic Disorder NOS," yet neither paranoid nor psychotic symptoms were selected.

Child Diagnostic Screening Battery. On one trial, for a 9-year-old male patient who was identified as having suicidal behavior, self-destructive behavior, and overreacting to many things, the list of "Diagnostic Possibilities" did not include "Depression" as a consideration with either DSM version. Another patient with suicidal behaviors, this time a 5-year-old male, also did not produce "Depression" on the list of Axis I "Diagnostic Possibilities." However, he was offered Axis II diagnoses of "Histrionic Personality Disorder" and "Atypical, Mixed or Other Personality Disorder" when the DSM-III version was used, and "Histrionic Personality Disorder" and "Personality Disorder NOS" when the DSM-IIIR version was tested.

instructions. The "Introduction" presents information in a poorly organized manner. For example, the authors begin stating their purpose for designing the program on the first page of the guide. However, it is not until pages later, hidden among other information, that they conclude their statement of purpose with the sentence, "It is up to the qualified clinician to determine which diagnoses are most valid and appropriate for each patient" (Eisenberg & Smith, 1986, p. 5; 1989, p. 3). (The role of the clinician is not as clearly worded in the printed materials as it was during a conversation with the author. Eisenberg [personal communication, April 14, 1989] succinctly stated, "The program is to *work* like a clinician *not* to *think* like one, offering a broad list of diagnostic possibilities, allowing the clinician and his/her expertise to make the final diagnosis.") Located at the end of the "Introduction" section, and before the operating instructions, one finds a small paragraph that defines the hardware requirements. This includes one sentence that suggests a printer is optional, but it does not elaborate on any benefits or limitations. The manuals do not provide information here or elsewhere regarding how to access diagnostic possibilities without a printer. (This can be accomplished only if the printer is switched off and the user gives the command to "Run Diagnostic Determinations.")

In the manuals' sections referring to use of the system, there are instructions for entering patient demographics. The user is directed to identify the patient's gender by typing only the first letter: "'m' equals male, 'f' equals female." However, the instructions continue with "'e' equals elephant, 'a' equals apples" (Eisenberg & Smith, 1986, p. 9; 1989, pp. 6, 15). This leads a novice program user to question the intention of the authors with respect to instruction clarity.

There are also a few typographical errors throughout the manuals and in the software program. One important typo in both versions of the Adolescent Diagnostic Screening Battery is found in the patient questionnaire. One question contains an incomplete word; the word and the question are therefore unknown. This mistake invalidates the question, along with its assumed relevance. In the Child Diagnostic Screening Battery, a typo appeared in a printed list of diagnostic code numbers. For one young patient (Diston, 1989) the list of diagnostic possibilities printed "312.00 Conduct Disorder, Group Type, Moderate"; however, 312.00 is actually Conduct Disorder, Solitary Aggressive. There are also typos that appear in the directions in the 1986 IBM version of the manual for loading the system on to a hard drive. As a result, the program cannot be installed without a telephone call to the authors for corrections. In the revised program some but not all typos were corrected, and a telephone call to the authors may still be warranted.

In conclusion, when considering a computer-assisted diagnostic program, the buyer must remember the following: this program has problems with its diagnostic decision-making process that leads to errors, and it has major typographical errors in both manuals that preclude hard-drive installation without assistance from Smith and Eisenberg. More importantly, there are serious compliance problems with regard to the *Standards for Educational and Psychological Testing*. The absence of empirical studies and psychometric information on these batteries indicates the need for extensive research. At this stage of development, these reviewers cannot recommend the Diagnostic Screening Batteries for clinical use.

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