

NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY III

NEUROLOGICAL TESTING PROCEDURE MANUAL

August 1988

Revised November 1988

Second Revision - April 1989

Third Revision - May 1990

Fourth Revision - December 1991

Fifth edition - April 1993

Table of Contents

<u>Chapter</u>		<u>Page</u>
10	NEUROLOGICAL TESTING	
10.1	Introduction	10-1
	10.1.1 Overview	10-1
	10.1.2 General Overview of Procedures	10-2
10.2	Equipment	10-3
	10.2.1 Description of Exam Room	10-3
	10.2.2 Description of Equipment	10-5
	10.2.3 Equipment Setup Procedures ...	10-5
	10.2.4 Care and Maintenance	10-6
	10.2.5 End of Stand Procedures	10-6
10.3	Examination Protocol	10-7
	10.3.1 Eligibility Criteria	10-7
	10.3.2 Pre-examination Procedures ...	10-7
	10.3.3 Administering the NES Tests ..	10-12
	10.3.4 Postexamination Procedures ...	10-24
	10.3.5 Test Interruptions	10-29
	10.3.6 Problems	10-31
10.4	Logs and Records	10-32
10.5	Quality Control	10-33
	10.5.1 Examination Forms	10-33
	10.5.2 Data Handling and Transmittal	10-34

List of Exhibits

<u>Exhibit</u>		<u>Page</u>
10-1	Pre-test Questions (English)	10-10
10-2	Pre-test Questions (Spanish)	10-11
10-3	Spanish Version of Instructions	10-23
10-4	Result Codes for Paper Log	10-28
10-5	Interrupt Menu	10-30
10-6	Daily Log Sheet	10-32
10-7	Hard Copy of Pre-test and Post-test Questions	10-33

10. NEUROBEHAVIORAL TESTING

10.1 Introduction

10.1.1 Overview

Damage to the central nervous system can be due to exposure to neurotoxic substances (e.g. lead), use of neurotoxic medicines, and having a metabolic disorder such as diabetes or uremia. Of particular public health concern is the relationship between neurological impairment and toxins found in the workplace. Neurotoxic diseases are among the top ten leading work-related diseases and injuries in the United States. Occupational exposures to toxins such as lead, solvents, and insecticides are thought to contribute to the development of neurobehavioral dysfunction. Public health workers are also interested in investigating other sources of exposure such as the exposure to insecticides in a person's home, lawn or garden, as well as the effects of certain medications, and other potential contributing factors.

Neurobehavioral testing is a non-invasive method used to evaluate the functioning of a person's central nervous system. There are many neurobehavioral tests. Since the range of behavioral functions that may be affected by exposure to a toxic agent is extremely wide, investigators typically use sets (i.e. batteries) of tests. The computerized Neurobehavioral Evaluation System (NES) includes over a dozen neurobehavioral tests of psychomotor speed and control, perpetual speed, learning, attention and affect. A short version of the NES (three tests) is included in the NHANES III exam. This short version is affectionately called the "CNS" or Central Nervous System exam component. This is the first time a version of the NES, or any other computerized neurobehavioral test battery, has been administered to such a large sample (more than 5000) of the general population.

The main use of the NES is to relate the quantitative neurobehavioral variables to measurements of neurotoxicant exposure. On a group basis, exposure to neurotoxicants has been shown to significantly slow down performance of NES tests of psychomotor speed. Performance on the NES Symbol-digit test has been found to be lower for persons exposed to neurotoxicants. In addition, the skills measured by the NES tend to vary somewhat among individuals. For example, performance of NES tests have been shown to decline with increased age. This is why the CNS test results will be used to draw inferences about groups, and not individuals.

The CNS exam component was included in NHANES III for several reasons: (1) the NES is the most widely used computerized neurobehavioral test system in occupational health (used in over 40

studies), (2) it is the best computerized system available for large-scale cross-sectional epidemiologic studies (like NHANES III) and (3) it shows the most promise for international scientific collaborative use and continued development (translated into 8 languages). The NES can be easily and quickly administered, is reliable (i.e. get generally the same results if repeat the test on the same person), and can be used for group comparisons. Because it is automated, data collection is more efficient, and the tests are more objective and standardized than manually-administered tests. The tests included in the NES are simple, non-verbal tests which should not be affected greatly by differences in language and education (i.e. almost everyone should be able to do the tests).

CNS data from NHANES III can be used to assess precisely the effect of factors such as age, sex, educational level, socioeconomic level, and chronic alcohol intake. Baseline performance levels for individuals (i.e. norms) can be established for use in future studies of home and work exposures to toxic substances. Such baseline data would be extremely useful for (1) assessing the effect of accidents, (2) determining the effects of changes in hygienic conditions, and (3) early detection of chronic exposures. Researchers can compare the CNS test results from NHANES III with data from two different kinds of neurotoxic exposure studies: (1) where participants are tested at one time and their performance is related to measures of chronic exposure to potential neurotoxicants, and (2) investigating the short-term effects of exposure to neurotoxicants.

10.1.2 General Overview of Procedures

The CNS in NHANES III is composed of three tests selected from the larger battery of Neurobehavioral Evaluation System (NES) tests. Specifically, these include (1) Simple Reaction Time; (2) Serial Digit Learning; and (3) Symbol Digit Substitution. These are performance tests and not intelligence tests. Standardization of testing procedures is necessary to ensure maximum reliability and validity of test results.

Several factors may affect test results. These factors include both intrinsic (i.e. the person) and extrinsic (i.e. the testing environment) factors. Intrinsic factors include personal characteristics such as age, sex, and level of education. Personal lifestyle characteristics such as caffeine, drug, or alcohol usage may also influence performance on these tests. The motivational level of the individual at the time of testing is very important. The technician should encourage maximal effort on the tests and maintain a positive attitude towards each subject regardless of actual task performance. Technicians who are responsible for administering the test can do as much as possible to minimize any environmental factors which may influence CNS test performance. This includes monitoring temperature, humidity and air flow in the CNS testing booth, following the standardized protocol in

administering the test, and maintaining the equipment. It is important to adhere to standardized testing procedure at all times so that variation in the test environment affects the CNS test results as little as possible.

The CNS is designed to be easy to administer with a personal computer and specially developed computer software. The tasks that the technician is responsible for during the CNS test are somewhat limited since the examinees interact directly with the computer program. However, the technician carries out the important tasks of introducing the testing component to examinees, explaining the purpose and procedures of the tests, starting the test computer program, reading aloud the test instructions, providing assistance whenever problems arise, and encouraging all respondents to complete the tests. The technician is also responsible for recording any pertinent information about the testing situation and administering a brief pre-test and post-test questionnaires.

The CNS component is not designed to see how quickly people learn how to do the tests. The technician needs to make sure that the sample person:

1. understands how to do the tests
2. feels comfortable and relaxed in the test situation
3. gives maximal effort (most important).

10.2 Equipment

10.2.1 Description of the Exam Room in the MEC

The CNS testing is administered in the Audiometry room in Trailer 4 of the MEC. It is important that the testing environment remain the same at all times so that the data collection for the CNS testing component is standardized. As in many field testing situations, the technician may not have complete control over the testing environment. Nevertheless, the following minimal conditions must be maintained:

Electricity: The computer requires a 110V AC power outlet that is generally free of noise and power surges. This should not be difficult for technicians to maintain since these conditions are established during MEC set-up.

Furniture: Changes should not be made to the physical arrangement of the CNS and audiometry testing equipment in the exam room. The detachable monitor and joystick of the Compaq 286 personal computer sit on a small table with a pull-out drawer for the keyboard. The Compaq system unit (i.e. box) is located underneath the VT320 monitor and keyboard on another small table. Two chairs are placed in the room, one in front of the Compaq monitor and keyboard for the examinee and one in front of the VT320 monitor and keyboard for

the technician. It is important for the examinee to be directly facing the Compaq monitor. The monitor should be adjusted to be at the examinee's eye level before starting the CNS testing. Only the technician needs to be able to access easily the VT320 monitor and keyboard, since the sample person will perform all of the CNS tests with the Compaq monitor and keyboard.

Lighting: The lighting in this room in the MEC should be sufficiently dark to reduce both eye strain for the examinees and the possibility of glare on the screen. The technician should adjust the brightness of the screen to help the examinee read the screen.

Visual Distraction: The CNS/Audiometry room in the MEC is in a more isolated part of the fourth trailer to minimize distractions. When the examinee is seated in front of the Compaq monitor, and the door to the room is closed, they should not be distracted visually since they can not then see out of the one small window in the door.

Sound: Noise interference can present one of the main sources of distraction to examinees during CNS testing. The location of the testing room, and the fact that it is sound-proofed for audiometry testing, minimizes noise interference. It is important, though, that the door of the room remain closed throughout a test session. Children should not be present in the exam room when an exam is being conducted. For the most part, technicians should remain silent when the examinee is doing one of the three tests. Unless the sample person stops the tests, asks a question of the interviewer, or it is obvious that they are not following instructions (e.g. raising their finger up between squares during the simple reaction time test), then the technician should remain quiet while the examinee is doing one of the tests. At that time, the technician can then say something to either encourage the examinee to continue the test or to make sure the examinee understands how to do the test.

Temperature: Personal computers are sensitive to extreme temperature, as are examinees, so it is important to maintain a comfortable room temperature. Ideal testing conditions require that the room temperature remain below 75 degrees Fahrenheit. Recommended ambient temperature ranges are 70 to 78 degrees Fahrenheit in summer and 65 to 72 degrees Fahrenheit in winter. During warm weather, it is important to keep the door open between testing sessions to prevent buildup of heat in the testing room. The ambient temperature should be measured and recorded on the paper log after the CNS test was completed, and again for the last question on the VT320 post-test questionnaire. Writing the temperature down on the paper log allows the MEC manager an opportunity to help monitor and maintain the temperature in the exam room. Immediately report extreme heat and cold to the MEC manager.

Reading Glasses: A set of 4 pair of reading glasses are provided to be made available to SPs who forget to bring their reading glasses to the MEC. They are of different diopters of magnifying power. The tape around the reading glasses represent the different augmentation power: black=+1.0 diopter, blue=+1.5 diopters, green=+2.0 diopters and red=+2.5 diopters. In the event a pair of reading glasses is broken or missing, call the MEC manager or the project officer at NCHS to have them replaced immediately.

10.2.2 Description of Equipment and Supplies

The CNS software is designed to run on a Compaq portable computer. This particular subprogram which was developed specifically for the NHANES III, is to be run on the Compaq 286 Deskpro model. In addition to the computer itself, the hardware equipment consists of the keyboard, a keyboard overlay which covers keys which are not used during testing, the game adapter card, and the "joystick" attachment. The CNS program diskettes are to be stored in a disk case in the CNS/Audiometry exam room. A backup copy of the disk is kept by the office manager. The NES2 software package actually consists of a set of compiled programs with each neurobehavioral test written as a separate program.

10.2.3 Equipment Setup Procedures

10.2.3.1 Start of Stand Procedures

At the start of the stand, the computer needs to be installed in the Audiometry room. This requires connection of the AC line cord into the AC outlet, the Ethernet coaxle cable, the joystick cable to the game adapter in the slot on the back of the Compaq, the monitor data and power cables, the serial cable to the tympanometer and the keyboard cable.

The CNS software is usually run directly from the main system via a connection with the VAX computer, but may also be operated with a program diskette which is placed in the single (A) drive of the Compaq 286 Deskpro model. When using the VAX system, data is stored directly on the VAX after testing. The specific procedures on how to run the CNS software program is given in the procedures section below. It is important to keep a copy of the CNS software on hand in case there is an equipment failure which prevents running the CNS program directly off the VAX. Back-up procedures, for use when data have been acquired on floppy disks, require the use of pre-formatted diskettes and are explained below.

10.2.3.2 Calibration Procedures

In addition to checking button markings and cleaning the Compaq monitor screen at the beginning of each day, the CNS hardware is to be maintained in the following manner:

1. The heads should be cleaned and the response modules inspected for proper operation by the MEC manager at the start of each stand.
2. The CNS consultant (Richard Letz) will check head alignment and drive speed during system audits by using diagnostic disks.
3. Timing subroutines should be calibrated during system audits by the CNS consultant.
4. The clock on the Compaq needs to be set at the beginning of each stand and when there is a change to or from Daylight Savings Time.

10.2.3.3 Daily Procedures

At the start of each day, the technician should perform the following checking procedures:

1. Check ambient temperature of the Audiometry room. Temperature should also be measured at the end of each exam session and recorded on the paper log and with the post-test questions.
2. Check button markings on numerical keys and replace if necessary.
3. Clean monitor screen.
4. Check all connections on computer and attachments (i.e. keyboard, monitor, and joystick).
5. Prepare Daily Room Log.

10.2.4 Care and Maintenance of Equipment

Inspection of the CNS hardware equipment is generally the responsibility of the MEC manager and NCHS Biomedical Engineer at the start of each stand. At that time, the heads should be cleaned, response modules inspected and the Compaq clock set. Thereafter, system checks are to be made by the CNS consultant, Richard Letz, who will be making site visits for observation of CNS testing, as well for checking head alignment, drive speed, and timing subroutines. Computer malfunctions are to be reported directly to the MEC manager.

10.2.5 End of Stand Procedures

Equipment breakdown consists of removal and proper storage of the detachable joystick and keyboard overlay. In addition, all software should be properly stored in the diskette file box and any floppies used to back-up the data should be packaged in disk mailers and sent to the recipient at NIOSH who is designated in the procedures for data transmittal.

10.3 Examination Protocol

The following sections review the eligibility requirements for CNS examinees, how to operate the computer, the order of testing, how to administer the NES test battery and pre-test and post-test questionnaires, and how to handle problem situations.

Only CNS technicians, MEC interviewers, and translators who are comfortable in giving Spanish language exams (including reading Spanish), and who have been trained to do the CNS test, should administer the Spanish version of the CNS exam. When a translator is used, note this in the Comment section of the paper log. Translators should only be used as a last resort. They need to be trained in the CNS exam before exams actually start (e.g. dry run day). CNS training for the translators should include (1) acting as a sample person and (2) administering the exam (i.e. practice reading all of the instructions out loud) in Spanish. This training should be conducted by either a Spanish-speaking health technician or a CNS-trained MEC interviewer. Sample persons who can not speak English or Spanish should not be given the exam. Replicates and dry runs should be treated exactly the same way as sample persons selected for the CNS.

10.3.1 Eligibility Criteria

The CNS exam component is to be administered to a half sample of all adults, ages 20-59 years, who undergo the MEC exam. Assignment of SPs to CNS testing is based on SP number; those SPs whose NCHS identification numbers end with an odd check digit are to be given the CNS tests. The MEC coordinator is responsible for scheduling this component for SPs who meet these eligibility requirements. The computer will check to see whether the sample person should have the exam. If any SPs were incorrectly sent for testing and do not meet age and check digit criteria, contact the MEC coordinator to verify SP assignment prior to testing.

10.3.2 Pre-examination Procedures

Check to make sure that the Compaq computer is on. As the SP enters the testing room, be sure to introduce yourself and to address the SP by Mr., Mrs., or Ms._____, as is appropriate. The following script is suggested to introduce the CNS test to SPs:

"HELLO MY NAME IS _____. ARE YOU MORE COMFORTABLE IN SPANISH OR ENGLISH?"

WE ARE GOING TO DO A CENTRAL NERVOUS SYSTEM TEST. THIS IS NOT AN IQ TEST. IT IS A PERFORMANCE TEST DONE ON A COMPUTER. YOU DO NOT NEED EXPERIENCE WITH COMPUTERS TO DO THIS TEST. PLEASE HAVE A SEAT. BEFORE WE GET STARTED, I NEED TO ASK YOU A FEW QUESTIONS. I AM GOING TO MOVE BACK HERE TO RECORD YOUR ANSWERS."

VAMOS A HACER UNA PRUEBA DEL SISTEMA NERVIOSO CENTRAL. ESTO NO ES

UNA PRUEBA DE INTELIGENCIA. ES UNA PRUEBA DE RENDIMIENTO QUE SE HACE CON LA COMPUTADORA. USTED NO TIENE QUE TENER EXPERIENCIA CON COMPUTADORA PARA PODER HACER ESTA PRUEBA. POR FAVOR, TOME ASIENTO. ANTES DE COMENZAR, NECESITO HACERLE UNAS PREGUNTAS. VOY A MOVERME AQUI ATRAS PARA PODER ANOTAR SUS RESPUESTAS.

At this point, you move back to the chair in front of the VT320 monitor and keyboard. Complete the entry screen on the VT320. First, enter "Audiometry" in response to the USERNAME prompt; be sure to hit the return key. The next screen asks you to choose a mode of operation; press the "SELECT" key on the response pad in response to the flashing cursor next to "Data Collection"; a new screen will appear. Follow the general procedures for entry screens on the VT320 and enter your technician identification number on the designated line. Your name should appear automatically. Next, enter the SP's identification number; the name of the SP, his or her age in years/months, and sex should appear on the screen when the identification number is entered correctly. Verify the SP information and then hit any key to acknowledge message. The computer will then bring up the next screen. It is extremely important that you take your time going through the exam so that if you make mistakes you can correct them before they are actually entered.

The next option given to you on the screen is the language in which the CNS tests are to be administered. If the exam is being conducted in English, simply press the key numbered "1" and then hit any key to acknowledge the message as instructed. If the exam is being conducted in Spanish, press the key numbered "2" followed by any key to acknowledge the message as instructed on the screen. Note on the paper log if a translator is used.

Exhibits 10-1 (English) and 10-2 (Spanish) list the 6 questions included on the pre-test questionnaire. Read the questions outloud exactly as written and enter the numerical code for the response given. As soon as you press the number of the response and hit the "ENTER" key on the response pad, the next question in this series will appear. Continue asking each question aloud and entering the numerical code for each response given for Items 1 through 6. It is very important that the questions be read exactly as written every time and that you take your time entering the responses.

The first pre-test question asks about the amount of sleep that the SP had the night before relative to the amount that is usual for that person. Be sure that the SP understands that the question is referring to what is usual for him or her as opposed to what is usual for other people.

The second question asks how well the SP is feeling at the time of the CNS exam. Be sure that the SP uses one of the specified response options to answer the question. If he or she responds by

saying "okay", ask the question again with emphasis on the response options. Do not assume that "okay" means the same as "average"; do not impose your interpretation on the SP's response.

The third question asks about how familiar the SP feels that he or she is with computers and/or video games. Again, the intent of the question is to obtain the SP's own perception of their degree of familiarity, regardless of actual skills or ability.

For the fourth question, it is important to obtain information on how many cups of caffeinated drinks the SP has consumed in the past three hours. This item refers to coffee, tea, and cola or caffeine-containing beverages. The response options include "None", "1", or "2+" (2 or more). Be sure to enter the numerical code for the response given, not the number of cups named (unless the code and the number happen to be the same).

The fifth question asks about alcoholic intake during the previous 3 hours, including wine, beer, or hard liquor. Be sure to emphasize the time frame as stated. Again, choose the numerical code corresponding to the correct response.

Finally, the sixth question, asks which hand the SP prefers to use for this test. The SP should respond with the understanding that we are interested only in which hand he/she prefers to use in the testing situation, even if that is different than his/her preferred hand for writing or other activities. If the person is not sure which hand they would prefer to use for the test, ask them whether they are right or left handed, or which hand they use for most things. Record the ambient temperature in degrees in Fahrenheit on the paper log. This completes the pre-examination procedures and the CNS tests are to be administered at this point.

Exhibit 10-1

PRE-TEST QUESTIONS (ENGLISH)

1. How much sleep did you get last night? Would you say about the usual amount, less than usual, or more than usual?

- 1 about the usual amount
- 2 less than usual,
- 3 more than usual

2. Right now would you say you are feeling energetic, fresh, average, tired, or exhausted?

- 1 energetic
- 2 fresh
- 3 average
- 4 tired
- 5 exhausted

3. How familiar are you with computers or video games? Would you say none, some, or a lot?

- 1 none
- 2 some
- 3 a lot

4. Not counting decaffeinated products, how many cups of coffee, tea or cola have you had in the past 3 hours?

- 0 none
- 1 1
- 2 2+

5. How many drinks of alcohol have you had in the past 3 hours? Include any alcoholic drinks such as wine, beer, or hard liquor.

- 0 none
- 1 1
- 2 2+

6. Which hand do you prefer to use for this test? Right or left?

- 1 right
- 2 left

Exhibit 10-2

PRE-TEST QUESTIONS (SPANISH)

1. ¿Cuánto tiempo durmió usted anoche? ¿Diría usted, más o menos la cantidad acostumbrada, menos de lo acostumbrado, o más de lo acostumbrado?

- 1 más o menos la cantidad acostumbrada
- 2 menos de lo acostumbrado
- 3 más de lo acostumbrado

2. Ahora mismo, ¿diría usted que se siente enérgico, refrescado, normal, cansado, o exhausto?

- 1 enérgico
- 2 refrescado
- 3 normal
- 4 cansado
- 5 exhausto

3. ¿Cuánta familiaridad tiene usted con computadoras o juegos "video"?

- 1 ninguna
- 2 alguna
- 3 mucha

4. Sin incluir los productos decafeinados, ¿cuántas tazas de café, té, o cola ha tomado durante las últimas 3 horas?

- 1 ninguna
- 2 1
- 3 2+

5. ¿Cuántos tragos de bebidas alcohólicas ha tomado durante las últimas 3 horas? Incluya todo tipo de bebida alcohólica, tal como vino, cerveza, licor o alcohol fuerte?

- 1 ninguno
- 2 1
- 3 2+

6. ¿Cuál mano prefiere utilizar para esta prueba?

- 1 la derecha
- 2 la izquierda

10.3.3 Administering the NES Tests

10.3.3.1 Starting the CNS tests

The following steps summarize how to operate the Compaq for running the NES2 program:

Make sure the Compaq computer is on at the start of each session. If the connection with the VAX is working properly, the Compaq will attach itself to the VAX network and prepare the CNS programs to be initiated by the VAX. You can then type "1" for "English" or "2" for "Spanish", followed by a space and then the SP ID number in response to the "C:\->" prompt. Use the gold-numbered keys, 1-10 above the keyboard overlay. Then, hit the return key to call up the program in the appropriate language for testing the SP. If you have made a mistake and entered the wrong language, do not immediately return to change the language. Instead, abort the test on the Compaq (Hit F1, F8, then select option 9), and then you can go back to change the language. If you do not do this, you will find that the correct language pre-test questions will come up, but the wrong language instructions will come up on the Compaq screen.

If the Compaq does not connect to the VAX, you will need to turn the Compaq off, place a CNS diskette in the disk drive, and turn it back on. After the Compaq boots from the diskette, you can then type "1" for English or "2" for Spanish and follow the rest of the procedure as described.

The test program on the Compaq will then begin. You will be given the following prompt:

```
INTERVIEWER ID (4 CHARACTERS)?
```

If the VAX initiated the session, your tech ID code will also appear. Hit ENTER (or F10). Otherwise, type in your four- number identification code and hit ENTER (or F10). The next prompt that will appear is the following:

```
SP ID (7 CHARACTERS)?
```

If the VAX initiated the session, verify that the 7-character SP identification number is correct and hit ENTER (or F10). If the ID number is missing or incorrect, use the backspace (or F9) key to back up and enter the correct number, then hit ENTER. A new screen will automatically appear briefly as follows:

```
CHECKING THAT ALL REQUIRED FILES ARE AVAILABLE.
```

Now turn away from the VT320 and move closer to the Compaq without crowding the SP. Give the SP a brief introduction to the CNS testing, as follows:

"NOW YOU WILL NEED TO LOOK AT THE COMPUTER SCREEN TO DO THE TEST."

"AHORA TIENE QUE MIRAR A LA PANTALLA DE LA COMPUTADORA PARA HACER LA PRUEBA."

If not wearing glasses:

"DO YOU USE GLASSES TO READ? DID YOU BRING YOUR READING GLASSES? YOU WILL NEED TO PUT THEM ON. If SP does not have reading glasses with him on the MEC, suggest: WOULD YOU LIKE TO TRY ONE OF THESE GLASSES? CAN YOU SEE THE COMPUTER SCREEN NOW? (adjust seat to face monitor, adjust monitor to eye level, adjust brightness of screen). ARE YOU COMFORTABLE NOW? THERE ARE THREE PARTS TO THIS TEST. WE WILL NOW START THE FIRST ONE."

"¿USA USTED LENTES O ESPEJUELOS PARA PODER LEER? ¿TRAJO USTED SUS LENTES O ESPEJUELOS DE LEER? NECESITA PONERSELOS. ¿PUEDE VER LA PANTALLA AHORA?" (adjust seat to face monitor, adjust monitor to eye level, adjust brightness of screen). **¿SE SIENTE MAS COMODO AHORA? LA PRUEBA TIENE TRES PARTES. VAMOS A COMENZAR CON LA PRIMERA PARTE AHORA."**

If wearing glasses:

"CAN YOU SEE THE COMPUTER SCREEN? (adjust seat to face monitor, adjust monitor to eye level, adjust brightness of screen). ARE YOU COMFORTABLE NOW? THERE ARE THREE PARTS TO THIS TEST. WE WILL NOW START THE FIRST ONE."

"¿PUEDE VER LA PANTALLA AHORA?" (adjust seat to face monitor, adjust monitor to eye level, adjust brightness of screen). **¿SE SIENTE MAS COMODO AHORA? LA PRUEBA TIENE TRES PARTES. VAMOS A COMENZAR CON LA PRIMERA PARTE AHORA."**

Say:

"YOU WILL ANSWER THE MACHINE BY PRESSING ONE OF THE GOLD NUMBERED KEYS OR BY USING THE BLUE BUTTON. WHEN RESPONDING, YOU ONLY NEED TO TOUCH THE KEYS LIGHTLY. USE YOUR INDEX FINGER OF YOUR _____ HAND (left or right--preferred hand according to SP's response to pre-test questions) ONLY WHEN ANSWERING. I WILL READ THE INSTRUCTIONS FOR EACH TASK ALOUD AS YOU SEE THEM APPEAR ON THE SCREEN. IF I GO TOO QUICKLY OR SAY SOMETHING THAT YOU DO NOT UNDERSTAND, PLEASE STOP ME."

"USTED LE CONTESTARA A LA MAQUINA OPRIMIENDO UNA DE LAS TECLAS CON LOS NUMEROS EN ORO O USANDO EL BOTON AZUL. CUANDO CONTESTE, SOLAMENTE TIENE QUE TOCAR LAS TECLAS SUAVEMENTE. USE SOLAMENTE EL DEDO INDICE DE SU MANO _____ (left or right IZQUIERDA O DERECHA - - preferred hand according to SP's response to pre-test questions) CUANDO CONTESTE. YO LE LEERE EN VOZ ALTA LAS INSTRUCCIONES PARA CADA TAREA AL MISMO TIEMPO QUE LAS VE APARECER EN LA PANTALLA. SI VOY MUY RAPIDO O SI DIGO ALGO QUE USTED NO ENTIENDE, POR FAVOR DIGAMELO"

If for any reason the joystick is not properly attached to the Compaq, a message will appear on the screen to remind you to attach it to the machine. Then, the "+" key must be pressed again. The program will then begin automatically, beginning with the instructions for the SP.

The NES tests consist of three separate tasks, which are presented to each SP in the same order. The NES tests will run automatically in the proper sequence of testing, and the responses will be recorded directly on-line throughout testing. The general and the task-specific instructions are automatically given on the screen. The technician should read instructions aloud exactly as they are presented on the screen and assist the SP if it appears that the directions are not understood. Sometimes the computer will give a message to the examinee if there is some problem in the manner of responding. The technician should be available to assist the SP in understanding the correct way of entering responses. When the "call interviewer" message comes on the Compaq screen, press F5 and explain again to the sample person the testing procedure. If you need to interrupt the test, press F1 and F8 (may have to do this several times vigorously) and the menu will come up. If you need to abort the test then select option 9. Select option 3 if you want to go onto the next test. The Spanish version of the instructions is given in Exhibit 10-3.

10.3.3.2 Simple Reaction Time test procedures:

The first task is called the Simple Reaction Time (SRT) test. This test assesses how quickly the SP responds to a given stimulus. Each time a large square is presented on the screen, the SP must press a blue button. The blue button must be pressed with the index finger of the SP's preferred hand.

Read instructions that appear on the screen:

THIS IS A TASK TO SEE HOW QUICKLY YOU CAN RESPOND. EACH TIME A LARGE BOX APPEARS IN THE CENTER OF THE SCREEN, PRESS THE BLUE BUTTON IN FRONT OF YOU WITH THE INDEX FINGER OF YOUR PREFERRED HAND. ONCE YOU HAVE STARTED, REMEMBER TO PRESS THE BLUE BUTTON AS QUICKLY AS YOU CAN. THIS WILL GO ON FOR SOME TIME.

ESTA ES UNA TAREA PARA VER LA RAPIDEZ CON QUE USTED PUEDE RESPONDER. CADA VEZ QUE APARECE UN CUADRADO GRANDE EN EL CENTRO DE LA PANTALLA OPRIMA EL BOTON AZUL ALFRENTE DE USTED CON EL DEDO INDICE DE SU MANO PREFERIDA. UNA VEZ QUE HAYA EMPEZADO, RECUERDE DE OPRIMIR EL BOTON AZUL LO MAS RAPIDO POSIBLE. ESTA TAREA VA A CONTINUAR POR ALGUN TIEMPO.

Make sure the joystick box is positioned correctly and physically place SP's finger on the blue button. The heel of the hand should rest on the joystick box and the joystick should be placed in the middle of the keyboard. The index finger of the SP's preferred hand (as stated during the pre- test questions) should rest lightly on the end of the blue button. Make sure the hand is oriented towards the screen and that the finger is not turned to the side. The finger should be laying on the end closest to the SP.

Say:

"I AM GOING TO WATCH YOU GET STARTED, THEN I AM GOING TO MOVE BACK OUT OF THE WAY SO THAT YOU CAN CONCENTRATE. ARE YOU READY TO BEGIN?"

"VOY A OBSERVARLO MIENTRAS USTED COMIENZA, LUEGO ME VOY A MOVER AQUI ATRAS PARA QUE USTED SE PUEDA CONCENTRAR. ¿ESTA LISTO PARA COMENZAR?"

Then you press the "+" key to begin. Move slightly out of the way, verify that the SP is responding appropriately (including not lifting her/his finger completely off the button), then retreat to your seat. It is important to monitor the SP's index finger position at all times. The SP's index finger should rest lightly on the blue button between responses. Do not let the SP keep the finger raised above the blue button between responses, or hold the button down too long. If pressure is applied between responses, an error message will appear to that effect.

PLEASE DO NOT HOLD THE BUTTON DOWN. PRESS IT BRIEFLY, AS QUICKLY AS YOU CAN AFTER THE BOX APPEARS ON THE SCREEN.

POR FAVOR, NO OPRIMA EL BOTON POR MUCHO TIEMPO. TAN PRONTO VEA EL CUADRADO EN LA PANTALLA OPRIMA EL BOTON BREVEMENTE.

The technician must remind the SP that the blue button is sensitive

to touch and that it needs to be pressed only briefly to register a response. Demonstrate the proper technique if the SP continues to press too long on the button. Press "+" to continue. A high-pitched beeping noise signals that the SP is leaning too hard on the joystick-- which is pressing the template against the keyboard.

Because this test seems to go on and on (the square will show up on the screen 50 times), some SP's may complain that they are bored, stop, or ask how much longer the test will take. If this happens, tell them:

"PLEASE CONCENTRATE AND RESPOND AS QUICKLY AS YOU CAN. THIS TEST WILL ONLY GO ON FOR A SHORT TIME LONGER."

"POR FAVOR CONCENTRESE Y RESPONDA TAN PRONTO COMO PUEDA. ESTA PRUEBA CONTINUARA POR ALGUN TIEMPO MAS."

When completed, say a simple "GOOD" **"MUY BIEN"** and move to the COMPAQ for the next test. Remove the joystick box from the top of the keyboard overlay and place the box out of the way.

10.3.3.3 Symbol Digit test procedures:

The second NES test is the Symbol Digit Substitution test. This test measures visual motor speed, learning and memory. Nine symbols are presented paired with nine digits. The SP is asked to press the numbered key to match the correct digit with the scrambled order symbols that are presented lower on the screen. Four trials are presented.

Read instructions that appear on the screen:

IN THIS TASK SOME SYMBOLS WILL BE MATCHED WITH NUMBERS ON THE SCREEN. YOUR JOB WILL BE TO PRESS THE NUMBERED KEY THAT IS MATCHED WITH EACH SYMBOL AT THE TOP OF THE SCREEN. WHAT YOU ARE EXPECTED TO DO WILL BECOME CLEAR DURING THE PRACTICE TRIAL THAT FOLLOWS. IT IS EASIER TO EXPLAIN BY GOING THROUGH A PRACTICE TRIAL TOGETHER.

EN LA SIGUIENTE TAREA, APARECERAN EN LA PANTALLA PAREJAS DE SIMBOLOS Y NUMEROS. SU TAREA ES APRETAR LA TECLA QUE CONTIENE EL NUMERO QUE LE CORRESPONDE A CADA SIMBOLO EN LA PARTE DE ARRIBA DE LA PANTALLA. PRIMERO HAREMOS UNA PRACTICA JUNTOS Y ASI LO QUE TIENE QUE HACER LE RESULTARA MAS FACIL DE COMPRENDER.

Press the "+" key (even if the SP appears not to understand). Then point to the bottom row and say:

"WHAT YOU ARE GOING TO DO IS TO FILL IN THIS BOTTOM ROW. SEE WHERE THIS LINE IS FLASHING? (Point to it) LOOK FOR THE SYMBOL JUST ABOVE IT IN THE TOP ROW. (Point to the first symbol, then the first symbol in the top row, move your finger across to the right to the symbol, and finally to the digit paired with it.) PRESS THE NUMBERED KEY, 2, THAT IS MATCHED WITH IT. (Press the "2" key yourself) SEE HOW THE NUMBER GOT ENTERED AND THE LINE MOVED OVER? (Point to the 2nd cell on the bottom row) NOW LOOK FOR THIS SYMBOL IN THE TOP ROW AND PRESS THE NUMBER PAIRED WITH IT. (If the SP is timid, move her/his finger around) NOW YOU FILL OUT THE REST OF THE BOTTOM ROW WITH YOUR INDEX FINGER.

"LO QUE VA A HACER ES A LLENAR LA FILA DE ABAJO. ¿VE DONDE ESTA LINEA PRENDE Y APAGA? (Point to it) BUSQUE POR EL SIMBOLO QUE LE CORRESPONDE EN LA LINEA DE ARRIBA. (Point to the first symbol, then the first symbol in the top row, move your finger across to the right to the symbol, and finally to the digit paired with it.) APRIETA LA TECLA CON EL NUMERO, 2, ESA ES LA COMBINACION O LA PAREJA DE ESTE SIMBOLO. (Press the "2" key yourself) ¿VE COMO EL NUMERO FUE ENTRADO Y LA LINEA SE MOVIO? (Point to the 2nd cell on the bottom row) AHORA BUSQUE POR ESTE SIMBOLO EN LA LINEA DE ARRIBA Y APRIETA EL NUMERO QUE ESTA PAREADO CON ESTE SIMBOLO. (If the SP is timid, move her/his finger around) AHORA USTED LLENARA EL RESTO DE LA LINEA DE ABAJO CON SU DEDO INDICE."

If the SP hits a wrong key during the practice trial (but not in the later trials), a soft beep will sound. Be prepared to reassure the SP and encourage him or her with:

"THAT'S NOT THE CORRECT ONE. PLEASE TRY ANOTHER KEY."

"ESA NO ES LA TECLA CORRECTA. POR FAVOR TRATE UNA VEZ MAS".

USTED COMETIO ALGUNOS ERRORES ESA VEZ. SU TAREA ES ESCOGER EL NUMERO QUE CORRESPONDE A CADA UNO DE LOS NUEVE SIMBOLOS SIN EQUIVOCARSE. SI ENTIENDE LO QUE HAY QUE HACER, PRACTIQUE OTRA VEZ.

Be sure that the SP understands how to respond. The SP should start at the bottom left and find the same symbol in the top row. Once the symbol is located, the SP must press the number matched with that symbol in the top row, and then continue across until all symbols are matched. Encourage the SP to respond as quickly and accurately as possible. If the SP makes an error on the practice trial, the program makes a low beep and does not enter the response.

A few (say 1 in 100) SPs will not get the idea of the test. If

five or six beeps occur, help the SP again by guiding his/her finger around from the flashing line (1) to the symbol just above it, (2) to the beginning of the top row, (3) to the symbol, (4) to the digit paired with it, (5) to the correct key on the keyboard. If you have to do this more than 2 times with the SP, say:

"WE HAVE RUN OUT OF TIME FOR THIS TEST AND NEED TO MOVE ON TO THE NEXT TEST." [Press F1/F8, select option 3 (go on to the next test) and make a note on the log]

"SE NOS HA ACABADO EL TIEMPO PARA ESTA PRUEBA Y TENEMOS QUE MOVERNOS A LA SIGUIENTE PRUEBA." [Press F1/F8, select option 3 (go on to the next test) and make a note on the log]

After the practice trial, read the additional instructions:

NOW YOU WILL PERFORM 4 DIFFERENT SCREENS FOR THE RECORD. IF YOU MAKE ANY MISTAKES, YOU WILL NOT BE ABLE TO CORRECT THEM, SO JUST IGNORE THEM AND TRY NOT TO MAKE ANY MORE. IT IS VERY IMPORTANT THAT YOU TRY YOUR VERY BEST TO GO AS FAST AS YOU CAN WITHOUT MAKING ANY MISTAKES. REMEMBER TO USE ONLY YOUR INDEX FINGER THROUGHOUT. PRESS THE "+" KEY TO BEGIN.

AHORA, VA A TRABAJAR CON 4 DIFERENTES PANTALLAS. NO SE LE PERMITIRA CORREGIR NINGUN ERROR QUE HAGA, POR LO TANTO IGNORELOS Y TRATE DE NO COMETER MAS ERRORES. ES MUY IMPORTANTE QUE USTED TRATE DE HACERLO LO MAS RAPIDO POSIBLE SIN EQUIVOCARSE. ACUERDESE DE UTILIZAR SOLAMENTE EL DEDO INDICE. CUANDO ESTE LISTO APRIETE LA TECLA DE SUMA O "+".

Move away slightly, verify that the SP is using only one finger and that s/he gets the first 3 symbols correct before retreating to your seat. If the SP is confused or becomes frustrated, explain the instructions again and encourage the SP to just do the best that s/he can. If the SP notices that s/he has made a mistake, tell him/her to leave it as they cannot back up on this task and encourage the SP to go as fast as he/she can without making any more errors.

When completed, make appropriate entry on the CNS screen, say a simple "GOOD," **"MUY BIEN"** and move to the COMPAQ for the next test.

10.3.3.4 Serial Digit Learning test procedures:

The third NES test consists of a Serial Digit Learning task in which the SP must try to learn a series of digits which are

presented slowly one at a time on the screen. This is a memory task requiring the SP to use the numbered keys at the top to enter the set of numbers after they are presented one at a time. First a practice set of 4 numbers is presented; on subsequent trials, a set of 8 numbers are presented one at a time, after which the SP is asked to key in as many digits as s/he can recall in the order of presentation. Up to eight trials are presented. If the SP makes a mistake and wants to change a number, the "-" key will back the cursor up and the new number can be typed in. No changes can be made after the "+" key is hit, as this registers the response given and forwards the program to the next trial. The SP should guess if s/he cannot recall all of the numbers on any given trial. The technician should assist in any way necessary to help the SP perform the task as instructed.

Read instructions that appear on the screen:

IN THIS TASK YOU ARE ASKED TO LEARN A SET OF NUMBERS. THE NUMBERS WILL FLASH BRIEFLY, ONE AT A TIME. AFTER ALL THE NUMBERS HAVE APPEARED, USE THE NUMBERED KEYS TO TYPE THEM IN, IN THE SAME ORDER THAT THEY APPEARED. AGAIN, IT'S EASIER TO GET THE IDEA OF THE TEST BY GOING THROUGH A PRACTICE TRIAL TOGETHER.

EN ESTA TAREA, HAY QUE APRENDERSE UN GRUPO DE NUMEROS. LOS NUMEROS VAN A APARECER EN LA PANTALLA BREVEMENTE, UNO POR UNO. CUANDO TODOS LOS NUMEROS HAN APARECIDO, USE LAS TECLAS NUMERADA PARA ESCRIBIRLOS EN EL MISMO ORDEN EN QUE APARECIERON. LO QUE TIENE QUE HACER LE RESULTARA CLARO DESPUES DE HACER UNA PRUEBA PRACTICA JUNTOS.

Then say:

"FIRST THERE WILL BE A MESSAGE TO GET READY, SAYING 'HERE ARE THE FOUR NUMBERS'. THEN THE FOUR NUMBERS (point with forefinger and thumb) WILL APPEAR ON THE SCREEN. THEN YOU WILL PRESS THE KEYS TO THE FOUR NUMBERS IN THE SAME ORDER THAT THEY APPEARED. ARE YOU READY FOR THE PRACTICE TRIAL?"

Press the "+" and read:

HERE ARE THE FOUR NUMBERS:

Read the numbers out loud as they appear ("1", "7", "3", "6"), then say: "NOW PRESS THE KEYS FOR THOSE FOUR NUMBERS."
When the SP has entered the 4 digits, point out:

"PLEASE NOTICE THAT YOU CAN PRESS THE '-' KEY TO BACK UP ONE SPACE IF YOU SHOULD HIT A WRONG KEY. (Do this and enter the number back in) THEN WHEN YOU HAVE ENTERED ALL THE NUMBERS, YOU WILL HAVE TO HIT THE '+' KEY TO GO ON. ALSO, IF YOU DON'T REMEMBER THEM ALL, JUST GUESS"

PRIMERO APARECERA UN MENSAJE PARA QUE SE PREPARE A COMENZAR, DICHIENDO "AQUI ESTAN LOS CUATRO NUMEROS". ENTONCES LOS CUATRO NUMEROS (point with forefinger and thumb) APARECERAN EN LA PANTALLA. ENTONCES USTED OPRIMIRA LAS TECLAS DE LOS CUATRO NUMEROS EN EL ORDEN QUE ELLOS APARECIERON. ¿ESTA LISTO PARA LA PRUEBA DE PRACTICA?

Press the "+" and read:

AQUI ESTAN LOS CUATRO NUMEROS:

Read the numbers out loud as they appear ("1 - UNO", "7 - SIETE", "3 - TRES", "6 - SEIS"), then say: "AHORA OPRIMA LAS TECLAS PARA ESOS CUATRO NUMEROS".

When the SP has entered the 4 digits, point out:

"POR FAVOR NOTE QUE, SI OPRIMIO LA TECLA INCORRECTA, PUEDE OPRIMIR LA TECLA DE MENOS '-' PARA MOVERSE HACIA ATRAS UN ESPACIO (Do this and enter the number back in) UNA VEZ HAYA ENTRADO TODOS LOS NUMEROS, TIENE QUE OPRIMIR LA TECLA '+' PARA PODER CONTINUAR. SI NO RECUERDA TODOS LOS NUMEROS, ADIVINE"

If the SP gets the practice trial wrong, go through the second attempt of the practice trial with her/him, just as you did above. If s/he gets it wrong again, after you have said the numbers out loud twice, there will be a beep and a "PLEASE CALL THE INTERVIEWER" message. Press the F5 key to continue and go through the practice trial again. If s/he still makes a mistake, the "CALL THE INTERVIEWER" message will appear again. This time, press F1/F8 and select "3" (go on to the next test). Tell the SP: "WE HAVE RUN OUT OF TIME, SO WE HAVE TO STOP HERE." "SE NOS ACABO EL TIEMPO, VAMOS A PARAR AQUI POR AHORA." Make the appropriate log entry that the SP was unable to understand the test.

After successful completion of the practice trial, read the next screen of instructions:

NOW YOU WILL DO THE SAME THING EXCEPT WITH A LONGER SET OF NUMBERS. YOU WILL HAVE SEVERAL CHANCES WITH THE SAME SET OF NUMBERS, SO YOU SHOULD START BY REMEMBERING THE FIRST FEW AND THEN TRY TO REMEMBER MORE ON THE NEXT TRY. THE SAME SET WILL APPEAR AGAIN EVEN IF YOU GET THEM ALL RIGHT. WATCH THE NUMBERS CLOSELY, BUT DON'T SAY THEM

OUTLOUD.

Then say: "PRESS THE '+' KEY TO BEGIN." Then retreat to your seat.

AHORA HARA LO MISMO PERO CON UN GRUPO DE
NUMEROS MAS GRANDE. VA A TRABAJAR CON EL
MISMO GRUPO DE NUMEROS MAS DE UNA VEZ. AUNQUE
USTED CONTESTO BIEN UNA VEZ, TIENE QUE HACERLO
OTRA VEZ. POR LO TANTO, EMPIECE RECORDANDO
LOS PRIMEROS NUMEROS Y ENTONCES TRATE DE
RECORDAR MAS NUMEROS HASTA RECORDARLOS TODOS.
ESTA TAREA ES DIFICIL. POR LO TANTO, HAGALA
CON CUIDADO.

Then say: "PRESS THE '+' KEY TO BEGIN." "APRIETE LA TECLA '+' PARA
COMENZAR" Then retreat to your seat.

Sometimes the SP will forget to press the "+" key. Give her/him 5 seconds after the 8th digit and say:

"YOU HAVE TO PRESS THE '+' KEY TO GO ON."

"TIENE QUE APRETAR LA TECLA '+' PARA PODER CONTINUAR"

If the SP does not fill in 8 digits and attempts to go on by hitting the "+" key, say:

"YOU HAVE TO FILL IN 8 NUMBERS. IF YOU DON'T REMEMBER THEM ALL, JUST GUESS, AND PRESS THE '+' KEY WHEN ALL THE SPACES ARE FILLED."

If the SP begins to get frustrated and stops or makes a verbal comment, say:

"JUST REMEMBER AS MANY AS YOU CAN AND IMPROVE A LITTLE EACH TIME. THE TEST WILL GO ON FOR A LITTLE BIT LONGER EVEN AFTER YOU GET THEM ALL CORRECT."

If the SP reads the numbers out loud, say: "YOU CAN REPEAT THE NUMBERS SILENTLY TO YOURSELF AS THEY APPEAR, BUT PLEASE DON'T SAY THEM OUT LOUD". Then note that the SP read the numbers out loud in the comments section of the paper log.

"TIENE QUE LLENAR LOS ESPACIOS CON 8 NUMEROS. SI NO RECUERDA TODOS
LOS NUMEROS, ADIVINE. UNA VEZ TODOS LOS ESPACIOS HAYAN SIDO
LLENADOS APRIETE LA TECLA '+'."

If the SP begins to get frustrated and stops or makes a verbal comment, say:

"SOLO TRATE DE RECORDAR TANTOS NUMEROS COMO PUEDA Y CADA VEZ MEJORE UN POCO MAS. LA PRUEBA CONTINUARA AUN CUANDO LOS HAYA CONTESTADO CORRECTAMENTE"

If the SP reads the numbers out loud, say: "YOU CAN REPEAT THE NUMBERS SILENTLY TO YOURSELF AS THEY APPEAR, BUT PLEASE DON'T SAY THEM OUT LOUD". "PUEDE REPETIR LOS NUMEROS EN SILENCIO PARA USTED MISMO MIENTRAS VAYAN APARECIENDO, PERO POR FAVOR, NO PUEDE DECIRLOS EN VOZ ALTA" Then note that the SP read the numbers out loud in the comments section of the paper log.

When the SP finishes the last test, Serial Digit Learning, a message will appear on the screen which instructs the SP as follows:

THAT CONCLUDES THESE COMPUTER TASKS.

ASI TERMINAN ESTAS TAREAS DE COMPUTADORAS

Say: "GOOD, THAT COMPLETES THESE COMPUTER TESTS. I JUST NEED TO ASK YOU ONE MORE QUESTION."

Say: "BIEN, CON ESO COMPLETAMOS ESTAS PRUEBAS DE COMPUTADORA. SOLO NECESITO HACERLE UNA PREGUNTA MAS."

If the SP asks how s/he did, answer: "FINE." "MUY BIEN"

Exhibit 10-3

SPANISH VERSION OF INSTRUCTIONS

On Compaq screen at beginning of Simple Reaction Time Test:

ESTA ES UNA TAREA PARA VER LA RAPIDEZ CON QUE USTED PUEDE
RESPONDER. CADA VEZ QUE APARECE UN CUADRADO GRANDE EN EL CENTRO DE
LA PANTALLA APRIETE EL BOTON AZUL ENFRENTE DE USTED CON EL DEDO
INDICE DE SU MANO PREFERIDA. UNA VEZ QUE A EMPEZADO, RECUERDE DE
APRETAR EL BOTON AZUL LO MAS RAPIDO POSIBLE. ESTA TAREA VA A
CONTINUAR POR ALGUN TIEMPO MAS.

If the SP holds the button down too long, the following message
appears:

POR FAVOR, NO APRIETE EL BOTON DEMASIADO TIEMPO. ESPERE A VER EL
CUADRADO, ENTONCES APRIETE EL BOTON RAPIDAMENTE Y BREVEMENTE.

At the beginning of the Symbol Digit Recognition Test:

EN ESTA TAREA PAREJAS DE SIMBOLOS Y NUMEROS APARECERAN EN LA
PANTALLA. SU TAREA ES APRETAR LA TECLA QUE CONTIENE EL NUMERO QUE
LE CORRESPONDE A CADA SIMBOLO EN LA PARTE DE ARRIBA DE LA PANTALLA.
LO QUE TIENE QUE HACER LE RESULTARA CLARO DESPUES DE HACER UNA
PRACTICA JUNTOS.

EMPEZANDO EN EL FONDO IZQUIERDO, BUSQUE EL MISMO SIMBOLO EN LA FILA
DE ARRIBA. LUEGO APRIETE EL NUMERO DEL SIMBOLO CORRESPONDIENTE EN
LA FILA DE ARRIBA Y CONTINUE.

If they made too many errors, the screen message reads:

USTED COMETIO ALGUNOS ERRORES ESA VEZ. SU TAREA ES ESCOGER EL
NUMERO QUE CORRESPONDE A CADA UNO DE LOS NUEVE SIMBOLOS SIN
EQUIVOCARSE. SI ENTIENDE LO QUE HAY QUE HACER, PRACTIQUE OTRA VEZ.

When the practice trials are successfully completed, the actual
test starts:

AHORA, VA A TRABAJAR CON 4 DIFERENTES PANTALLAS. NO SE LE

PERMITIRA CORREGIR NINGUNOS ERRORES QUE HAGA, POR LO TANTO IGNORALOS Y TRATE DE NO COMETER MAS ERRORES. ES MUY IMPORTANTE QUE USTED TRATE DE HACERLO LO MAS RAPIDO POSIBLE SIN EQUIVOCARSE. ACUERDESE DE UTILIZAR SOLAMENTE EL DEDO INDICE. CUANDO ESTE LISTO,

These instructions introduce the last test:

EN ESTA TAREA, HAY QUE APRENDERSE UN GRUPO DE NUMEROS. LOS NUMEROS VAN A APARECER EN LA PANTALLA BREVEMENTE, UNO POR UNO. CUANDO TODOS LOS NUMEROS HAN APARECIDO, USE LAS TECLAS NUMERADA PARA ESCRIBIRLOS EN EL MISMO ORDEN EN QUE APARECIERON. LO QUE TIENE QUE HACER LE RESULTARA CLARO DESPUES DE HACER UNA PRUEBA PRACTICA JUNTOS.

If they make a mistake, the following message appears:

USE LA TECLA '-' PARA BORRAR UN NUMERO Y LA TECLA '+' PARA TERMINAR LA RESPUESTA. SI NO RECUERDA TODOS LOS NUMEROS, ADIVINE.

Then the numbers appear:

----- AQUÍ
ESTAN LOS CUATRO NUMEROS. POR FAVOR ENTRE CUATRO NUMEROS.
USE LA TECLA '-' PARA BORRAR UN NUMERO Y LA TECLA '+' PARA TERMINAR SU RESPUESTA. SI NO RECUERDA TODOS LOS NUMEROS ADIVINE.

If there was an error during the first trial:

RECUERDERSE, USTED DEBE VOLVER A ESCRIBIR LOS NUMEROS EN EL MISMO ORDEN EN QUE APARECEN. POR FAVOR, TRATE DE HACERLO OTRA VEZ.

The following instructions introduce the test:

AHORA HARA LOS MISMO PERO CON UN GRUPO DE NUMEROS MAS GRANDE. VA A TRABAJAR CON EL MISMO GRUPO DE NUMEROS MAS DE UNA VEZ. AUNQUE USTED CONTESTO BIEN UNA VEZ, TIENE QUE HACERLO OTRA VEZ. POR LO TANTO, EMPIECE RECORDANDO LOS PRIMEROS NUMEROS Y ENTONCES TRATE DE RECORDAR MAS NUMEROS HASTA RECORDARLOS TODOS. ESTA TAREA ES DIFICIL. POR LO TANTO, HAGALA CON CUIDADO.

10.3.4 Postexamination Procedures

During the administration of the three NES2 tests, and immediately afterwards, the technician can continue with the questionnaire at the VT320. The next item inquires whether or not each of the three tests were completed. The first prompt is "Simple Reaction Time?". Simply enter "1" for "Yes" or "2" for "No". The second prompt is "Symbol Digit Substitution?"; enter "1" for "Yes" or "2" for "No". Finally, the third prompt is "Serial Digit Learning"; again, enter "1" for "Yes" or "2" for "No". Be sure to use the "ENTER" key on the response pad after selecting the appropriate numerical code for each part of this question.

The next screen presents the following question:

HOW HARD DID YOU TRY TO PERFORM THIS COMPUTER TEST?

- 1 NONE, NOT AT ALL
 - 2 SOME
 - 3 A LOT
 - 4 AS HARD AS I COULD
-

Read the question aloud to the respondent, along with the response options. Enter the number corresponding to the appropriate response given by the SP. If the SP is not sure, repeat the question and response options. Be sure to use the "ENTER" key to register the SP's response. Then, press the "NEXT SCREEN" key, followed by any key to acknowledge the message, as instructed on the computer screen. Be sure not to impose your interpretation on this response. The intent of the question is to obtain the SP's perception of level of effort.

Following is the Spanish version of the same question:

¿Cuánto esfuerzo hizo para esta prueba de computadora?

- 1 ningun/nada
 - 2 algun
 - 3 mucho
 - 4 lo més que podía
-

Record the ambient temperature at the end of the test in response to the next question:

WHAT IS THE TEMPERATURE?

Enter degrees in Fahrenheit. If the thermometer is broken, missing

or not working, enter the code 777 (not available).

The next screen to appear refers to the results of the examination. Select one of the three response options:

RESULTS OF EXAMINATION:

- 1 Satisfactory test
 - 2 Test complete but unsatisfactory
 - 3 Test not done
-

Be sure to use the "SELECT" key after moving the cursor to the appropriate line. Then, press any key to acknowledge the message, as instructed. If option "1" is selected, the post-test questionnaire is over. However, if either option "2" or "3" is selected to indicate unsatisfactory testing or incomplete testing, respectively, then another screen will follow after either of those numerical codes are entered and acknowledged. The last screen will read as follows:

REASONS TEST INCOMPLETE OR NOT DONE:

- 1 Equipment malfunction
 - 2 Insufficient time available or room not available
 - 3 Examinee refused or uncooperative
 - 4 Examinee unable to physically cooperate
 - 5 Examinee unable to understand test instructions due to language barrier or due to other reasons
 - 6 Examinee very frustrated, angry, or inattentive
 - 7 Comments:
-

Move the cursor down to the appropriate response option and use the "SELECT" key to enter that response. Then, enter any comments on the paper log which may be pertinent to interpreting the test results or any unusual conditions or problems (it is difficult to add comments on the screen since the keyboard is at a 90 degree angle). Hit the "ENTER" key (or the return key on the regular keyboard), followed by "NEXT SCREEN". Finally, press any key to acknowledge message, as instructed by the computer. The program will start over if the "PREVIOUS SCREEN" key is pressed at the completion of the post-test questionnaire. Enter the "Data collection" mode by hitting the "SELECT" key and the entry screen for Tech and SP identifying information will return.

Following is a short explanation of a few of the result code options given on the screen:

Equipment malfunction is self-evident, as is the case of **insufficient time available** or **room not available**.

There are no exclusions due to possible safety risk of the CNS test. An examinee who is unable to "**physically cooperate**" with the test protocol would include any SP who has a pre-existing condition that would affect the validity of the tests, or who is physically unable to see the monitor or manipulate the response buttons. This category also includes wheel-chair bound persons who could not enter the exam room because they could not be transferred to the MEC wheelchair.

Any examinee who is **uncooperative due to anger, inattentiveness, or frustration** may not be able to complete the testing. Be sure to indicate this on the paper log and add helpful comments. If a SP refuses to do the test or to continue, enter reasons why on the paper log. A sample person who arrives too late to the exam session to do the CNS exam, should be coded as "refused or uncooperative". Please explain this further in the comments sections.

An examinee who is **unable to understand the test instructions** due to a language barrier or the inability to conceptualize the task requirements or to follow the instructions may not be able to perform the tasks. This reason should be specified, where appropriate, and any additional comments that explain the situation or problem should be elaborated in the "Comments" section of the paper log. A Spanish-Only-Speaker (SOS) who did not have time to do the test because a Spanish-speaking health technician, MEC interviewer, or the combination of a CNS-trained translator and health technician was not available, should be coded as "unable to understand the test instructions", NOT, "insufficient time".

Complete the paper log, entering the appropriate result code and any comments. The result codes that should be used, and an explanation of when the result codes should be used, are shown in Exhibit 10-4. Take the time to enter comments whenever a problem situation arises, especially if the reason for not testing or not completing the tests is not obvious to the coder.

Exhibit 10-4

RESULT CODES FOR PAPER LOG

010 Satisfactory test (test completed according to protocol)

013 Refused to start test (SP initiated non-response, SP refused to initiate the test for any reason, SP arrived too late to exam session to do CNS exam)

014 Out of time (SP comes on time, adequate staff in MEC, it's the end of session and no time to conduct the test)

015 Physically unable to cooperate (SP has physical handicap that makes it impossible to initiate or complete the test)

016 SP unable to understand instructions (language or other communication problems, SP only speaks Spanish and Spanish-speaking health technician, MEC interviewer or combination of CNS-trained translator and health technician is not available)

017 Equipment problem (failure of equipment or power supply)

018 Other Reasons (limit use of this code, only for reasons that can not be coded with other categories, explain in comments)

002 Unsatisfactory exam [test is completed but with difficulty and is unsatisfactory or test is incomplete. Give reasons using:

021 Examinee very frustrated or angry (test incomplete or unsatisfactory because examinee was too frustrated or angry)

022 Examinee inattentive (test incomplete or unsatisfactory because examinee was inattentive)

024 Other reasons (explain in comments)]

10.3.5 Test Interruptions

At any point during testing, the program may tell the SP to call the interviewer. This is only necessary if there is a problem with the SP's response. When this message appears, the technician should press the F5 key to continue. The technician should always be as unobtrusive as possible when offering assistance in order to minimize interference with the data. Finally, if it is necessary to interrupt a test, the F1 and F8 keys can be pushed simultaneously to bring up the interrupt menu. The options for the technician at that point are self-evident as can be seen by Exhibit 10-5, which shows the menu as it will appear on the monitor. Press "2" if the SP is not going to finish the program, and then press "3" to go to the next task or "9" to exit entirely. Select option "1" only if the interruption is very early in the test: during the first few trials of the Simple Reaction Time or the practice trials of the other two tasks. Otherwise, never start over beyond these points. Note that tests are never repeated when there is some major interruption that prevented the SP from completing the task in the first administration.

Remember the responses are being written onto the program floppy during testing, or directly into the main system when the interface with the VAX is functioning. In either case, the program documents verbatim what occurs during testing. The technician should record any reasons for interrupting or aborting a task in the log. Never interrupt a CNS exam to complete another exam or interview component.

Exhibit 10-5

INTERRUPT MENU

- 1 START THE CURRENT PROGRAM AT THE BEGINNING
- 2 WRITE CURRENT RESULTS TO DATA FILE
- 3 GO TO THE NEXT PROGRAM IN THE SEQUENCE
- 4 GO TO THE PREVIOUS PROGRAM IN THE SEQUENCE
- 5 RETURN TO THE MENU PROGRAM
- 6 EDIT PARAMETER FILE
- 7 EDIT CONFIGURATION FILE
- 8 EXIT TEMPORARILY TO DOS
- 9 EXIT NES2 ENTIRELY

WHICH OPTION (1-9)?

10.3.6 Problems

Basically, two kinds of problem situations can arise during the administration of the CNS: examinee problems and computer problems. Any problems encountered during a testing session should be entered into the CNS Daily Log Sheet (See Exhibit 10-6) immediately, along with any comments about actions taken.

PROBLEMS WITH THE EXAMINEE: Problems during the CNS testing should be relatively rare, but occasionally an examinee may behave in an uncooperative manner, or become too frustrated to concentrate, or become ill. An examinee may complain about some aspect of the testing situation. It is important to listen to the complaint and to try to respond in an understanding manner while also explaining that test procedures must be standardized in order to obtain reliable results. Record the substance of any complaints given by the SP in the CNS Log, especially if an action taken by the SP interferes with the completion of the test. If the examinee leaves the room, try to determine the cause and give him/her encouragement to return and complete the test. Examinees may need to be reminded about the nature and purpose of the testing and the importance of their individual contribution to the study.

Occasionally an examinee may become too upset or frustrated to concentrate on the NES tasks. One common reason why some may become upset is unfamiliarity and/or uncertainty about what is expected of them in the testing situation. It is important to use basic interviewing skills to establish good rapport with the SPs from the very start of the testing session. Then, if a problem arises, try to identify the cause and help alleviate the concern by restating the nature and purpose of the test or by reminding the SPs that only a few keys will be used to respond during the tests.

In order to motivate the examinee, encouragement and support can be given when required throughout testing, regardless of his/her level of performance. It is very important for the examinee to be motivated to ensure the collection of valid data, but s/he should never be distracted from the testing by unsolicited comments. If the examinee remarks about the test difficulty, respond that the tests are designed to be so difficult that no one can perform them perfectly. Encourage each SP to give the tests his/her best effort. If testing is interrupted due to frustration, encourage the SP to continue by saying:

"NOW RELAX AND CONTINUE AS QUICKLY AND ACCURATELY AS YOU CAN. IF YOU HAVE ANY QUESTIONS AT ANY TIME, I WILL BE HERE TO HELP YOU."
"AHORA RELAJESE Y CONTINUE TAN RAPIDO Y EXACTO COMO USTED PUEDA. SI TIENE ALGUNA PREGUNTA EN CUALQUIER MOMENTO, YO ESTARE AQUI PARA AYUDARLE"

If the SP has difficulty understanding the instructions, repeat

them slowly and demonstrate the correct keys to use for responding. However, after 3 "call the interviewer" instructions appear on the screen, terminate the test and go on to the next test. We do not want to frustrate the SP so much that s/he refuses to finish the testing or the rest of the exam. Any of the tests may be interrupted, if necessary, by simultaneously pressing the F1 and F8 "function" keys (several times if needed) at the left of the keyboard. Then press F5 to continue, or select one of the other options if necessary.

If an SP is upset when arriving for CNS testing, examiners may use one of the following methods for gaining cooperation:

1. Allow the SP a moment to relax, then explain the test in the usual way.
2. If the SP is still resistant about the testing programs on the COMPAQ (F1/F8, Option 9) and record the reason on the CNS Log.
3. Remember, if the SP mentions "IQ testing," say emphatically that this test has nothing to do with testing IQ. It is "performance testing" to see "how quickly" you can perform some simple responses.
4. If the SP appears discouraged and is not performing a test trial, ask s/he to "give it a try and if you still don't want to do it, we can stop at any time."

If an examinee becomes too ill during testing to continue the session (e.g. feels faint from having had blood drawn) do not attempt the CNS. Instead, assist him/her to the reception area or call the Physician if s/he is too ill to walk. Follow the general emergency procedures that apply throughout the MEC.

COMPUTER MALFUNCTIONS: Malfunctions of two types may occur during test administration. Hardware problems are likely to be detected by the machine itself during the start-up phase. Report any hardware problems directly to the MEC manager. Software problems should be minimized due to the fact that the program is called up directly from the VAX for testing. Unforeseen problems can be further minimized by keeping a backup CNS program disk in the staff lounge. Should the backup program fail or the computer malfunction, the MEC manager should immediately contact NCHS SOB for assistance. Be sure to record any computer problems in the CNS Log.

10.4 Logs and Records

The automated system eliminates the need for extensive record-keeping for the CNS component. However, certain daily logs are necessary in order to keep track of testing times and to record any

Exhibit 10-6

CNS

NEUROLOGICAL TESTING DAILY LOG SHEET

May 1990

10-32

SP ID #	Disk Label Number	Examiner ID #	Time In/Time Out	Exam Status	Comments
1.			____/____		
2.			____/____		
3.			____/____		
4.			____/____		
5.			____/____		
6.			____/____		
7.			____/____		
8.			____/____		
9.			____/____		
10.			____/____		

STATUS CODES: C - Complete, PC - Partially Complete (must include comments), NE - No Exam (include comments)

CENTRAL NERVOUS SYSTEM TESTS

AGES 20-59 ODD

STAFF NO.	COMPAQ NO.	SAMPLE NO
NEUROBEHAVIORAL INDICES		
1. How much sleep did you get last night? Would you say about the usual amount, less than usual, or more than usual?		1 <input type="checkbox"/> about the usual amount 2 <input type="checkbox"/> less than usual 3 <input type="checkbox"/> more than usual
2. Right now would you say you are feeling energetic, fresh, average, tired, or exhausted?		1 <input type="checkbox"/> energetic 2 <input type="checkbox"/> fresh 3 <input type="checkbox"/> average 4 <input type="checkbox"/> tired 5 <input type="checkbox"/> exhausted
3. How much familiarity do you have with computers or video games? Would you say none, some, or a lot?		1 <input type="checkbox"/> none 2 <input type="checkbox"/> some 3 <input type="checkbox"/> a lot
4. Not counting decaffeinated products, how many cups of coffee, tea or cola have you had in the past 3 hours?		0 <input type="checkbox"/> none 1 <input type="checkbox"/> 1 2 <input type="checkbox"/> 2+
5. How many drinks of alcohol have you had in the past 3 hours? Include any alcoholic drinks such as wine, beer, or hard liquor.		0 <input type="checkbox"/> none 1 <input type="checkbox"/> 1 2 <input type="checkbox"/> 2+
6. Which hand do you prefer to use for this test?		1 <input type="checkbox"/> Right 2 <input type="checkbox"/> Left
TESTS COMPLETED		
Simple Reaction Time		1 <input type="checkbox"/> Y 2 <input type="checkbox"/> N
Symbol Digit Substitution		1 <input type="checkbox"/> Y 2 <input type="checkbox"/> N
Serial Digit Learning		1 <input type="checkbox"/> Y 2 <input type="checkbox"/> N
How hard did you try to perform this computer test?		1 <input type="checkbox"/> None/not at all 2 <input type="checkbox"/> Some 3 <input type="checkbox"/> A lot 4 <input type="checkbox"/> As hard as I could

PHS 6300-4

Rev. 11/89

problem situations. A daily paper log is kept for each of the MEC exam components on a standardized log form (See Exhibit 10-6). The component name is placed at the top, in this case, CNS Testing. The date (month, day, and year) and exam session (AM, PM, or EVE) should be entered at the top, with the Stand Number and Location. Keep a separate log sheet for each exam session. Prior to the start of testing, place on the log one of the preprinted stickers with the SP identification number on it. The sticker should be placed under the column "SP ID#." Enter the box label number from the CNS diskette under the column titled "Disk Label Number". Each examiner must also enter his or her assigned examiner ID number in the appropriate column. The ambient temperature in degrees Fahrenheit should be recorded at the start of each exam. Record the time the SP begins the CNS testing component and the time the SP finishes under the headings of "Time In" and "Time Out." Note "C" if all tests are completed; note "PC" if the tests are only partially completed; and note "NE" (No Exam) if the tests are not done at all. Be sure to enter a comment in the last column to explain any problems or incomplete testing situations.

It is important to record carefully any problems that arise with specific subtests or portions of the CNS testing component. Note whether the problem involves the VT320 administration of the pre- and post-examination questionnaires or the Compaq administration of the NES tests. Then, describe the problem that occurred, including the specific NES test in use at the time and any resolution under the column labeled "Comments." If more space is needed to continue the comments, continue them on the next line for comments.

Note that the automated system allows room for giving feedback on the testing situation in the post-examination questionnaire. It is not necessary to duplicate this information on paper, but it is important to highlight any repetitive problems or idiosyncrasies with the testing situation which may need to be addressed immediately in order to improve the validity and reliability of the test results.

10.5 Quality Control

10.5.1 Examination Forms

The automation of the NES tests eliminates the use of hard-copy forms for the Simple Reaction Time, Symbol-Digit Substitution, or Serial Learning tasks. Before the computer program is started up from the VAX, the CNS tests can be run from a NES2 program disk inserted in the single drive of the Compaq. The test data are recorded onto this same floppy disk during testing. Program floppy disks should be kept in the testing room at all times to allow administration of the CNS tests on the Compaq if the main system is temporarily down.

If the VAX is down, it will be necessary to administer the paper version of the Neurobehavioral Indices pre-test questionnaire and the post-test questionnaire. This is combined in one form labelled "CENTRAL NERVOUS SYSTEM TESTS" as shown in Exhibit 10-7. Complete only the Neurobehavioral Indices portion before administering the NES tests, then complete the remainder of the questionnaire, following the specifications given earlier in this chapter. Be sure to correctly record the SP identification number (NCHS Number), the Examiner Number and COMPAQ Number at the top of the form and to place a preprinted sticker on the hard-copy to prevent identification problems at the time of coding. All hard copy questionnaires should be entered into the VAX when the system becomes available. Entry of hard copy data must be coordinated with the MEC Manager.

10.5.2 Data Handling and Transmittal

Data are normally recorded directly to the VAX system during CNS testing. If the CNS test are being run from a floppy disk, the data are written onto the same floppy disk. There is ample space on each floppy to record the results of several testing sessions. The technician is responsible for handling the data. As soon as it becomes possible to collect CNS data directly onto the VAX, use of the floppy diskettes for data collection should be discontinued and the technician should copy data collected on a floppy disk to the VAX using the VAXMATE in the staff lounge.

The technician must ensure that a copy of the NES2 program disk is available for running CNS tests during the following week of exams and for data collection purposes. At least two copies of the program disk should be in the MEC staff lounge at all times. When the VAX is down, and the NES tests need to be run directly from the Compaq, the data is recorded onto the same diskette which is used to run the CNS programs. These diskettes are then mailed out to NIOSH. A replacement of the CNS program diskette will need to be created and placed in the Audiometry/CNS exam room when the VAX is again up and running. Since diskettes which contain data from the CNS exams (including those created when the VAX is up and running) are mailed to NIOSH, only new diskettes should be used to copy the CNS programs off the Staff lounge VAXMATE.

Procedures for handling data from the CNS are available on the main menu of the VAXMATE in the staff lounge. The menu provides options for technicians to either create a new program diskette, copy information from a floppy diskette to the main VAX system, or to copy data from the main VAX system onto a floppy disk. To copy CNS data files onto a floppy disk to send to NIOSH, insert a high density diskette, select option 3 from the Lounge workstation menu (write files to a diskette). Then select option 2 (Copy NES files from VAX) from the "Write files to diskette" submenu on the next screen. Place the disk in a disk mailer and complete a transmittal form indicating that the disk contains CNS testing data for that

particular week (specify exact dates of testing). The mailer should be sent to the NIOSH representative at the address provided by the Chief Health Technician and MEC Manager.

Since procedures for data handling may change as the computer capabilities are improved, all memos should be read carefully and any new responsibilities implemented. As needed, Westat, NCHS staff, and consultants will conduct update sessions in the field to orient technicians to new procedures.