
CANTABeclipse™

Test Administration Guide

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Manual version 3.0.0

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Acknowledgements

We would like to acknowledge the contributions made to the development of CANTAB® by John Downes, John Evenden, Robin Morris, Adrian Owen, Trevor Robbins, Angela Roberts and Barbara Sahakian.

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Introduction

Welcome to CANTABeclipse™, the simple, flexible and easy to administer cognitive assessment tool that runs on Windows-based PC systems.

Documentation overview

The documentation set for CANTABeclipse consists of:

- The CANTABeclipse Test Administration Guide
- The CANTABeclipse Software User Guide

This is the CANTABeclipse Test Administration Guide. It contains detailed descriptions of the tests in CANTABeclipse and instructions for administering these tests to subjects.

The CANTABeclipse Software User Guide describes how to install, set up and run CANTABeclipse. It is best to read the CANTABeclipse Software User Guide first.

About this guide

This guide assumes that you have a basic working knowledge of Windows, including how to use a mouse to point and click, how to use menus and commands, and how to open, close and save files. If you need more information on any of these, please refer to the documentation that came with your computer.

Outline

Chapter 1 gives an overview of CANTABeclipse, including brief descriptions of the tests.

Chapter 2 gives instructions for setting up the test environment and for running tests and batteries.

Chapter 3 to Chapter 24 give detailed descriptions and administration information for the tests, starting with the Motor Screening test, MOT, in Chapter 3, and then describing the remainder of the tests, in alphabetical order, in the subsequent chapters.



Chapter 25 gives a description of outcome measures available for each of the tests.

Conventions used in this guide

Step-by-step instructions are shown like this:

➔ This is an instruction to click on a **particular item**.

! **Particularly important information is shown like this.**

Keyboard input is shown like this: Press  or .

Technical terms, when first mentioned in the text, are shown **like this**, and may be found in the glossary towards the end of this guide.

! **This manual is provided as a guide to the best use of the CANTABeclipse software. Training courses are also available. Please contact Cambridge Cognition for details of available courses, or look at www.cantabeclipse.com/training.**

Test administration scripts

In the test administration scripts shown in Chapter 3 to Chapter 24, instructions for the tester are given on the left of the page, and the words the tester should say are shown on the right of the page.

The colour of the background for the words the tester should say indicates the mode of the test.

Say:

This is a prompt for a test which does not have different administration scripts for any of its modes

Press SPACE to begin the test.

This is a prompt for a clinical mode of a test

The screen displays **Please Wait**.

This is a prompt for a parallel mode of a test

This is a prompt for a child mode of a test

This is a prompt for an additional mode of a test (described in the test mode title)

This is a prompt for another additional mode of a test (described in the test mode title)

Chapter 1

CANTABeclipse overview

CANTABeclipse contains all the original tests from the world-renowned CANTAB® (Cambridge Neuropsychological Test Automated Battery) system. These tests, which provide an effective method of cognitive assessment, are described briefly later in this chapter. Full details and administration information for the tests are given later in this guide.

The language-independent tests and touch screen technology deliver rapid and non-invasive cognitive assessment.

CANTAB has been used and validated in many research departments and data from control **subjects** have been collated to create a **normative database** for many of the tests. Reference to these norms can assist in the interpretation of test data. CANTABeclipse incorporates this normative database.

! Cambridge Cognition is continually improving its CANTAB products, and new tests are periodically incorporated. These tests may be the product of recent research, and there may not be normative data available for them.

Running CANTABeclipse tests

CANTABeclipse contains 22 tests. You can:

- Run tests individually.
- Set up a **battery** of a number of tests. This is particularly useful for running the same sequence of tests for a number of subjects.

Running tests individually and setting up a test battery is described in the *CANTABeclipse Software User Guide*.

Test modes

Some of the tests in CANTABeclipse may be run in more than one mode. When you run a test, either on its own or as part of a battery, you may choose to run it in:

- clinical** mode – for running once only per subject
- parallel** mode (if available) – for repeat testing

Other modes may also be available, depending on the test. Each test description chapter in this guide (chapters 3 to 24) gives information on the modes available for each test.

Refer to the *CANTABeclipse Software User Guide* for more information on clinical and parallel modes.

Test descriptions

The tests in CANTABeclipse may be broadly divided into six main groups:

- screening tests
- visual memory tests
- executive function, working memory and planning tests
- attention tests
- semantic/verbal memory tests
- decision-making and response control tests

In the tables below, each test in a group is briefly described, together with an approximate administration time, although this will vary depending on the performance of the subject being tested. More detailed descriptions of the tests, and full instructions for test administration, are given later in this guide.

Screening tests

Test name	Administration time	Purpose
Motor screening (MOT)	3 minutes	Screens for visual, movement and comprehension difficulties
Big/ Little Circle (BLC)	3 minutes	Tests comprehension, learning and reversal

Visual memory tests

Test name	Administration time	Purpose
Delayed Matching to Sample (DMS)	10 minutes	Tests immediate and delayed perceptual matching
Paired Associates Learning (PAL)	10 minutes	Assesses episodic memory and learning
Pattern Recognition Memory (PRM)	5 minutes	Tests visual recognition memory
Spatial Recognition Memory (SRM)	5 minutes	Assesses spatial recognition memory

Executive function, working memory and planning tests

Test name	Administration time	Purpose
Intra/ Extradimensional Set Shift (IED)	7 minutes	Assesses rule acquisition and attentional set shifting
One Touch Stockings of Cambridge (OTS)	10 minutes	Assesses spatial planning
Stockings of Cambridge (SOC)	10 minutes	Assesses spatial planning and motor control
Spatial Span (SSP)	5 minutes	Tests working memory capacity

Test name	Administration time	Purpose
Spatial Working Memory (SWM)	8 minutes	Assesses working memory and strategy use

Attention tests

Test name	Administration time	Purpose
Choice Reaction Time (CRT)	7 minutes	Measures speed of response in a simple 2-choice paradigm
Match to Sample Visual Search (MTS)	9 minutes	Tests ability to match visual stimuli and measures reaction and movement time
Reaction Time (RTI)	5 minutes	Measures speed of response and movement in single and 5-choice paradigms
Rapid Visual Information Processing (RVP)	7 minutes	Tests visual sustained attention
Simple Reaction Time (SRT)	6 minutes	Measures speed of response to a single stimulus

Semantic/verbal memory tests

Test name	Administration time	Purpose
Graded Naming Test (GNT)	10 minutes	Gives a measure of semantic memory by assessing object naming ability
Verbal Recognition Memory (VRM)	20 minutes in total for immediate and delayed modes combined. (Delayed mode should always be administered 20 minutes after the immediate mode)	Assesses free recall, and immediate and delayed recognition memory for verbal information.


Decision making and response control tests

Test name	Administration time	Purpose
Affective Go/No-go (AGN)	10 minutes	Assesses information processing biases and inhibitory control for positive and negative stimuli.
Cambridge Gambling Task (CGT)	Up to 30 minutes	Assesses impulse control and risk-taking in decision making
Information Sampling Task (IST)	Up to 15 minutes	Tests impulsivity and decision making
Stop Signal Task (SST)	Up to 20 minutes	Gives a measure of response inhibition

Input

The **subject** taking the tests interacts with the system by touching the **touch screen**. You need to keep the keyboard out of the way, so that the subject has comfortable access to the touch screen.

In the Affective Go/No-go (AGN), Choice Reaction Time (CRT), Matching to Sample Visual Search (MTS), Reaction Time (RTI), Rapid Visual Information Processing (RVP), Simple Reaction Time (SRT) and Stop Signal Task (SST) tests, the subject also uses a **press pad** as an input device. See *Press pad* on page 24 for further information on using press pads.

As the **test administrator**, you typically have control of the keyboard, and press  to start a test or to continue to the next stage of a test.

In the Cambridge Gambling Task (CGT), One Touch Stockings of Cambridge (OTS), Stockings of Cambridge (SOC), Spatial Span (SSP), Spatial Working Memory (SWM) and the Verbal Recognition Memory (VRM) tests, you will also need to use the touch screen for part of the test, for demonstrating to the subject or recording the subject's responses.

In the Graded Naming Test (GNT), you will need to use the keyboard to record the subject's correct and incorrect responses.

If you choose to run the CANTABeclipse tests without a keyboard (see *Operation without a keyboard* on page 25) you will need to be able to reach the touch screen for each test, except for the Graded Naming Test, for which you should use the press pad.

Test evaluation without dedicated hardware

For **test evaluation purposes only**, if a touch screen is not available, the **F1** key may be used to toggle a mouse cursor (pointer), and the left mouse button used to simulate a touch at the indicated location.

Similarly, if a press pad is not available, the right (or secondary) mouse button may be used for tests requiring a single response button (AGN, MTS, RTI, RVP, SRT). This is likely to give less accurate results than a press pad.

! Do not use the mouse as an input device for test subjects.

For tests which use two press pad response buttons (such as CRT and SST) the **F7** and **F8** keys on your computer keyboard may be used if a press pad is not available. This is also likely to give less accurate results than a press pad.

! Do not use the keyboard as an input device for test subjects.

Subject user interface

CANTABeclipse runs on a standard PC system running Microsoft Windows® (desktop, laptop or tablet) with attached or built-in touch screen. The actual tests (or batteries of tests) that the subject takes are run in **full-screen mode**, as shown in Figure 1-1, with the touch screen as the primary interface for the subject. In full-screen mode, the PC screen is completely blank except for the test stimuli displayed on the screen.

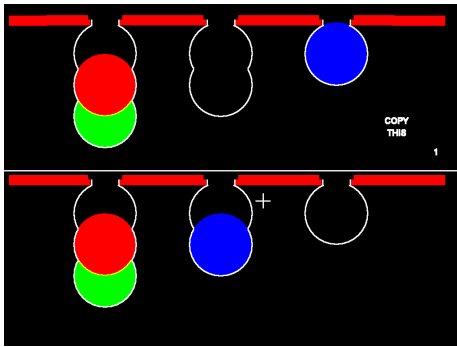


Figure 1-1 Full screen mode for the subject user interface (the test shown is SOC, Stockings of Cambridge).

Test results storage and output

CANTABeclipse stores all test results on your computer. You can view and search for your results using the CANTABeclipse Results Manager, which is described in more detail in the *CANTABeclipse Software User Guide*.

Summary test results

For each test the values for a number of **outcome measures** are calculated. Each measure relates to a particular test, and has a single value for each run of that test. For example, 'BLC Percent Correct' gives the total number of correct responses expressed as a percentage of total responses made during the assessment part of the whole BLC test. **Summary test results** consist of a value for each of these outcome measures and may be:

- displayed in an application of your choice
- displayed in a browser window as a graphical report
- saved to a disk either as a **.csv file** or as a graphical report (**HTML file**).

Outcome measures are described in detail in *Chapter 25 Description of Outcome Measures*.

Detailed test results

In addition, you can save detailed trial-by-trial results to one or more files for further analysis, for instance using a spreadsheet package such as OpenOffice or Microsoft Excel®.

For more information on results and data output, please refer to the *CANTABeclipse Software User Guide*.

Chapter 2

Test administration

The test environment

The CANTABeclipse tests have been designed to run under the supervision of a tester. For these tests, the computer is a convenient and less threatening medium for the subject to interact with, freeing the test administrator for observation and social interaction.

The test computer should be set up in a quiet room and the subject should sit directly in front of the screen at a comfortable distance (approximately 30-50cm) to allow them to touch the screen, whilst remaining with their back upright against the chair so they don't need to lean forward. They should not sit with their elbows on the table in front of them.

If circumstances require that the subject should be tested in bed, the subject should be sitting up as far as possible, with the screen directly in front of them, and within comfortable touching distance, on the table over the bed.

Touching the screen

The subject should use the index finger of their dominant hand to touch the screen. They should not have access to the keyboard or mouse, as none of the tests requires this. Subjects should only be able to touch the touch screen or the press pad (for those tests which require the press pad). For the VRM test, the screen should be arranged so that it may easily be turned to face the test administrator and away from the subject during the free recall phase. For tests which require the administrator to demonstrate steps, the screen should be arranged so that the administrator can reach it to demonstrate the test. If the option for test administration without a keyboard has been selected, the test administrator must be able to reach the screen at all times.

Keyboard and mouse

The keyboard and mouse should be situated to the side of the computer, in front of the test administrator, so that the administrator can reach the keyboard easily during the tests. The subject should not be permitted to touch the keyboard or mouse.

! Because the tests rely on mouse emulation, the test administrator and the subject must NOT touch the mouse while the test is running.

Press pad

If you are running tests which do not require a press pad, you do not need to connect a press pad to the computer. If you are running tests which do require a press pad, you should connect the press pad to the computer and arrange it as follows:

Single press pad button

For the tests which require a single response button on the press pad (AGN, MTS, RTI, RVP and SRT) the press pad should be moved to the front of the screen, as shown in Figure 2-1, arranged so that the response button, the button further from the cable, is 15 cm away from the screen and closer to the subject than the other button, which is not used.

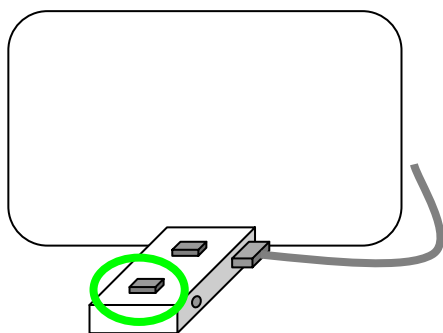


Figure 2-1 Press pad arrangement for 1-button tests. The response button is shown with a green circle.

Two press pad buttons

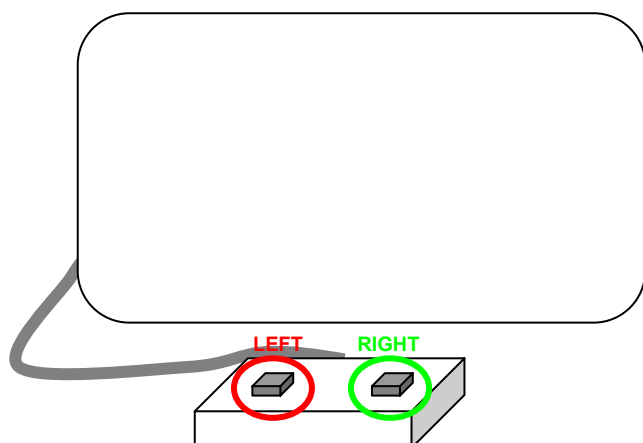


Figure 2-2 Press pad arrangement for two-button tests. The left response button is shown with a red circle and the right response button is shown with a green circle.

For CRT and SST, which require two response buttons on the press pad, the press pad should be placed so that the longer side of the press pad is facing the subject. The subject should sit with the forefingers of both hands gently resting on the press pad buttons. The press pad cable should not be facing the subject.

If you wish to use the press pad to record the subject's responses for GNT, you should arrange it as shown above for two-button tests, but use it out of sight of the subject (for example, below the table).

Refer to the *CANTABeclipse Software User Guide* for more information on connecting the press pad. If you think your press pad is not covered by these instructions, please refer to www.cantabeclipse.com/presspads for further information.

Operation without a keyboard

If you wish, you may run CANTABeclipse without a keyboard – this has advantages if, for example, you are using a small portable tablet PC. If you choose to configure

CANTABeclipse so that you can run it without a keyboard, you can use the touch screen instead as described below.

Instead of the space bar

Where the test administration scripts require you to press **SPACE** (typically for advancing through a test), instead you should touch either bottom corner (shown in green in Figure 2-3) of the touch screen **once**. You should touch as close to the corner as possible.

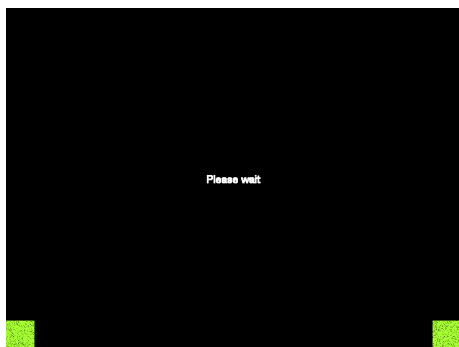


Figure 2-3 The two bottom corners (here shown in green) of the Please wait screen

Instead of the Esc key

If you wish to pause a test, or cancel testing, touch either top corner of the screen (as shown in Figure 2-4) **three times** quickly instead of pressing the **ESC** key. You should touch as close to the corner as possible. You should then touch the Yes or No box displayed on the screen.

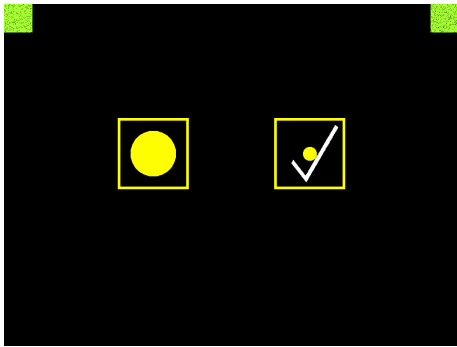


Figure 2-4 The top two corners (here shown in green) on the BLC task screen

For GNT, which requires you to indicate whether the subject's responses are correct or incorrect, you should use the press pad to record the subject's responses. See the GNT chapter for further information.

Refer to the *CANTABeclipse Software User Guide* for information on how to allow test administration without a keyboard.

The test administrator

The test administrator should sit next to the subject and give instructions as described in the administration scripts in chapters 3 to 24 in this guide. There are verbal instructions accompanying each test, and specific verbal prompts and encouragement may be used where indicated.

Administering tests separately

If you wish to administer the tests in CANTABeclipse separately:

- ➔ Select the subject to whom you wish to administer the test(s), or enter details for a new subject.
- ➔ Click the Battery tab and select a battery containing the test (or tests) you wish to administer by clicking the drop-down arrow on the right of the Battery box.

- ➔ If necessary, change the mode of the test by clicking the row for the test in the Mode column and then click the drop-down arrow to display the list of modes. Select the mode in which you wish to run the test by clicking it.
- ➔ Click on the test you wish to administer, to select it.
- ➔ If you wish to select more than one test, control-click on them (hold the **CTRL** key down and click on them with the mouse), or click and drag in the leftmost grey test number column to select the tests you require if they are on adjacent lines.
- ➔ Click on the **Run selected tests** button to run the selected test(s). The Confirm subject details dialog box is displayed which summarises the subject details and the test(s) you are about to run. If the information in the dialog box is correct, click the **Confirm** button to continue and run the battery, otherwise click the **Cancel** button.
- ➔ Please use the detailed test administration scripts and information on administering the tests to subjects given later in this guide.

All tests in CANTABeclipse are run in full-screen mode.

These procedures are all described in more detail in the *CANTABeclipse Software User Guide*.

! Remember to use the administration scripts supplied.

Administration scripts

The verbal instructions provided in the administration scripts in Chapter 3 to Chapter 24 have been developed by testing subjects of a range of ages and IQ, including healthy subjects as well as subjects with a wide range of disorders. The wording of these instructions is designed to avoid unintentionally instructing subjects to use one strategy (for example, verbal rehearsal) rather than another. We therefore recommend that you adhere as closely as is reasonably possible to the instructions we have provided.

Test start screens

At the start of each test, the computer will display the test start screen.

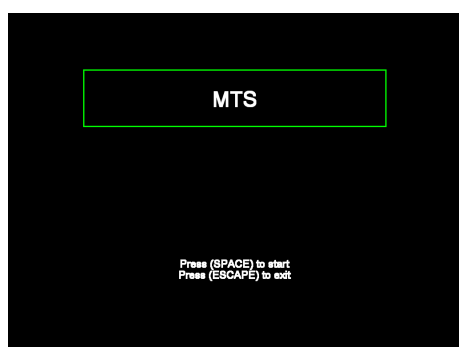


Figure 2-5 The start screen for the MTS test

Each test has its own start screen, with the three-letter abbreviation for the name of the test shown in the green box.

Running batteries

To run a battery of tests you have previously designed and saved:

- ➔ Use the CANTABeclipse Control Centre Subject tab to select the subject to whom you wish to administer the battery, or enter details for a new subject. For more information, see the *CANTABeclipse Software User Guide*.
- ➔ Click the CANTABeclipse Control Centre Battery tab or the **Next>>** button, to display the Battery tab, and select the battery you wish to administer by clicking the drop-down arrow on the right of the Battery box.
- ➔ Click on the **Run battery** button to run the battery. The Confirm subject details dialog box is displayed which summarises the subject details and the battery you are about to run. If the information in the dialog box is correct, click the **Confirm** button to continue and run the battery, otherwise click the **Cancel** button.

- ➔ Please use the detailed test administration scripts and information on administering the tests to subjects given later in this guide.

Pausing or aborting a test

It is possible to pause or abort a test if necessary, though this is not recommended. However, there might be particular circumstances in which pausing or aborting a test is required, for example:

- the subject refuses to continue the test.
- the subject becomes unwell or distressed during the test.

To pause or abort a test:

- ➔ Press the **ESC** key. The test (if running) is paused, and you are prompted to see if you really wish to abort the test.
- ➔ To abort the test, press **Y**; to end a pause, return to the test and continue, press **N**

If you were running a series of tests, and one or more tests are remaining, a further screen is displayed asking you if you wish to run the remaining tests in the battery. Press **Y** to run the remaining tests; press **N** to return to the Control Centre.

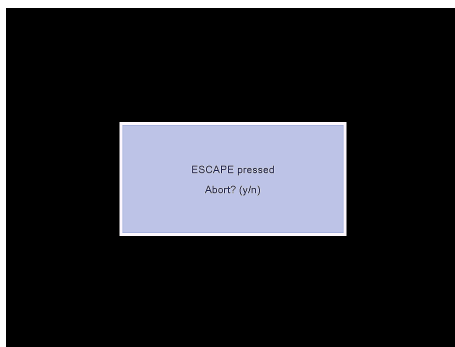


Figure 2-6 The message displayed after you press the Esc key when a test is running

More information on pausing and aborting tests is given in the *CANTABeclipse Software User Guide*.

If you are running CANTABeclipse without a keyboard, you should touch one of the top corners of the screen three times quickly to display the ESCAPE pressed message and then touch the Yes or No box.

At the end of a test

When a test ends within a battery, the start screen for the next test in the battery is displayed.

If you are running a test individually, or as the last test in a battery, the following message is displayed at the end of the test:

Testing session finished and results saved successfully.

Press (SPACE) to continue.

➔ Press SPACE to return to the CANTABeclipse Control Centre window.

The chapters which follow give full descriptions of the tests and information on administering the tests to subjects.

Chapter 3

Motor Screening (MOT)

MOT description

The Motor Screening test (MOT) is a training procedure designed to relax the subject and to introduce them to the computer and touch screen. It should always be given at the beginning of a test session.

It simultaneously screens for difficulties with:

- vision
- movement
- comprehension

and ascertains that the subject can follow simple instructions.

Display

A series of crosses is shown in different locations on the screen.

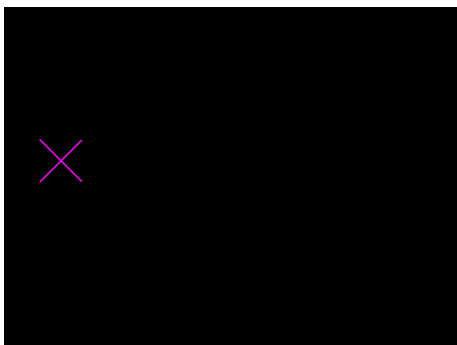


Figure 3-1 The Motor Screening test (MOT)

MOT

Task

After a demonstration of the correct way to point, using the forefinger of the dominant hand, the subject must touch the crosses in turn.

MOT test modes

The MOT test has two modes:

- clinical
- high visibility

In the high visibility mode, the crosses displayed on the screen are thicker and easier for the subject to see, particularly on smaller screens. The modes are the same in every other respect, and both use the same administration script.

MOT administration script

With the MOT start screen displayed, say this:

Here is the computer that we will use. I am going to show you how it should be used. Are you ready?

Press to start the test and start pointing to the Xs displayed on the screen in turn.

Demonstrate.

The idea is to touch the Xs in turn when they flash pink and green, as I am doing now. If you touch them properly, there will be a tune. If you do not touch them properly, you will not hear anything.

After three **Xs** the computer will display the message **Please Wait**.

Now give the following instructions:

Press 

Then say:

If the subject's presses are on target but the crosses are not disappearing, say:

If the subject is confused by the procedure or does not touch the **Xs** properly, the following prompts may be used:

If the screen does not respond, ask the subject to take their finger away and touch again – pressing harder will not make it work.

The test ends after the subject has touched the 10th cross.

You should use the tip of the forefinger of the hand you write with for it to work properly. If you touch properly the cross will go. You must then take your hand away and wait for the next one.

Now you try, please.

Remember to touch the Xs with the tip of your forefinger when they flash.

Press firmly.

Use the tip of your forefinger. Now look for the next one (that flashes).
Touch only, there's no need to press hard.

Chapter 4

Affective Go/No-go (AGN)

AGN description

In the Affective Go/No-go (AGN) test, a series of words is rapidly presented in the centre of the screen. These words fall into three valences:

- Positive (for example, joyful, warmth, courage)
- Negative (for example, mistake, hopeless, burden)
- Neutral (for example, item, pause, element)

The subject is given a target valence and asked to press the press pad when they see a word that matches this valence.

Display

Words are displayed one at a time in the centre of the screen. Each word is displayed for 300 ms and there is an interval between the words of 900 ms.

If you want to make the words look larger on the screen, refer to the *Options* section of the *CANTABeclipse Software User Guide*, which explains how to use large fonts in verbal tests.

AGN



Figure 4-1 The AGN test screen (normal size font on the left, large size font in the right)

Task

Words from two categories at a time are displayed, and the subject is asked to press the pad whenever they see a word matching the target category. Blocks of 18 words are displayed, with a pause between the blocks.

! This test uses a press pad. If no press pad is available, and you wish to evaluate the test, you can use the right hand (or secondary) button on your mouse. Always test subjects using a press pad.

AGN test modes

There are 6 possible modes for running this test, which can be separated into two cases. It may be run in either:

- Case 1 – positive and negative stimuli only
- Case 2 – positive, negative and neutral stimuli.

The modes within these cases are described below. A pre-empt delay excludes any responses from analysis that happened in the first 100ms of presentation.

Administration scripts are provided for Case 1 and Case 2.

Case 1 – positive and negative

- ❑ positive target valence first, with blocks in the order
PosPosNegNeg PosPosNegNegPosPos, with no pre-empt delay
(pos-neg-noped)
- ❑ positive target valence first, with blocks in the order
PosPosNegNeg PosPosNegNegPosPos, with pre-empt delay (pos-
neg-ped)
- ❑ negative target valence first, with blocks in the order
NegNegPosPos NegNegPosPosNegNeg, with no pre-empt delay
(neg-pos-noped)
- ❑ negative target valence first, with blocks in the order
NegNegPosPos NegNegPosPosNegNeg, with pre-empt delay (neg-
pos-ped)

Each of these test modes consists of ten 18-word blocks. The first two blocks in each test are practice blocks, and are not scored. The administrator is advised of the target valence and the distractor valence before each block is run.

Case 2 – positive, negative and neutral

- ❑ with target valences in the order
PosNegPosPosNeuNeuNegNegPosPos
NeuNeuNegNegPosPosNeuNeuNegNeg, with no pre-empt delay
(pos-neg-neut-noped)
- ❑ with target valences in the order
PosNegPosPosNeuNeuNegNegPosPos
NeuNeuNegNegPosPosNeuNeuNegNeg, with pre-empt delay
(pos-neg-neut-noped)

Each block contains words of only two valences – either positive and negative, positive and neutral, or neutral and negative. The administrator is advised of the target valence and the distractor valence before each block is run.

Each of these test modes consists of twenty 18-word blocks. The first two blocks in each test are practice blocks, and are not scored.

A screen similar to that shown in Figure 4-2 is displayed in between each block, to allow you to advise the subject of the target valence for the next block.

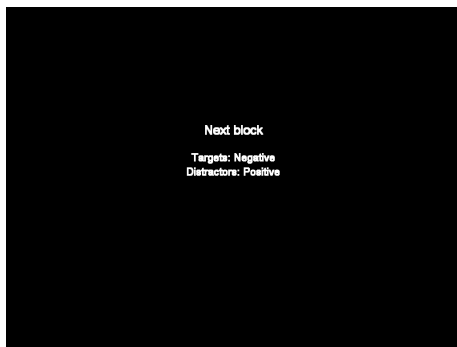


Figure 4-2 The AGN Next Block screen

AGN administration script – Case 1

- ! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24.

These instructions are for all the Case 1 modes (positive and negative stimuli only). For Case 2 modes (positive, negative and neutral stimuli) please use the administration script given later in this chapter.

With the AGN start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable.

Now explain the first part of this test, saying:

In this test, a series of words will appear very quickly on the screen.

Half of these words are positive, or happy, words and half are negative, or sad, words.

Press **SPACE** to start the test. Look at the screen, which will say **Next block** and then, below, the valence of the target words and the distractor words. These valences will depend on the mode chosen for the test.

Say the following:

All you have to do is press the button as fast as you can as soon as you see a (target valence) word. **Remember to respond as fast as you can, whilst trying not to make any mistakes.**

Press **SPACE** to start the first block.

At the end of the block, the screen will again say **Next block** and then, below, the valence of the target words and the distractor words. Say:

Well done. Now we're going to do the same thing again. Press the button as fast as you can as soon as you see a (target valence) word. **Remember to respond as fast as you can, whilst trying not to make any mistakes.**

Press **SPACE** to start the second block.

At the end of the block, when **Next block** is displayed, check the screen carefully. **The target valence will now be different.** Say:

This time, I'd like you to do something a bit different. Now press the button as fast as you can each time you see a (new target valence) word. **Remember to respond as fast as you can, whilst trying not to make any mistakes.**

AGN

Continue running the test, advising the subject of the target valence before you start each block, and **reminding the subject to respond as fast as they can, whilst trying not to make any mistakes**. There are 10 blocks in total in the test.

AGN administration script – Case 2

! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24.

These instructions are for the Case 2 modes (positive, negative and neutral stimuli). For Case 1 modes (positive and negative stimuli only) please use the administration script given earlier in this chapter.

With the AGN start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable.

Now explain the first part of this test, saying:

In this test, a series of words will appear very quickly on the screen.

A third of these words are positive, or happy words.

A third of these words are negative, or sad words.

A third of these words are neutral words, which are neither happy nor sad.

However, each block of words will consist of only 2 types of words.

Press **SPACE** to start the test. Look at the screen, which will say **Next block** and then, below, the valence of the target words (positive) and the distractor words (negative).

Say the following:

All you have to do is press the button as fast as you can as soon as you see a positive word. **Remember to respond as fast as you can, whilst trying not to make any mistakes.**

Press **SPACE** to start the first block.

At the end of the block, when **Next block** is displayed, check the screen carefully. **The target valence will now be negative, and the distractors positive.** Say:

Well done.
This time, I'd like you to do something a bit different. Now press the button as fast as you can each time you see a negative word. **Remember to respond as fast as you can, whilst trying not to make any mistakes.**

Press **SPACE** to start the second block.

At the end of the block, the screen will again say **Next block** and then, below, the valence of the target words (positive) and the distractor words (neutral). Say:

Now we're going to do the same thing again. Press the button as fast as you can as soon as you see a (target valence) word. **Remember to respond as fast as you can, whilst trying not to make any mistakes.**

Continue running the test, advising the subject of the target valence before you start each block, and **reminding the subject to respond as fast as they can, whilst trying not to make any mistakes.** There are 20 blocks in total in the test.

Chapter 5

Big/Little Circle (BLC)

Big/Little Circle (BLC) is primarily a training/screening test to prepare the subject for the Intra-Extra Dimensional Set Shifting (IED) test, and so should usually be given before the IED test.

BLC description

BLC is a simple test of attention. This visual discrimination test is designed to train a subject to:

- follow a simple rule
- reverse a rule

Display

The subject is presented with a series of pairs of circles, one large and one small.

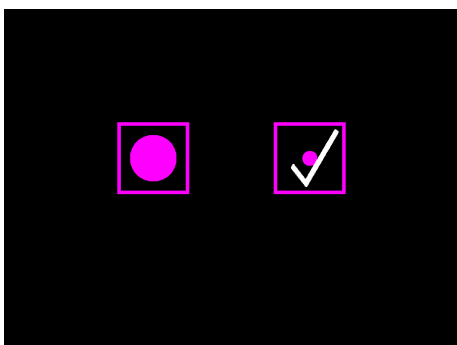


Figure 5-1 The BLC test screen

BLC

Task

The subject is instructed first to touch the small circle and then, after 20 trials, to touch the larger circle for a further 20 trials.

BLC test modes

Big/Little Circle has one test mode:

- clinical

BLC administration script

! Always administer this test before the IED test.

With the BLC start screen displayed, say:

Now you are going to see two squares, each with a circle in it. I would like you to touch the little circle.

Press **SPACE** to display the first pair of circles.

Then say:

Touch the little circle.

If necessary, you may prompt up to a maximum of three times (unless the subject stops responding altogether) with:

Keep touching the little circle.

If the subject is getting it wrong, say:

You are touching the wrong one.

If the subject keeps their finger on the screen, say:

Take your finger away so the next two circles can appear on the screen.

After 20 pairs of circles the computer will stop and display **Please wait**.

BLC

At this point say:

This time you will again see two circles,
but now I would like you to touch the
big circle.

Press **SPACE** to display the next pair of
circles.

Then instruct the subject with:

Keep touching the big circle.

After 20 more pairs of circles the test
ends.

BLC

BLC

Chapter 6

Cambridge Gambling Task (CGT)

CGT description

The Cambridge Gambling Task has been developed to assess decision-making and risk-taking behaviour outside a learning context. Relevant information is presented to the subjects ‘up-front’ and there is no need to learn or retrieve information over consecutive trials.

Display

On each trial, the subject is presented with a row of ten boxes across the top of the screen, some of which are red and some of which are blue. At the bottom of the screen are rectangles containing the words ‘Red’ and ‘Blue’. The subject must guess whether a yellow token is hidden in a red box or a blue box.

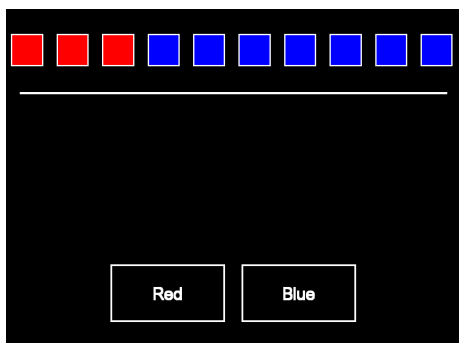


Figure 6-1 The CGT task screen for the decision stage

In the gambling stages, subjects start with a number of points which are displayed on the screen. Subjects can select a proportion of these points (5%, 25%, 50%, 75% or 95%), displayed in either rising or falling order, to gamble on their confidence in the

location of the yellow token. A stake box on the screen displays the current amount of the bet.

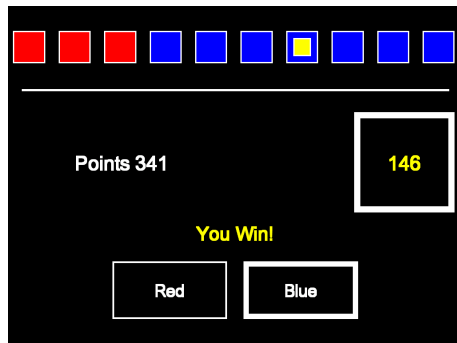


Figure 6-2 The CGT task screen for a gambling trial. The subject has just won 146 points after a lucky bet on blue, and now has 341 points..

Task

The task is made up of five stages, with instruction given at the start of each stage.

The first stage is a decision stage only, where the subject must choose whether a token is hidden in a red or blue box by touching the appropriate box at the bottom of the screen.

The second stage is a training stage for gambling, with either ascending or descending stakes (depending on the test mode selected), where the subject must first choose whether a token is hidden in a red or blue box by touching the appropriate box at the bottom of the screen, and then select the amount they wish to bet (the stake) by touching the stake box on the screen at the appropriate time as the bets are displayed in either ascending or descending order. If the screen is not touched to choose a stake, the final value displayed in the stake box will be used.

The third stage is a test stage for gambling, where the subject's performance will be assessed.

The fourth stage is a further training stage for gambling, this time with the stakes moving in the opposite direction to the second and third stages.

The fifth stage is a further test stage for gambling, with the stakes moving in the same direction as the fourth stage. The subject's performance will be assessed.

CGT test modes

The CGT test has two modes:

- ascending first (decision only stage, ascending training and test stages then descending training and test stages)
- descending first (decision only stage, descending training and test stages then ascending training and test stages)


In the ascending first mode, the value of the stakes displayed in the stake box rises in stages 2 and 3 and falls in stages 4 and 5.

In the descending first mode, the value of the stakes displayed in the stake box falls in stages 2 and 3 and rises in stages 4 and 5.

- ! If you have a group of subjects to whom you wish to administer this test, you should counterbalance ascending first and descending first modes within the group. If you are administering this test as part of a battery, this will require setting up two near-identical batteries, and administering the appropriate battery to each subject.**

CGT administration script (ascending first)

Decision only stage

With the CGT start screen displayed, press  to begin the test.

Demonstrate the test to the subject first as follows:

You can see a row of boxes across the top of the screen. At the moment there are X red boxes and Y blue boxes. The computer has hidden a yellow token under one of these boxes. All you have to do is decide whether you think it is hidden under a red or blue box and touch the 'Red' or 'Blue' square at the bottom of the screen. This time I think it is in a BLUE box, so I will touch the 'Blue' square.

Touch the 'Blue' square and get feedback for correct decision (**You Win!** displayed on the screen, and a rising tone from the speakers.)

Some of the boxes along the top of the screen change colour, ready for the next trial.

Say to the subject:

Now you try.

At the end of the stage (four trials in total), the screen displays **Please wait**.

A small triangle is displayed at the bottom right hand corner of the screen, pointing upwards, to indicate that the next stage is an ascending stage.

Ascending training and test

Press **SPACE** to start the next stage, and demonstrate the gambling test to the subject, saying:

We are now going to give you 100 points to start with. After you choose red or blue, you have to bet a certain amount of points that you will win.

So first of all, I'll decide that it is in the RED box.

Touch the 'Red' square.

Point to the stake box.

Now you get offered bets in this square.

The bets in the stake box are increased at 5 second intervals, with a short musical tone played as the amount is changed.

The first bet you are shown is small, but as you wait, the bets get larger, so you can choose the size of your bet.

Touch the stake box.

To make your bet, just touch it like this. If you win, your bet gets added to your score, and if you lose, it gets taken away. That time I won <xxx> points, so now I have a total of <xxx>. The idea is to build up as many points as you can. Try not to let your score get as low as one point, because then you will lose the game.

When the screen displays the start of the next trial, with a row of red and blue boxes along the top of the screen and the 'Red' and 'Blue' squares at the bottom, say to the subject:

Now you try. You get three turns to practise.

At the end of the training stage, the screen displays **Please wait** with an upwards-pointing triangle in the bottom right hand corner.

Prepare the subject for the test stage by saying:

Now we're going to do some more problems like that. Try to make as much as you can.

Press **SPACE** to start the test stage.

This consists of four blocks, each of nine trials. At the end of each block, the screen displays the final score.

The points score is reset to 100 points at the start of each block.

Press **SPACE** to start the next block.

At the end of the fourth block, after the final score is displayed and you press **SPACE**, the screen displays **Please wait**, with a **downwards** pointing triangle in the bottom right hand corner, to alert you that the next stage will be the descending training stage.

At the **Final score** screen in between the blocks, you can use the following prompts, depending on how well the subject is increasing their points score:

Well done!
That was good.
Now you're going to start off with 100 points again and you need to try to build up as many points as you can again.

If a subject's score goes too low, the block will end early. You can use the following prompt:

Hard luck!

Descending training and test

When the screen displays **Please wait** with a downwards pointing triangle in the bottom right hand corner of the screen, press **SPACE** to start the descending training stage, and say:

This time, the way you select your bets is slightly different, so that the first bet you are offered will be **large**, and they will then get gradually smaller. Just have a go to practise.

At the end of the training stage (4 trials), the screen displays **Please wait** with a downwards pointing triangle in the bottom right hand corner of the screen.

Prepare the subject for the test stage by saying:

Now we're going to do some more problems like that. Try to make as much as you can.

Press **SPACE** to start the test stage.

This consists of four blocks, each of nine trials. At the end of each block, the screen displays the final score.

The points score is reset to 100 points at the start of each block.

At the end of the fourth block, the test ends.

CGT administration script (descending first)

Decision only stage

With the CGT start screen displayed, press **[SPACE]** to begin the test.

Demonstrate the test to the subject first as follows:

You can see a row of boxes across the top of the screen. At the moment there are X red boxes and Y blue boxes. The computer has hidden a yellow token under one of these boxes. All you have to do is decide whether you think it is hidden under a red or blue box and touch the 'Red' or 'Blue' square at the bottom of the screen. This time I think it is in a BLUE box so I will touch the 'Blue' square.

Touch the 'Blue' square and get feedback for correct decision ('You Win!' displayed on the screen, and a rising tone from the speakers.)

Some of the boxes along the top of the screen change colour, ready for the next trial.

Say to the subject:

Now you try.

At the end of the stage (four trials in total), the screen displays **Please wait**.

A small triangle is displayed at the bottom right hand corner of the screen, pointing downwards, to indicate that the next stage is a descending stage.

Descending training and test

Press **SPACE** to start the next stage, and demonstrate the gambling test to the subject, saying:

Okay, now we are going to give you 100 points to start with. After you choose red or blue, you have to bet a certain amount of points that you will win.

So first of all, I'll decide that it is in the BLUE box.

Touch the 'Blue' square.

Point to the stake box.

Now you get offered bets in this square.

The bets in the stake box are decreased at 5 second intervals, with a short musical tone played as the amount is changed.

The first bet you are shown is large, but as you wait, the bets get smaller, so you can choose the size of your bet.

Touch the stake box.

To make your bet, just touch it like this. If you win, your bet gets added to your score, and if you lose, it gets taken away. That time I won <xxx> points, so now I have a total of <xxx>. The idea is to build up as many points as you can. Try not to let your score get as low as one point, because then you will lose the game.

When the screen displays the start of the next trial, with a row of red and blue boxes along the top of the screen and the 'Red' and 'Blue' squares at the bottom, say to the subject:

Now you try. You get three turns to practise.

At the end of the training stage, the screen displays **Please wait** with a downwards-pointing triangle in the bottom right hand corner.

Prepare the subject for the test stage by saying:

Now we're going to do some more problems like that. Try to make as much as you can.

Press **SPACE** to start the test stage.

This consists of four blocks, each of nine trials. At the end of each block, the screen displays the final score.

The points score is reset to 100 points at the start of each block.

Press **SPACE** to start the next block.

At the end of the fourth block, after the final score is displayed and you press **SPACE**, the screen displays **Please wait**, with an **upwards** pointing triangle in the bottom right hand corner, to alert you that the next stage will be the ascending training stage.

At the **Final score** screen in between the blocks, you can use the following prompts, depending on how well the subject is increasing their points score:

Well done!
That was good.
Now you're going to start off with 100 points again and you need to try to build up as many points as you can again.

If a subject's score goes too low, the block will end early. You can use the following prompt:

Hard luck!

Ascending training and test

When the screen displays **Please wait** with an upwards pointing triangle in the bottom right hand corner of the screen, press **SPACE** to start the ascending training stage, and say:

OK, this time the way you select your bets is slightly different, so that the first bet you are offered will be **small**, and they will then get gradually larger. Just have a go to practise.

At the end of the training stage (4 trials), the screen displays **Please wait** with an upwards pointing triangle in the bottom right hand corner of the screen.

Prepare the subject for the test stage by saying:

Now we're going to do some more problems like that. Try to make as much as you can.

Press **SPACE** to start the test stage.

This consists of four blocks, each of nine trials. At the end of each block, the screen displays the final score.

The points score is reset to 100 points at the start of each block.

At the end of the fourth block, the test ends.

Chapter 7

Choice Reaction Time (CRT)

CRT description

CRT is a 2-choice reaction time test which is similar to the Simple Reaction Time test except that stimulus and response uncertainty are introduced by having two possible stimuli and two possible responses.

Display

An arrow-shaped stimulus is displayed on either the left or the right side of the screen.

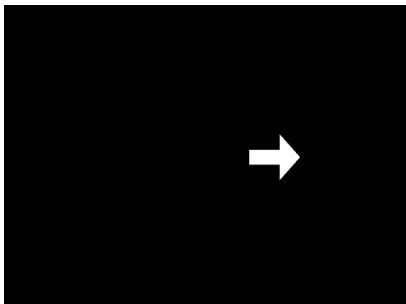


Figure 7-1 The CRT task screen

Task

The subject must press the left hand button on the press pad if the stimulus is displayed on the left hand side of the screen, and the right hand button on the press pad if the stimulus is displayed on the right hand side of the screen.

There is a practice stage (block 1) of 24 trials and two assessment stages (block 2 and block 3), each of 50 trials.

CRT test modes

The CRT test has one mode:

- Clinical

! This test uses a 2-button press pad. If no press pad is available, and you wish to evaluate the test, you can use the **F7** and **F8** keys on your computer keyboard. Always test subjects using a press pad.

CRT administration script

! The press-pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of each hand resting gently on each button. Please refer to Figure 2-2 on page 25.

Stage 1 (practice stage)

With the CRT start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable, using the index finger of the left hand to press the left button and the index finger of the right hand to press the right button. Their fingers should be resting lightly over the buttons on the press pad but not pressing down.

Now explain the first part of this test:

An arrow will appear on the screen pointing either to the left or to the right. When you see the arrow pointing to the left, press the **left** button on the press pad.

When you see the arrow pointing to the right, press the **right** button on the press pad.

Press the buttons as quickly as you can whilst trying to avoid making mistakes.

Press **SPACE** to start the first stage of the test.

Every time the subject presses the correct button the computer will beep and display **GOOD**. If the subject makes an error the computer will give a lower pitched beep and display one of the messages below.

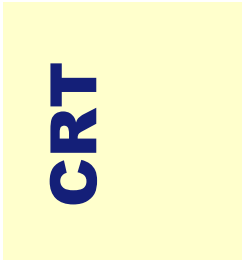
- If the subject presses the button **TOO SOON**, prompt with:
- If the subject presses the button **TOO LATE**, prompt with:
- If the subject does not press the correct button (**WRONG**), prompt with:

Try not to press the button until after you see the arrow.

Try and press the button a little quicker.

Try and press the correct button.

After 24 trials the computer will pause and display **Please wait**.



Stage 2 – (first assessment phase)

Explain this part of the test:

Now you will see the arrow again. Press the buttons on the press pad, as you did before.

Press **SPACE** to begin stage 2.

If the subject makes errors, you can use the prompts from Stage 1 (above) to help them.

At the end of this stage (50 trials) the computer will display **Please wait**. This is to allow the subject a brief rest between the two assessed stages. This rest should be no longer than 30 seconds.

Stage 3 – (second assessment phase)

Explain this part of the test:

Now you will see the arrow again. Press the buttons on the press pad, as you did before. This is the last part of the test.

Press **SPACE** to begin stage 3.

This stage has 50 trials, after which the test ends.

Chapter 8

Delayed Matching to Sample (DMS)

DMS is a test of simultaneous and delayed matching to sample. This test is primarily sensitive to damage in the medial temporal lobe area, with some input from the frontal lobes.

DMS description

Display

The subject is shown a complex visual pattern (the sample) and then, after a brief delay, four patterns. Each pattern is made up of four sub-elements, each of a different colour. One of the choice patterns is identical to the sample, one is a novel distractor pattern, one has the shape of the sample and the colours of the distractor, and the fourth has the colours of the sample and the shape of the distractor. To discourage strategies based on encoding single quadrants, all four choice patterns have one quadrant in common with the sample.

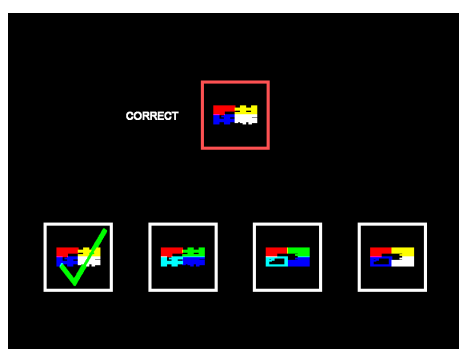


Figure 8-1 The DMS test screen

DMS

Task

The subject is instructed to touch the pattern that matches the sample. In some trials the sample and the choice patterns are shown simultaneously, whereas in others a delay (of 0, 4, or 12 seconds) is introduced between covering the sample pattern and showing the choice patterns. If the first choice is incorrect, the subject must make a second choice, and so on, until a correct choice is made.

DMS test modes

The DMS test has the following modes:

- clinical
- parallel 1
- parallel 2
- parallel 3
- parallel 4
- child

Clinical mode

After 3 practice trials, there are 20 counterbalanced test trials, including 5 simultaneous and 5 at each of the 3 delay intervals. After a pause to allow the subject to rest (if necessary) there are 20 more counterbalanced test trials, making a total of 40 trials for clinical mode.

Parallel mode

For each of the parallel modes (parallel 1, parallel 2, parallel 3 and parallel 4) there are 3 practice trials, and then 20 counterbalanced test trials, including 5 simultaneous and 5 at each of the 3 delay intervals.

Child mode


After 3 practice trials, there are 20 counterbalanced test trials, including 5 simultaneous and 5 at each of the 3 delay intervals.

DMS administration script

There are three practice examples before the test begins.

The same script is used for the practice trials, then the appropriate script for the clinical, parallel, or child mode should be used.

Example 1 – simultaneous matching

With the DMS start screen displayed, press  to begin the test, and say:

In front of you is a red box that has opened up to show a pattern. Below the red box are four boxes, each with its own pattern. Touch the box that has a pattern which is exactly the same as the one in the red box.

If the subject makes an error, say:

Try another one; look carefully to see if they are the same.

Repeat if further errors are made. Prompt as necessary with any of the following:

Touch the one that matches.
Try again.

Example 2 – zero second delay

For the second example, the procedure will change to delayed matching to sample with zero delay.

Focus the subject's attention on the screen and whilst pointing to the pattern in the red box say quickly:

This time you have to **remember** the pattern in the red box. It will be covered over before the patterns appear in the boxes below.

Now you can see the four patterns. Touch the one which is exactly the same as the one you saw in the red box.

If the subject makes an error, say:

Try another one.

Subjects can be prompted with any of the following instructions:

Now touch the one you saw before.
Try again.

Example 3 – delayed matching

For the third example there is a 12-second delay between sample and choice patterns. Again, get the attention of the subject and focus it on the pattern in the red box by pointing to it.

Then say:

Again, you have to **remember** the pattern in the red box because it will be covered over and there will be a longer wait before the patterns in the white boxes appear.

After the third example, the words **Please wait** are displayed.

! The clinical, parallel, and child modes differ for this test. Please only follow the appropriate instructions below.

Clinical mode

Say:

Now there will be some more patterns to match. Sometimes the pattern will stay on the screen and other times it will be covered up, so always try to remember it.

Press **SPACE** to begin the fourth trial.

After 20 counterbalanced trials the prompt **Please wait** is displayed, allowing the subject a brief rest.

Press **SPACE** to continue to the second part when the subject is ready (usually straight away). There are 40 counterbalanced trials in total, after which the test ends.

Parallel mode

Say:

Now there will be some more patterns to match. Sometimes the pattern will stay on the screen and other times it will be covered up, so always try to remember it.

Press **SPACE** to begin the fourth trial.

There are 20 counterbalanced trials in total, after which the test ends.

DMS

Child mode

Say:

Now there will be some more patterns to match. Sometimes the pattern will stay on the screen and other times it will be covered up, so always try to remember it.

Press  to begin the fourth trial.

There are 20 counterbalanced trials in total, after which the test ends.

Chapter 9

Graded Naming Test (GNT)

GNT description

The Graded Naming Test, developed by Professor Elizabeth Warrington and Dr Pat McKenna, has been used extensively in cognitive neuropsychology. The test consists of a number of black and white line drawings, ordered with increasing difficulty. This test assesses object-naming ability, but is in addition graded in difficulty to allow for individual differences. This means that it may be able to detect any word-finding difficulty even in those with an extensive naming vocabulary.

Display

Thirty different line drawings are displayed on the screen.

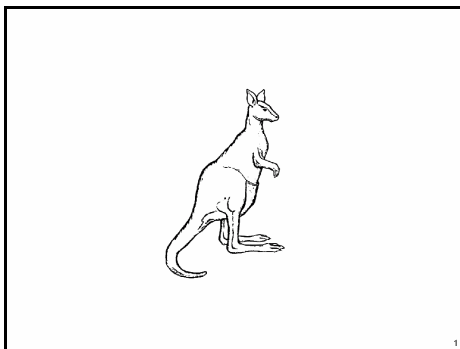


Figure 9-1 The GNT task screen showing the first drawing (a kangaroo)

Task

The subject must identify the object depicted in the drawing. The test administrator then records each response as correct or incorrect.

GNT test modes

There is only one test mode for GNT – clinical.

GNT object names

- ! Make sure you are familiar with all the objects in the GNT before administering it to a subject, as you are responsible for scoring the subject's performance in this test.**

The correct names for the objects depicted in the GNT are given below. The numbers are shown beneath each drawing on the screen.

Number	Object name	Number	Object name
1	Kangaroo	16	Turtle
2	Scarecrow	17	Trampoline
3	Buoy	18	Bellows
4	Thimble	19	Shuttlecock
5	Handcuffs	20	Anteater or Tapir
6	Tweezers	21	Pagoda
7	Corkscrew	22	Radius
8	Sporran	23	Leotard
9	Tassel	24	Mitre
10	Sundial	25	Yashmak
11	Chopsticks	26	Sextant
12	Periscope	27	Centaur
13	Boar	28	Cowl
14	Blinkers	29	Tutu
15	Monocle	30	Retort

GNT administration script

- ! Make sure you are familiar with all the objects in the GNT before administering it to a subject.
- ! You need to use the keyboard (or the two buttons on the press pad, if you are running CANTABeclipse without a keyboard) throughout this test to record the subject's responses. Keep the keyboard (or press pad) out of the subject's direct line of sight as it is important that they should not be distracted by seeing you recording their responses. See Figure 2-2 on page 25 for information on the press pad buttons.

With the GNT start screen displayed, give the subject the following instructions:

I'm going to show you a series of line drawings and I'd just like you to tell me what each drawing represents. There is no time limit on your response.

Press **SPACE** to begin the test.

There are 30 drawings of objects for the subject to identify.

Sometimes there is a need to question responses.

Subjects occasionally misperceive an item altogether, perhaps identifying the shuttlecock as 'flowers', or give a generic response (for example, the pagoda might be called a 'building').

Attention may also be drawn to the salient feature of the stimulus by pointing (for example blinkers might be called a 'horse' and radius might be called a 'circle').



If this should happen, the subject should be prompted with a suitable one of the following:

No, it's something else altogether.

What is another name for it?

Can you think of something else it could be?

You need to name this part.

To record a correct response and display the next drawing, press  (the **right** arrow key). To record an incorrect response and display the next drawing, press  (the **left** arrow key).

If you are using the press pad to record responses, press the **right** button on the press pad to record a correct response and the **left** button on the press pad to record an incorrect response. See Figure 2-2 on page 25.

For further information on orienting your press pad correctly, please refer to www.cantabeclipse.com/presspads.

There are 30 line drawings in total, after which the test ends.

Chapter 10

Intra/Extradimensional Set Shift (IED)

IED description

Intra/Extradimensional Set Shift is a test of rule acquisition and reversal. It features:

- visual discrimination and attentional set formation
- maintenance, shifting and flexibility of attention

This test is primarily sensitive to changes to the fronto-striatal areas of the brain.

! Big/Little Circle (BLC) should always be administered before this test.

Display

Two artificial dimensions are used in the test:

- colour-filled shapes
- white lines

Simple stimuli are made up of just one of these dimensions, whereas compound stimuli are made up of both, namely white lines overlying colour-filled shapes.

Subjects progress through the test by satisfying a set criterion of learning at each stage (6 consecutive correct responses). If at any stage the subject fails to reach this criterion after 50 trials, the test terminates.



IED

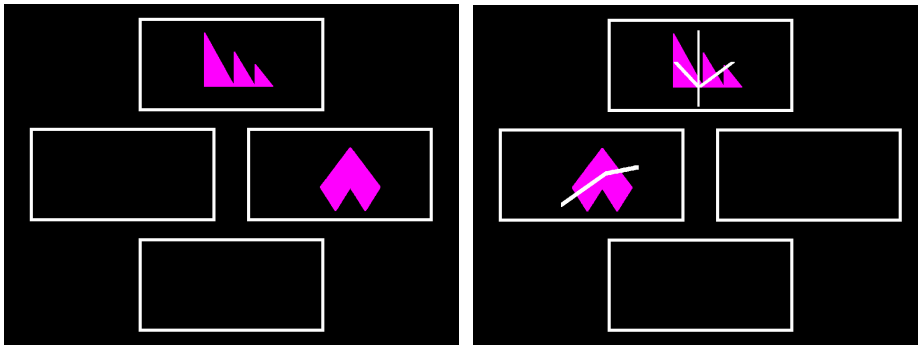


Figure 10-1 The IED test screen for block 1 (left) and block 4(right)

Task

The test starts with Block 1, the presentation of two simple, colour-filled shapes. The subject must learn which of the stimuli is correct by touching it, and continue until the criterion is reached. In Block 2, the contingencies are reversed, so that now the previously incorrect stimulus is correct.

In Block 3, the second dimension is then introduced, initially lying adjacent to, and then, for Block 4, overlapping, the first dimension. The contingencies do not change, remaining the same as at the end of the simple discrimination. Once the criterion has been reached with the overlapping compound stimulus in Block 4, the contingencies are reversed for Block 5, within the original dimension. It is important to note that the second dimension is entirely redundant to the solution of the problem at this stage.

Once the subject has learned the compound discrimination, new compound stimuli are presented (Block 6), still varying along the same 2 dimensions (of shape and of line). Subjects are required to continue to attend to the previously relevant dimension of shape and learn which of the two new exemplars is correct (the ‘intradimensional shift’).

Once the subject has completed a successful intradimensional shift, followed by a reversal (Block 7), again the compound stimuli are changed. For this stage (Block 8), subjects are required to shift attention to the previously irrelevant dimension and learn which of the two exemplars in this dimension is now correct (the ‘extradimensional shift’). In Block 9 the contingencies are again reversed.

! Always run BLC before this test.

IED test modes

The IED test has the following modes:

- clinical
- parallel 1
- parallel 2
- parallel 3
- parallel 4
- parallel 5
- parallel 6
- parallel 7

The differences between these modes are solely in the stimuli used, which are different shapes and lines. One administration script (given below) applies to all the setups.



IED

IED administration script

With the IED start screen displayed, press **SPACE** to begin the test, and say:

Do NOT mention “pink shapes” or “white lines”, as this may alert the subject to the distinction and therefore help in performing the task.

Now you can see two patterns. One of the patterns is correct and the other is wrong. What you have to do is to touch the one you think is correct. There is a rule that you can learn and follow to make sure you get it correct each time. The computer will be keeping track of how well you are doing and when it is clear that you know the rule, the computer will change it, but remember, **this will not happen very often.**

When the rule is changed you will have to think of a different rule in order to go on doing well. To begin with, there is nothing on the screen to tell you which of the two patterns is correct, so your first choice will be a simple guess. However, the computer will give a message after each attempt to tell you whether you are right or wrong. You can start now.

If they hesitate, prompt with:

Just guess this first time.
Choose now.

If they get it *correct*, say:

Good, now keep on trying to get it correct.

If they get it *wrong*, say:

Bad luck, now try to get it correct.

When the subject makes their first mistake *at a rule change* say:

Now remember, the rule will change at some point.

As long as it is clear that the subject has understood the instructions, no further instructions or help should be given. Where necessary, neutral prompts such as “well done” or “you are doing fine” may be used.

Under no circumstances should any mention be made of ‘pink shapes’ or ‘white lines’, as this may alert the subject to the distinction and therefore help in performing the task.

The test ends either at the end of the ninth block or earlier if the subject has not reached the criterion.

IED

Chapter 11

Information Sampling Task (IST)

IST description

IST is a task designed to measure pre-decisional processing, where the subject gathers and evaluates information prior to making a decision. Inadequate reflection means that decisions will be made on the basis of less evidence, and, therefore will reduce the accuracy of the eventual decision.

Display

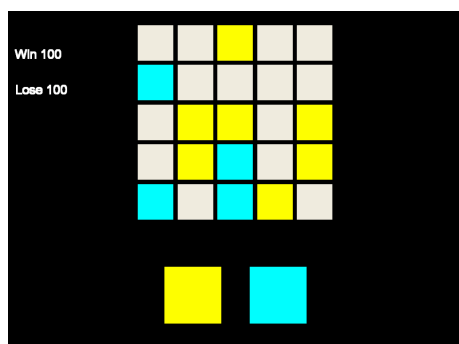


Figure 11-1 The IST task screen (training stage). The subject has touched 11 boxes already.

The subject is presented with a 5x5 array of grey boxes on the screen, and two larger coloured panels below these boxes. The subject is instructed that they are playing a game for points, which they can win by making a correct decision about which colour is in the majority under the grey boxes. They must touch the grey boxes one at a time, which open up to reveal one of the two colours shown at the bottom of the screen. Once a box has been touched, it remains open. When the subject has made their decision about which colour is in the majority, they must touch the panel of that

colour at the bottom of the screen to indicate their choice. After the subject has indicated their choice, all the remaining grey boxes on the screen reveal their colours and a message is displayed to inform the subject whether or not they were correct. The colours change from trial to trial.

The boxes always open up in the same order – for example, if the order of opening in the first trial is blue, yellow, yellow, yellow, blue, blue, yellow, yellow, then the first five boxes that the subject touches will reveal colours in that order, regardless of the spatial location of the boxes the subject touches.

There are two conditions – the fixed win condition, in which the subject is awarded 100 points for a correct decision regardless of the number of boxes opened, and the decreasing win condition, in which the number of points that can be won for a correct decision starts at 250 and decreases by 10 points for every box touched. In either condition an incorrect decision costs 100 points.

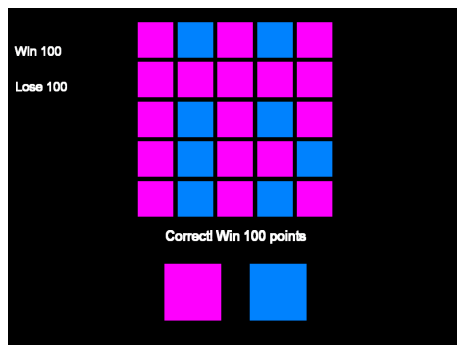


Figure 11-2 The IST test screen (in the fixed win condition) showing that the subject has chosen correctly

Task

The task begins with a single practice trial in the fixed-win condition, followed by 10 assessed trials in either the fixed-win condition or the decreasing-win condition (depending on the mode selected), then 10 further assessed trials in either the decreasing-win or the fixed-win condition.


IST test modes

The IST test has 2 modes:

- ❑ Fixed win-decreasing win, (one fixed-win practice trial, then 10 fixed-win assessed trials and 10 decreasing-win assessed trials)
 - ❑ Decreasing win-fixed win (one fixed win practice trial, then 10 decreasing-win assessed trials and 10 fixed-win assessed trials)
- !** If you have a group of subjects to whom you wish to administer this test, you should counterbalance both modes within this group. If you are administering this test as part of a battery, this will require setting up two near-identical batteries, and administering the appropriate battery to each subject.

IST administration script (fixed win-decreasing win)

Fixed-win practice stage

With the IST start screen displayed, press  to begin the test.

Explain the test to the subject as follows, indicating the appropriate areas of the screen.

You are about to play a game in which you can win points. The game will take about 10 minutes to complete. It consists of a short practice part and then two main parts. On each main part there will be 10 turns. On every turn, you will be able to see 25 boxes on the screen.

IST

Indicate the grey boxes and the coloured panels.

To start with, all the boxes will be grey, like they are at the moment. When you touch a box, it opens and shows one of two colours. You have to decide whether there are more blue boxes, or more yellow boxes, and then touch the panel of that colour at the bottom of the screen.

If you make a correct decision, you win 100 points, and if you make a wrong decision you lose 100 points.

You will start with 100 points. Try to win as many more points as you can.

Encourage the subject to touch a box.

Try touching one of the boxes now.

Ask the subject to touch another box.

And another box.

If the subject is hesitating, prompt with:

Touch some more boxes until you are ready to decide, and then touch one of the panels at the bottom of the screen.

The subject must touch at least one box in the 5 x 5 array before they can use the coloured panels at the bottom of the screen to indicate which colour they wish to choose.

When the subject has touched one of the panels at the bottom, of the screen, the message **Correct! Win 100 points** or **Wrong! Lose 100 points** is displayed.

At the end of the practice trial, the message **Well done, you have completed this part. Total points XXX** is displayed.

That was the practice part – well done.

Fixed win assessed stage

Say:

Now we'll try playing for some more points. It will be just the same as the practice part, and there will be different colours on every turn. Again, you will start with 100 points, and you have to decide whether there are more (colour 1) boxes or more (colour 2) boxes.

You will win 100 points if you choose the correct colour, regardless of how many boxes you open, and you can open as many boxes as you wish.

You will lose 100 points if you get it wrong.

Press **SPACE** to begin the next part of the test.

Try to win as many points as you can.

The subject has to touch at least one box in the 5 x 5 array before they can use the coloured panels at the bottom of the screen to indicate which colour they wish to choose.

When the subject has touched one of the panels at the bottom of the screen, the message **Correct! Win 100 points** or **Wrong! Lose 100 points** is displayed.

At the end of the trial, the 25 grey boxes reappear on the screen. If necessary, say:

Let's wait until all the boxes are back on screen before the next turn starts.

IST

If necessary, remind the subject to touch the boxes and choose the colour of which there are more boxes using the following (optional) prompts:

It is entirely up to you how many boxes you open before you decide. When you have decided, touch that colour panel at the bottom of the screen.

Try touching one of the boxes now.

And another box.

Touch some more boxes until you are ready to decide, then touch one of the panels at the bottom of the screen.

At the end of this block, the message **Well done, you have completed this part. Total points XXX** is displayed.

Well done, that's the end of that part.

Decreasing win assessed stage

Say:

Now we'll try playing for some more points. The way you win points this time is slightly different.

Again, you'll start with 100 points.

However, on each of these turns, the amount you can win starts at 250 points and will go down by 10 points with **every box you open**, so the earlier you make your decision, the more points you will win, if you get it right.

You will lose 100 points if you get it wrong, regardless of when you make your decision.


Press **SPACE** to begin the next part of the test, and say:

Try to win as many points as you can.

The subject has to touch at least one box in the 5 x 5 array before they can use the coloured panels at the bottom of the screen to indicate which colour they wish to choose.

When the subject has touched one of the panels at the bottom, of the screen, the message **Correct! Win XXX points** or **Wrong! Lose 100 points** is displayed. If necessary, say:

At the end of this block, the message **Well done, you have completed this part. Total points XXX** is displayed.


Press  to end the test.

Let's wait until all the boxes are back on screen before the next turn starts.

Well done, that's the end of the test.

IST administration script (decreasing-win fixed-win)

Fixed-win practice stage

With the IST start screen displayed, press  to begin the test.

Explain the test to the subject as follows, indicating the appropriate areas of the screen.

You are about to play a game in which you can win points. The game will take about 10 minutes to complete. It consists of a short practice part and then two main parts. On each main part there will be 10 turns. On every turn, you will be able to see 25 boxes on the screen.

IST

Indicate the grey boxes and the coloured panels.

To start with, all the boxes will be grey, like they are at the moment. When you touch a box, it opens and shows one of two colours. You have to decide whether there are more blue boxes, or more yellow boxes, and then touch the panel of that colour at the bottom of the screen.

If you make a correct decision, you win 100 points, and if you make a wrong decision you lose 100 points.

You will start with 100 points. Try to win as many more points as you can.

Encourage the subject to touch a box.

Try touching one of the boxes now.

Ask the subject to touch another box.

And another box.

If the subject is hesitating, prompt with:

Touch some more boxes until you are ready to decide, and then touch one of the panels at the bottom of the screen.

The subject must touch at least one box in the 5 x 5 array before they can use the coloured panels at the bottom of the screen to indicate which colour they wish to choose.

When the subject has touched one of the panels at the bottom, of the screen, the message **Correct! Win 100 points** or **Wrong! Lose 100 points** is displayed.

At the end of the practice trial, the message **Well done, you have completed this part. Total points XXX** is displayed.

That was the practice part – well done.

Decreasing win assessed stage

Say:

Now we'll try playing for some more points. The way you win points this time is slightly different.

Again, you'll start with 100 points.

However, on each of these turns, the amount you can win starts at 250 points and will go down by 10 points with **every box you open**, so the earlier you make your decision, the more points you will win, if you get it right.

You will lose 100 points if you get it wrong, regardless of when you make your decision.

Press **SPACE** to begin the next part of the test, and say:

Try to win as many points as you can.

The subject has to touch at least one box in the 5 x 5 array before they can use the coloured panels at the bottom of the screen to indicate which colour they wish to choose.

When the subject has touched one of the panels at the bottom, of the screen, the message **Correct! Win XXX points** or **Wrong! Lose 100 points** is displayed.

At the end of the trial, the 25 grey boxes reappear on the screen. If necessary, say:

Let's wait until all the boxes are back on screen before the next turn starts.

IST

If necessary, remind the subject to touch the boxes and choose the colour of which there are more boxes using the following (optional) prompts:

It is entirely up to you how many boxes you open before you decide. When you have decided, touch that colour panel at the bottom of the screen.

Try touching one of the boxes now.

And another box.

Touch some more boxes until you are ready to decide, then touch one of the panels at the bottom of the screen.

At the end of this block, the message **Well done, you have completed this part. Total points XXX** is displayed.

Well done, that's the end of that part.

Fixed win assessed stage

Say:

Now we'll try playing for some more points. It will be just the same as the practice part, and there will be different colours on every turn.

Again, you will start with 100 points, and you have to decide whether there are more (colour 1) boxes or more (colour 2) boxes.

You will win 100 points if you choose the correct colour, regardless of how many boxes you open, and you can open as many boxes as you wish.

You will lose 100 points if you get it wrong.

Press **SPACE** to begin the next part of the test, and say:

Try to win as many points as you can.

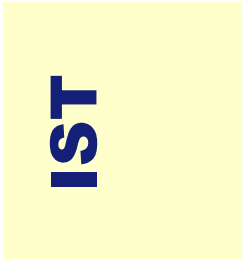
At the end of each trial, the grey boxes reappear on the screen and the subject's current points total is displayed below.

Let's wait until all the boxes are back on screen before the next turn starts.

At the end of this block, the message **Well done, you have completed this part. Total points XXX.** is displayed

Well done, that's the end of the test.

The test ends.



IST

Chapter 12

Match to Sample Visual Search (MTS)

MTS description

This is a matching test, with a speed/accuracy trade-off.

- ! This test uses a press pad. If no press pad is available, and you wish to evaluate the test, you can use the right (or secondary) mouse button. Always test subjects using a press pad.

Display

The sample stimulus is an abstract pattern, composed of four coloured elements. This is displayed within a red square, in the middle of the screen. After a brief delay, a varying number of similar patterns (1, 2, 4 or 8) is shown in a circle of boxes around the edge of the screen.

Only one of these patterns matches the pattern in the centre of the screen. The subject must indicate which it is by touching it.

MTS

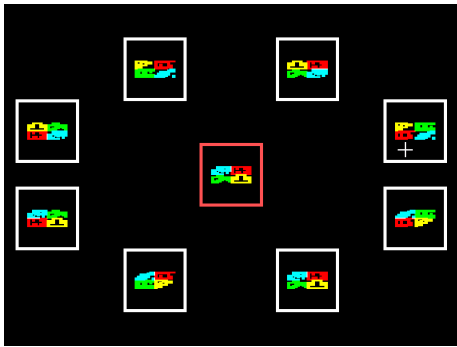


Figure 12-1 The MTS task screen

The incorrect patterns are composed of juggled elements of the sample pattern or juggled distractor elements.

Task

The subject must identify the matching pattern by touching it.

To obtain the sample pattern, the subject must hold down the button on the press pad. The subject must then keep their hand on the press pad before releasing it in order to point to the matching pattern when making the match.

- ! **The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24. In this test, the same hand is used to touch the press pad AND the screen.**

MTS test modes

There are five modes for the MTS test:

- clinical
- parallel 1

- parallel2
- parallel3
- parallel4

The parallel and clinical modes have different test administration scripts. Please follow the appropriate instructions.

Clinical mode

The clinical mode has four practice trials before the test begins:

- 1-pattern
- 2-patterns
- 4-pattern
- 8-patterns

These are not scored.

The test has 12 trials at each level of difficulty, which are presented in a randomised order.

Parallel mode

The parallel mode has three practice trials before the test begins:

- 2-patterns
- 4-patterns
- 8-patterns

These are not scored.

The test has six trials at each level of difficulty, which are presented in a randomised order.

Clinical MTS administration script

The test starts with four practice trials, with 1, 2, 4 and 8 patterns, before proceeding to the test proper, which has 12 trials at each of the four levels of difficulty, in a randomised order.

! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24.

With the MTS start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable.

Then press  and say:

Now I would like you to match patterns. I would like you to touch the pattern in the white boxes which exactly matches the one in the red open box in the middle. To get the patterns to appear you have to press down on the button and keep it held down. Then, when you see the pattern in the white box that matches, I'd like you to release the button and touch that box as quickly as you can, **with the same hand.**

Start the test for one pattern by asking the subject to press the button.

Sometimes there will be one pattern...

Set up the test for two patterns by asking the subject to press the pad.

...sometimes two patterns...

Set up the test for four patterns by asking the subject to press the button.

...sometimes four patterns and...

Set up the test for eight patterns by asking the subject to press the button.

...sometimes eight patterns to choose from.

The computer will now display **Please wait**.

Now say:

When the patterns appear you should choose as quickly as you can, but do not let go of the button until you have made a decision. Try not to make mistakes. There will always be a pattern that exactly matches the middle one. Now put your hand back on the button.

If the subject makes a mistake, say:

Please choose again.

Up to four errors can be made, after which the computer will display **Let's try another** and move on to the next trial. After an incorrect response, the subject should be prompted to try again until 4 responses have been made, or the correct pattern has been touched.

If the subject becomes confused, you may prompt with the following:

Touch the pattern in the white boxes which looks like the one in the middle as quickly as you can.

Choose as quickly as you can, but try to get it correct.

Hold the button down until the patterns appear.

Use the same hand to touch the button and the screen.

The test ends after the 52nd trial (there are 4 practice trials and 48 assessed trials).

Parallel MTS administration script

The test starts with three practice trials, one with two sample patterns, one with four sample patterns and one with eight sample patterns, before proceeding to the test proper, which has six trials at each of the three levels of difficulty, in a randomised order.

! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24.

With the MTS start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable.

Press  and say:

Now I would like you to match patterns. I would like you to touch the pattern in the white boxes which looks like the one in the red open box in the middle. To get the patterns to appear you have to press down on the button and keep it held down. Then, when you see the pattern in the white box that matches, I'd like you to release the button and touch that box as quickly as you can **with the same hand**.

Start the test for two patterns by asking the subject to press the button.

Sometimes there will be two patterns...

Set up the test for four patterns by asking the subject to press the button.

...sometimes four patterns and...

Set up the test for eight patterns by asking the subject to press the button.

...sometimes eight patterns to choose from.

The computer will now display **Please wait**.

MTS

Now say:

When the patterns appear you should choose as quickly as you can, but do not let go of the button until you have made a decision. Try not to make mistakes. There will always be a pattern that exactly matches the middle one. Now put your hand back on the button.

If the subject makes a mistake say:

Please choose again.

Up to four errors can be made after which the computer will display **Let's try another** and move on to the next trial. After an incorrect response, the subject should be prompted to try again until 4 responses have been made or the correct pattern has been touched.

If the subject becomes confused, you may prompt with the following:

Touch the pattern in the white boxes which looks like the one in the middle as quickly as you can.
 Choose as quickly as you can, but try to get it correct.
 Hold the button down until the patterns appear.
 Use the same hand to touch the button and the screen.

The test ends after the 21st trial (there are 3 practice trials and 18 assessed trials).

Chapter 13

One Touch Stockings of Cambridge (OTS)

OTS description

OTS is a spatial planning test variant based upon the CANTAB Stockings of Cambridge test.

This test gives a measure of frontal lobe function.

Display

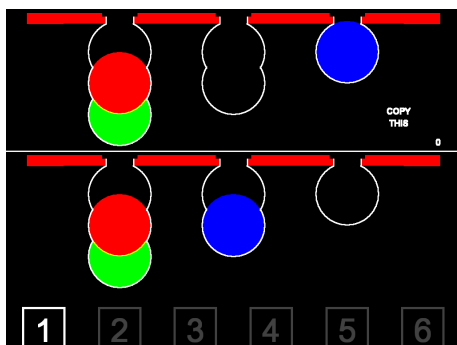


Figure 13-1 The OTS training screen showing a 1-move problem

The subject is shown two displays containing three coloured balls. The displays are presented in such a way that they can easily be perceived as stacks of coloured balls held in stockings or socks suspended from a beam. This arrangement makes the 3-D concepts involved apparent to the subject, and fits with the verbal instructions. There is a row of boxes containing numbers at the bottom of the screen, from one upwards.

Task

The test administrator first demonstrates to the subject how to use the balls in the lower display to copy the pattern shown in the upper display. The balls may be moved one at a time by touching the required ball, then touching the position to which it should be moved.

The subject is shown one demonstration problem, then must solve three further problems. These problems increase in complexity, from one move to four moves. If the subject makes too many moves in attempting to solve these problems, the computer presents the ideal solution to the subject.

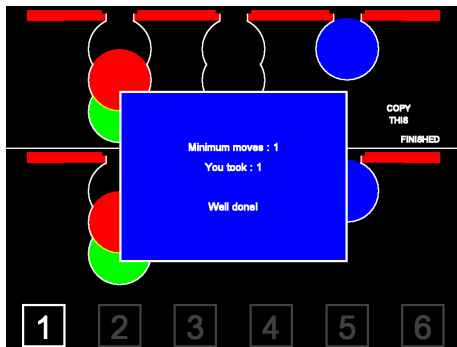


Figure 13-2 OTS training phase after solving the first example problem

Next the subject is shown more problems, and must work out how many moves the solutions require in their head, then touch the appropriate box at the bottom of the screen to indicate the number of moves required.

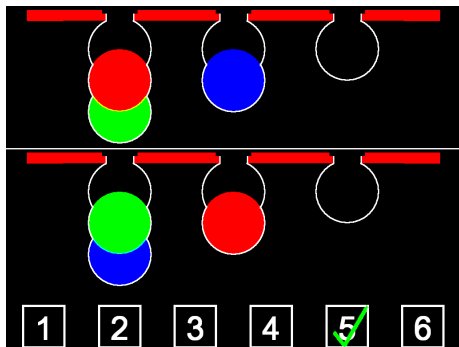


Figure 13-3 OTS assessed phase showing a 5-move problem

OTS test modes

The OTS test has four modes:

- 5-choice-legacy-20
- 6-choice-20
- 6-choice-legacy-24
- 7-choice-24

For each of these modes, the first number (5, 6 or 7) refers to the number of boxes along the bottom edge of the screen, and the second number (20 or 24) refers to the number of assessed problems that the subject must solve.

For the 6-choice-20 mode and the 7-choice-24 mode, the maximum number of moves required to solve the most difficult problems in these modes is **one fewer** than the number of boxes along the bottom edge of the screen. These modes are designed to prevent subjects from automatically assuming that if a problem looks difficult it must require the largest number of moves to solve it. The 7-choice-24 mode is designed to be challenging even for very able subjects.


The 5-choice-legacy-20 and the 6-choice-legacy-24 mode are included for historical reasons. In these modes, the maximum number of moves required to solve the most difficult problems is the same as the number of boxes along the bottom of the screen.

Unless you have previously tested subjects using these modes, we recommend that you should use the 6-choice-20 and 7-choice-24 modes only.

OTS administration script

Even if you are familiar with administering the SOC (Stockings of Cambridge) test to subjects, please read these instructions carefully, as this test differs significantly from SOC.

Problem 1 (example)

With the OTS start screen displayed, press  to begin the test, and say:

I am going to show you how this works. You can see that there are two arrangements...

Point to these two arrangements.

...of coloured balls, like snooker or pool balls, hanging in stockings (or pockets), one at the top of the screen and one at the bottom. The idea is to make this bottom arrangement look like the top one by moving the balls in the bottom arrangement.

Touch the ball you want to move.

Touch the blue ball. (Each time you touch a ball the computer beeps).

Now you can see that the ball is flashing and waiting to be moved somewhere. Now I will move it where it should go.

Touch the blue ball and move it into its correct position. The top and bottom patterns will look the same, and the computer will give a higher-pitched beep to indicate success. The word **FINISHED** will be displayed on the right of the screen.

Indicate the comparison with a gesture.

Press **SPACE**.

The computer will display a blue rectangle containing a message like the following:

Minimum moves: 1

You took: 1

Well done!

Press **SPACE** to display the next problem.

If you exceed the minimum number of moves required to solve the problem, the computer will give a lower-pitched beep and display the words **TOO MANY** on the right.

Press **SPACE** and the blue rectangle displays this message:

Minimum moves: 1

You took: *n*

Here's the perfect solution.

Watch carefully...

Press **SPACE** to display the solution to the problem.

After you press **SPACE** the solution is played back to you, with **WATCH THIS** displayed at the right of the screen, and each ball flashing three times and beeping before moving to its new location.

Once the solution has played back the word **FINISHED** is displayed at the right of the screen, then the next problem is displayed on the screen.

Now you can see that the top and the bottom patterns look the same.

This blue box tells me how well I did. The problem could be solved in one move and I did it in one move.

Problems 2, 3 and 4 (examples)

During the example problems, the following additional points should be made.

Demonstrate this on screen by touching the green ball, which will not flash.

Touch the red ball and show that it cannot be moved into the empty space above it, and leave it flashing.

Indicate the red flashing ball.

Touch the red ball again, to stop it flashing.

Indicate this.

Point to the highlighted box at the bottom of the screen (2 for problem 2, which has a 2-move solution, 3 for problem 3, which has a 3-move solution, and 4 for problem 4, which has a 4-move solution).

The subject can now attempt this problem. Give the following instructions:

There are some rules that you need to remember. You can't move a ball that is beneath another ball, like this green one. If you want to move it you have to move the ball on top first...

... and you can't move a ball into thin air like this red one.

Also, if I touch a ball...

...but change my mind about moving it, I can touch it again to switch it off.

Like a real ball they won't just hang in mid-air, but they will sit at the bottom of the stocking (or pocket).

The number here tells you how many moves to make.

Now look at the top pattern and decide what you have to move at the bottom to copy it. Don't start until you think you know which move to make. Touch the ball you want to move. Now touch where you want to move it to.

It is possible that a subject will make a mistake at this level, in which case they can make further moves in an attempt to arrange the balls appropriately. These moves are limited to a fixed number at each level of problem. The computer will display **TOO MANY** if this number is exceeded, or **FINISHED** if the test is completed within this number.

At the end of each example problem, the computer will either give a higher-pitched beep and display **FINISHED**, or give a lower-pitched beep and display **TOO MANY**.

Press **SPACE** to display a blue rectangle containing a message like the following:

Minimum moves: n

You took: n

Well done!

And then say:

Well done, the problem could be solved in n moves and you did it in n moves

Or, if the message below is displayed, say:

Minimum moves: n

You took: m

Here's the perfect solution.

Watch carefully...

Then press **SPACE** to display the perfect solution.

Or:

The problem could have been solved in n moves and you did it in m moves – let's have a look at the perfect solution.

After all the example problems have been completed (either correctly solved, and you have then pressed **SPACE**, or you have pressed **SPACE** after an incorrect solution to have the solution replayed), **Please wait** is displayed on the screen.

Problems 5 onwards (assessed)

While **Please wait** is displayed, instruct the subject with the following BEFORE starting problem 5:

Now you will see two arrangements of balls, just as in the last task.

Below these arrangements, you will also see a row of numbers.

What you have to do is **IMAGINE** that you have to rearrange the balls on the bottom half of the screen so that they look the same as the top half.

You must try to work out **IN YOUR HEAD** the minimum number of moves needed to do this.

Once you have decided how many moves are required, touch the box with that number in it at the bottom of the screen.

If you get the answer wrong, you have another chance to get it correct.

Press **SPACE** to start the first problem.
The computer gives a long beep, and then displays the balls on the screen.

If the subject touches the correct box at the bottom of the screen, a green tick (check mark) ✓ is displayed in the box touched. If the subject touches the wrong box, a red ✗ is displayed in the box.

If the subject gets the answer wrong, say (as many times as necessary, if they make more than one mistake):

Try again.

After the subject has touched the correct box, the green tick (check mark) ✓ is displayed in the box for 2 seconds before **Please wait** is displayed in the middle of the screen.

Press **SPACE** to start the next problem.

If the subject appears to be guessing, please reiterate that they should think about the solution carefully before touching the screen by using the following (optional) prompt:

Please take your time to think about it and don't touch a number until you have worked it out.

The number of these problems for the subject to solve depends on the test mode. The test ends after the last problem.

OTS

Chapter 14

Paired Associates Learning (PAL)

PAL description

The PAL test assesses visual memory and new learning.

This test is primarily sensitive to changes in medial temporal lobe functioning.

PAL test modes

The PAL test has six modes:

- clinical
- parallel 1
- parallel 2
- parallel 3
- parallel 4
- parallel 5

! There are parallel and clinical modes for this test. Ensure that you follow the correct administration script.

Clinical mode

Display

Boxes are displayed on the screen and are opened in a randomised order. One or more of them will contain a pattern.

PAL

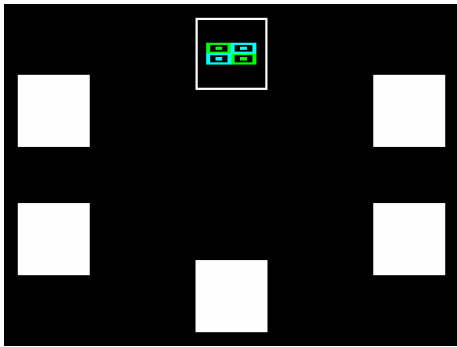


Figure 14-1 The PAL test screen showing a pattern in an open box

Task

The clinical mode of PAL has eight stages, which a subject must complete in order:

- Stage 1 1 pattern 6 boxes
- Stage 2 1 pattern 6 boxes
- Stage 3 2 patterns 6 boxes
- Stage 4 2 patterns 6 boxes
- Stage 5 3 patterns 6 boxes
- Stage 6 3 patterns 6 boxes
- Stage 7 6 patterns 6 boxes
- Stage 8 8 patterns 8 boxes

For each stage, boxes are displayed on the screen. All are opened in a randomised order. One or more of them will contain a pattern. The patterns shown in the boxes are then displayed in the middle of the screen, one at a time, and the subject must touch the box where the pattern was originally located.

Each stage may have up to 10 trials in total (the first presentation of all the shapes, then up to 9 repeat presentations). If the subject makes an error, the patterns are re-presented to remind the subject of their locations. When the subject gets all the

locations correct, they proceed to the next stage. If the subject cannot complete a stage correctly, the test terminates.

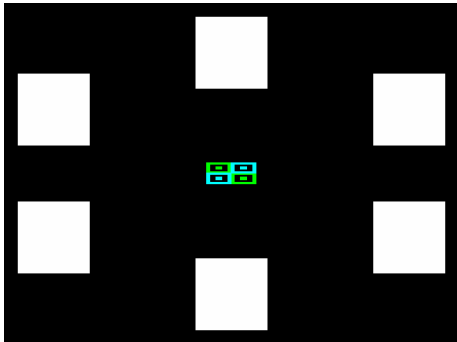


Figure 14-2 The PAL test screen showing a pattern in the middle

Clinical PAL administration script

The parallel and clinical modes differ for this test. These are the administration instructions for the clinical mode. Administration instructions for the parallel mode may be found on page 120.

One pattern (stages 1 and 2)

Go in to this test before explaining the instructions.

With the PAL start screen displayed, press **[SPACE]** to begin the first one pattern stage.

Now *quickly* say:

In this test you will see six white boxes and they will open up in a random order. There will be a pattern in one of the boxes and you have to remember which box it is in.

PAL

When the pattern appears say:

There is the pattern, try to remember which box it is in.

Make sure that the subject is looking at each box in turn. When all the boxes have been opened, the pattern appears in the middle of the screen.

Say:

Touch the box where you saw that pattern appear.

If the subject touches the correct box, the screen will display **All correct**.

Now say:

Now we are going to do the same thing again, but this time with a different pattern.

After a moment, move on to the next one pattern stage by pressing **SPACE** .

In the case of an error:

- If the subject has made a mistake during a stage, the screen will *not* display **All correct** immediately afterwards; instead the computer will pause then re-present the pattern(s).

During the pause, say:

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.

To help the tester keep track of the number of trials the subject has completed for the current stage, a 2-digit number is shown in grey in the lower right-hand corner of the screen when the pattern is shown in the middle of the screen. The difference between the 2 digits is the number of the current trial:

Number displayed	Trial number
No number	1
53	2
96	3
84	4
72	5
93	6
70	7
91	8
90	9
00	10

(If the subject makes 10 failed attempts on any stage, the test will terminate.)

At the end of the second correct stage with one pattern the computer will display **All correct. 2 new patterns**

The logo consists of the letters 'PAL' in a bold, blue, sans-serif font, oriented vertically. The text is centered within a yellow rectangular background.

Two patterns (stages 3 and 4)

Inform the subject that there are two patterns in this stage by saying:

This time there will be two patterns to remember. Each box will open up. You have to remember **which** pattern is in **which** box.

Press **SPACE** to continue. As the patterns appear, point to them and say:

There is one pattern... and there is the other pattern.

When all the boxes have been opened, the patterns appear in the middle of the screen, one by one.

Prompt as the two patterns come up in the centre of the screen with the instruction:

So which box was that pattern in? And which box was that pattern in?

You may prompt the subject with:

Just touch the box if you think the pattern goes in there.

- As before, if the subject chooses incorrectly, say:

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.

If the subject has chosen both boxes correctly, the screen will display **All correct**.

Now we are going to do the same thing again with two different patterns.

Three patterns (stages 5 and 6)

If the subject chose correctly on the second two pattern stage, the screen will display **All correct. 3 new patterns**

Press **SPACE** to continue and say:

This time there will be three patterns.

- As before, if the subject chooses incorrectly, say:

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.

If the first three pattern stage has been completed correctly, press **SPACE** to do the second three pattern stage.

Again there will be three different patterns to look out for.

If the second three pattern stage has been completed correctly, the screen will display **All correct. 6 new patterns.**

Six patterns (stage 7)

For six patterns (one stage only at this level), even good subjects may begin to make mistakes and they should be reminded that they will be required to get them all correct at a single trial (attempt), but that they may take more than one trial to do so.

Now say:

This time all six boxes will have a pattern inside and you have to remember which pattern goes in which box. You may not get this correct first time, but you can have more goes until you do. Just try to do the best you can.

Now press **SPACE**

- As before, if the subject chooses incorrectly, say:

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.



After the stage has been correctly completed, the screen will display **All correct. Last set of patterns.**

Eight patterns (stage 8)

Say this:

Now there will be eight boxes. Each box will have a pattern inside and you have to remember which pattern goes in which box. You may not get this all correct first time, but you can have more goes until you do. Just do the best you can.

Now press SPACE

- As before, if the subject chooses incorrectly, say:

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.

The test ends at the end of this stage, or earlier if the subject has made 10 errors at any stage..

Parallel mode

Display

Six 'boxes' are displayed on the screen. All are opened, one at a time, in a randomised order. In two or more of them are patterns.

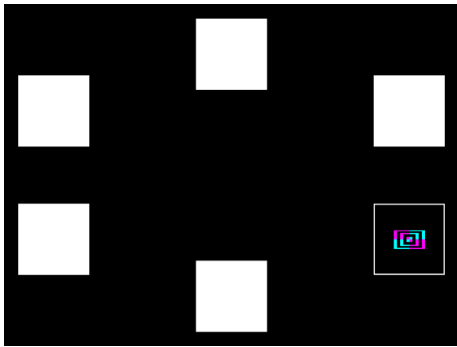


Figure 14-3 The PAL test screen showing a pattern in an open box

Task

The parallel mode of PAL has five stages, which a subject must complete in order:

- Stage 1 2 patterns 6 boxes
- Stage 2 2 patterns 6 boxes
- Stage 3 3 patterns 6 boxes
- Stage 4 6 patterns 6 boxes
- Stage 5 8 patterns 8 boxes

For each stage, boxes are displayed on the screen. All are opened in a randomised order. Two or more of them will contain a pattern. The patterns shown in the boxes are then displayed in the middle of the screen, one at a time, and the subject must touch the box where the pattern was originally located.

Each stage may have up to 10 trials in total (the first presentation of all the shapes, then up to 9 repeat presentations). If the subject makes an error, the patterns are re-presented to remind the subject of their locations. When the subject gets all the locations correct, they proceed to the next stage. If the subject cannot complete a stage correctly, the test terminates.

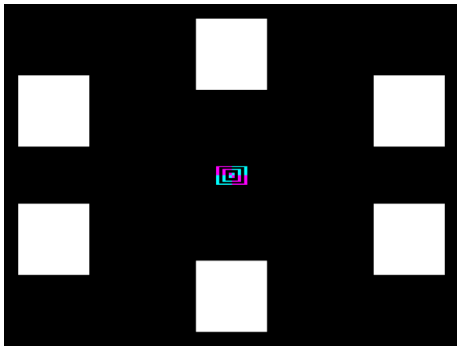


Figure 14-4 The PAL test screen showing a pattern in the middle

Parallel PAL administration script

The parallel and clinical modes differ for this test. These are the administration instructions for the parallel mode. Administration instructions for the clinical mode may be found on page 113.

Two patterns (stages 1 and 2)

Go in to this test before explaining the instructions.

With the PAL start screen displayed, press to begin the first two pattern stage.

Now *quickly* say:

As the patterns appear, point to them and say:

In this test you will see six white boxes and they will open up in a random order.

There will be a pattern in two of the boxes. You have to remember **which** pattern is in **which** box.

There is one pattern... and there is the other pattern.

When all the boxes have been opened, the patterns appear in the middle of the screen, one by one.

Prompt as the two patterns come up in the centre of the screen with the instruction:

So which box was that pattern in? And which box was that pattern in?

You may prompt the subject with:

Just touch the box if you think the pattern goes in there.

If the subject touches the correct boxes, the screen will display **All correct**.

Now say:

Now we are going to do the same thing again, but this time with different patterns.

After a moment, move on to the next two pattern stage by pressing **SPACE**.

In the case of an error:

- If the subject has made a mistake during a trial, the screen will *not* display **All correct** immediately afterwards; instead the computer will pause then re-present the patterns.

During the pause, say:

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.

PAL

To help the tester keep track of the number of trials the subject has completed for the current stage, a 2-digit number is shown in grey in the lower right-hand corner of the screen when the pattern is shown in the middle of the screen. The difference between the 2 digits is the number of the current trial:

Number displayed	Trial number
No number	1
53	2
96	3
84	4
72	5
93	6
70	7
91	8
90	9
00	10

(If the subject makes 10 failed attempts on any stage, the test will terminate.)

Three patterns (stage 3)

If the subject chose correctly on the last two pattern stage, the screen will display **All correct. 3 new patterns.**

Press to continue and say:

This time there will be three patterns.

- As before, if the subject chooses incorrectly, say:

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.

If the three pattern stage has been completed correctly, the screen will display **All correct. 6 new patterns.**

Six patterns (stage 4)

For six patterns (one stage only at this level), even good subjects may begin to make mistakes and they should be reminded that they will be required to get them all correct at a single trial (attempt), but that they may take more than one trial to do so.

Now say:

This time all six boxes will have a pattern inside and you have to remember which pattern goes in which box. You may not get this correct first time, but you can have more goes until you do. Just try to do the best you can.

Now press SPACE

- As before, if the subject chooses incorrectly, say:

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.

After the stage has been correctly completed, the computer will display **All correct. 8 new patterns.**



Eight patterns (stage 5)

Say this:

Now there will be eight boxes. Each box will have a pattern inside and you have to remember which pattern goes in which box. You may not get this all correct first time, but you can have more goes until you do. Just do the best you can.

Now press

- As before, if the subject chooses incorrectly, say:

When this stage ends, this is the end of the test.

That was not quite right. The computer will open the boxes up again to remind you where the patterns really were.

Chapter 15

Pattern Recognition Memory (PRM)

PRM description

PRM is a test of visual pattern recognition memory in a 2-choice forced discrimination paradigm.

This test is sensitive to dysfunction in medial temporal areas of the brain and relatively insensitive to dysfunction in the frontal lobe.

Display

The subject is presented with series of 12 visual patterns, one at a time, in the centre of the screen. These patterns are designed so that they cannot easily be given verbal labels.

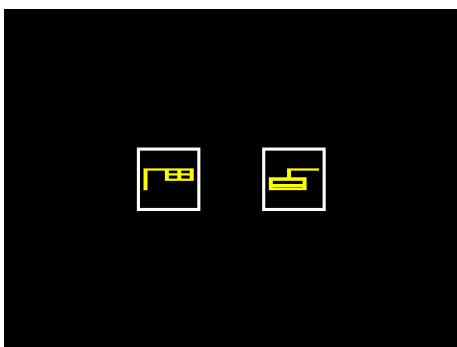


Figure 15-1 The PRM task screen showing the recognition phase

PRM

Task

In the recognition phase, the subject is required to choose between a pattern they have already seen and a novel pattern. In this phase, the test patterns are presented in the reverse order to the original order of presentation.

The sub-test is repeated with a new set of 12 patterns to be remembered.

PRM test modes

The PRM test has fifteen modes, which include the five ‘complete modes’ listed below, and immediate and delayed versions of each of these modes.

- clinical
- parallel1
- parallel2
- parallel3
- parallel4

Immediate and delayed modes

The immediate setups (which comprise the first presentation phase, first recall phase and the second presentation phase) should **always** be run before the delayed setups (which comprise the second recall phase only) in a battery.

Clinical and parallel setups have different sets of patterns.

! Always use a delayed setup that matches the immediate setup, so that the patterns match.

The delayed setups are designed so that you can run the recognition phase of the test 20 minutes after the initial presentation of the stimuli, to test delayed pattern recognition memory. You may wish to run other tests between the main part and the delayed part of the PRM test. However, please ensure that:

- The tests take around 20 minutes to run.

- ❑ The tests do not have a significant pattern recognition component. Most of the CANTABeclipse tests are suitable for this purpose, with the exception of PAL, MTS, and DMS. Tests such as AGN, CRT, SOC, RTI, RVP,SRT, SSP, and SWM could be suitable.
- ❑ You have carefully considered any possible interference effects.

Tests such as AGN, CRT, SOC, RTI, RVP,SRT, SSP, and SWM would be suitable.

The same test administration script is used for each of the immediate and ‘complete’ modes. Delayed modes have a separate administration script.

PRM administration script

Give the instructions before going into the test. With the PRM start screen displayed, say:

This time a box will appear. Several patterns will appear inside the box, one after the other.

Do NOT use the word ‘object’ since this may bias the subject to using a verbal label.

Look carefully, and try to remember the patterns that you see. You will not have to describe the patterns to me and you will not have to remember the order in which they appear, you will just have to pick them out from other patterns. **Are you ready?**

Press SPACE and the test will start. The patterns will be displayed.

Gesture to the screen and say:

Here is the first pattern.

Make sure that the subject is looking at the screen.

PRM

- If they are not, use the prompt:

Keep looking.

When the presentation phase has finished and the first two choice boxes are displayed, say the following:

Now there are two patterns. Touch the one that you saw before.

After the subject has responded and the next choice is displayed, say:

Touch the one you saw previously.

Use prompts for the remaining choices as necessary:

Which one did you see before? Touch it.

When the first trial is complete, the screen will display **Please wait**.

Say:

Now we are going to do the same thing again, but with new patterns. Again, look at the patterns and try to remember them.

Press SPACE to start the second presentation.

If you are running a 'complete' mode test, the second recognition phase will be displayed at the end of the presentation phase.

If you are running an 'immediate' mode test, the test will end at the end of the presentation phase. The second recognition phase will occur later in the battery, in the delayed mode test.

PRM Delayed administration script

Delayed recognition phase

To be run 20 minutes after the first (immediate) part of the test.

When the start screen for PRM is displayed, press **[SPACE]** to display the **Please wait** screen, then say to the subject:

A short while ago, you saw some patterns. We are now going to see how many of those you can remember.

Press **[SPACE]** to start.

When the first pair of patterns is displayed, say,

Now there are two patterns. Touch the one that you saw before.

Use prompts for the remaining choices as necessary:

Which one did you see before? Touch it.

PRM

PRM

Chapter 16

Reaction Time (RTI)

This task is designed to measure the subject's speed of response to a visual target where the stimulus is either predictable (simple reaction time) or unpredictable (choice reaction time).

RTI test modes

The RTI test has three modes:

- clinical
- parallel
- child

RTI Clinical mode description

The parallel mode is described on page 137 and the child mode is described on page 141.

- ! This test uses a press pad. If no press pad is available, and you wish to evaluate the test, you can use the right hand (or secondary) button on your mouse. Always test subjects using a press pad.**

Display

A yellow spot appears on the screen.

RTI

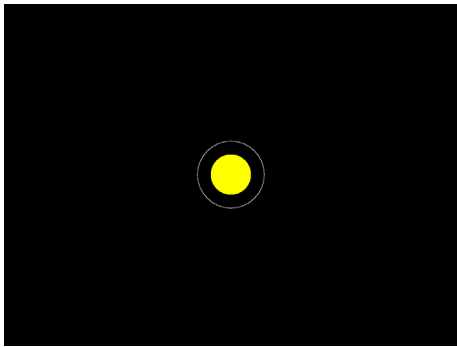


Figure 16-1 The RTI task screen for the first stage of the RTI test

Task

The task for the clinical mode of RTI is divided into five stages, each successive stage having increasingly complex response requirements.

In the first stage, the subject simply has to touch the screen when a yellow spot appears in the centre of the screen, neither touching too soon nor too late. Once the subject has achieved 5 out of 6 correct, or completed a maximum of 18 attempts, the second stage, which is the choice reaction task, is introduced.

In the second stage, the yellow spot may now appear in any one of five locations. Again, the subject is trained to a criterion of 5 out of 6 correct, with a maximum of 40 attempts. If the subject fails to achieve the criterion on this stage, the test terminates. Successful subjects are then introduced to the press pad.

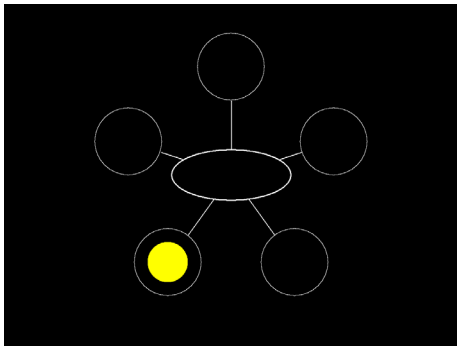


Figure 16-2 The RTI task screen for the second stage of the RTI test

In the third stage, the subject is required to hold down the press pad button until the yellow spot appears in the centre of the screen, but does not have to touch the screen.

In the fourth stage, the subject is required to hold down the press pad button until the yellow spot appears in the centre of the screen, and then must touch the screen where the spot appears. This is the first of the two assessed stages.

In the fifth and final stage, the choice reaction task is again introduced, and by this stage the subject has been trained to hold down the press pad button until the spot appears, then release the press pad button and touch the position on the screen where the spot was presented.

In all stages the subject is trained to a criterion of 5 out of 6, within 18 trials for the simple RT task and 40 trials for the choice RT task. If the subject fails to reach the criterion on any of these stages except the first stage, the task terminates.

Clinical RTI administration script

This test is divided into five sections, *however the first three components are for practice purposes only*, tasks four and five are test trials. The first two sections are compulsory. If the subject fails to reach the criterion in any of the subsequent sections, the test is terminated.

- ! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24. In this test, the same hand is used to touch the press pad AND the screen.

Stage 1 – pointing to the circle (practice phase)

With the RTI start screen displayed, say:

A yellow spot will appear inside a circle. Touch the circle as soon as you can after the spot appears, and then replace your hand on the table in front of the screen.

Press **SPACE** to begin the first stage.

- If the subject points *too soon*, prompt with:
- If the subject points *too late*, prompt with:

Try to wait until the spot appears.

Try and point a little quicker.

Every time the subject correctly touches the circle the computer will beep and display **GOOD**.

At the end of this stage the computer will pause and display **Please wait**.

Stage 2 – five choice pointing (practice phase)

Say this:

Now we are going on to pointing with five choices. Now the spot may appear in any one of five circles. Touch the circle where you saw the spot appear.

Press **SPACE** to begin stage 2.

Prompt with the following if the subject doesn't appear to have understood:

The spot might appear in any of the five circles. Touch the circle as quickly as you can after you see the spot appear.

- If the subject points to the wrong circle, the screen will display **WRONG**.
- If the subject touches the screen outside a circle, the screen will display **INACCURATE**.


At the end of this stage the computer will pause and display **Please wait**.

Stage 3 – single choice release (practice phase)

Give the subject the press pad and show them how it works. Let them try it until they are comfortable. Ensure the subject is using the same hand for the press pad that they used to touch the screen.

Then say:

The yellow spot will appear inside the circle soon after you press the button. Let go of the button as soon as you can after you see the spot. Don't let go until after you see the spot appear. You can begin now.

Press  to begin stage 3.

RTI

You can prompt with:


Press the button down.
Try not to let go of the button until after you see the spot.
Use the same hand to press the button and touch the screen.

At the end of this stage the computer will pause and display **Please wait**.

Stage 4 – single choice release and point (test phase)

Say this:

From now on, when you let go of the button, touch the circle as soon as you can. Remember not to let go before you see the spot, but this time remember you have to touch the circle.

Press  to begin stage 4.

Ensure the subject is using the same hand for both the press pad and the touch screen.

At the end of this stage the computer will pause and display **Please wait**.

Stage 5 – five choice release and point (test phase)

Say this:

Good. Now there will be five circles again. Remember, touch the circle where you saw the spot as soon as you can, but don't let go of the button until you see the spot.

Press **SPACE** to begin stage 5.

The test ends at the end of this stage.

RTI Parallel mode description

The parallel mode of the RTI test is divided into two sections, to measure:

- simple reaction time
- 5-choice reaction time.

Each section is divided into practice and test phases. Subjects failing to reach this level are given a second practice block, after which the computer presents the test phase irrespective of whether or not the subject has reached the criterion.

Display

In the simple reaction time task, the subject has to hold the press pad button down, then release it and touch the screen when a yellow spot appears in the centre, neither touching too soon nor too late. In the 5-choice reaction task, the yellow spot may now appear in any one of 5 locations.

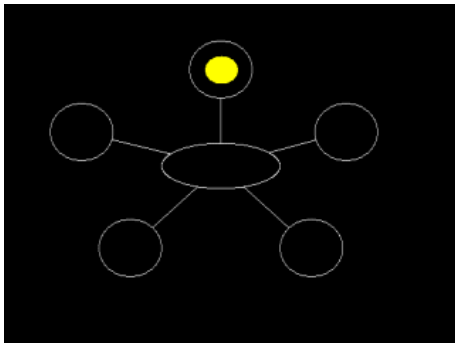


Figure 16-3 The RTI test screen showing the 5-choice test

Task

The task is divided into practice and test components. In the first practice phase for each section, subjects are required to make at least 9 out of 10 correct responses before progressing to the test phase. If subjects fail to reach this criterion in the first practice block, a second block of practice is given. After a second block of practice, the task proceeds to the test block irrespective of how well the subject has performed.

Parallel RTI administration script

- ! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24. In this test, the same hand is used to touch the press pad AND the screen.

Stage 1 – single release and point (practice phase)

With the RTI start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable.

Now explain the first part of this test:

A yellow spot will appear inside a circle soon after you press the button. Let go of the button and touch the circle as soon as you can after the spot appears. Remember not to let go before you see the spot. To begin with you will have some practice tries.

Press **SPACE** to start the first stage of the test.

Ensure the subject is using the same hand for both the press pad and the touch screen.

- If the subject points *too soon*, prompt with:
- If the subject points *too late*, prompt with:
- If the subject does not press the button down for the next trial, prompt with:

Try not to let go of the button until after you see the spot.

Try and point a little quicker.

Press the button down

Every time the subject correctly touches the circle the computer will beep and display **GOOD**.


If the subject has responded correctly on at least 9 out of 10 trials the computer will pause and display: **GOOD - Please wait**. The test will then move on to the test phase.

If the subject has made 2 or more errors the computer will display **Please wait and** a second block of practice will be given.

Stage 2 – single release and point (test phase)

Explain the next part of this test:

The yellow spot will appear again soon after you press the button. As before, touch the circle as soon as you can after the spot appears.

Press  to begin stage 2.

- If the subject points *too soon* prompt with:
- If the subject points *too late* prompt with:
- If the subject does not press the button down for the next trial, prompt with:

Try not to let go of the button until after you see the spot.

Try and point a little quicker.


Press the button down

At the end of this stage the computer will display **Please wait**.

Stage 3 – five choice release and point (practice phase)

Say this:

Now we are going on to pointing with five choices. After you press down the button, the spot will appear in any one of five circles. Let go of the button and touch the circle where you saw the spot appear. Again we will begin with some practice.

Press  to begin stage 3.

Prompt with the following if the subject doesn't appear to have understood:

The spot might appear in any of the five circles. Touch the circle as quickly as you can after you see the spot appear.

You can prompt with:

Press the button down.

Try not to let go until after you see the spot.

As with simple reaction time, if the subject has responded correctly on at least 9 out of 10 trials the computer will pause and display: **GOOD - Please wait**, ready to move on to the test phase. However, if the subject has made 2 or more errors, the computer will display **Please wait and** a second and final block of practice will be given.

Stage 4 – five choice release and point (test phase)

Say this:

Good. Now there will be five circles again. Remember, touch the circle where you saw the spot as soon as you can, but don't let go of the button until you see the spot.

Press **SPACE** to begin stage 5.

You can prompt with:

Press the button down.
Try not to let go until after you see the spot.
Use the same hand to press the button and touch the screen.

The test ends at the end of this stage.

RTI Child mode description

The child mode of the RTI test is divided into two sections, to measure:

- simple reaction time
- 5-choice reaction time.

Each section is divided into practice and test phases. Subjects failing to reach this level are given a second practice block, after which the computer presents the test phase irrespective of whether or not the subject has reached the criterion.

Display

In the simple reaction time task, the subject has to hold the press pad button down, then release it and touch the screen when a yellow spot appears in the centre, neither touching too soon nor too late. In the 5-choice reaction task, the yellow spot may now appear in any one of 5 locations.

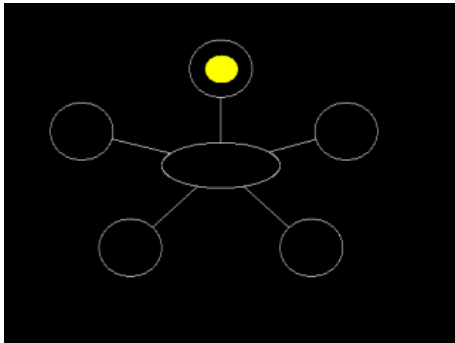


Figure 16-4 The RTI test screen showing the 5-choice test

Task

The task is divided into practice and test components. In the first practice phase for each section, subjects are required to make at least 4 out of 5 correct responses before progressing to the test phase of 15 trials. If subjects fail to reach this criterion in the first practice block, a second block of practice is given. After a second block of practice, the task proceeds to the test block irrespective of how well the subject has performed.

Child mode RTI administration script

- ! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24. In this test, the same hand is used to touch the press pad AND the screen.

Stage 1 – single release and point (practice phase)

With the RTI start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable.

Now explain the first part of this test:

A yellow spot will appear inside a circle soon after you press the button. Let go of the button and touch the circle as soon as you can after the spot appears. Remember not to let go before you see the spot. To begin with you will have some practice tries.

Press **SPACE** to start the first stage of the test.

Ensure the subject is using the same hand for both the press pad and the touch screen.

- If the subject points *too soon*, prompt with:
- If the subject points *too late*, prompt with:

Try not to let go of the button until after you see the spot.

Try and point a little quicker.

RTI

- If the subject does not press the button down for the next trial, prompt with:

Press the button down

Every time the subject correctly touches the circle the computer will beep and display **GOOD**.


If the subject has responded correctly on at least 4 out of 5 trials the computer will pause and display: **GOOD - Please wait**. The test will then move on to the test phase.

If the subject has made 2 or more errors the computer will display **Please wait and** then a second block of practice will be given.

Stage 2 – single release and point (test phase)

Explain the next part of this test:

The yellow spot will appear again soon after you press the button. As before, touch the circle as soon as you can after the spot appears.

Press  to begin stage 2.

- If the subject points *too soon* prompt with:
- If the subject points *too late* prompt with:
- If the subject does not press the button down for the next trial, prompt with:

Try not to let go of the button until after you see the spot.

Try and point a little quicker.

Press the button down

At the end of this stage the computer will display **Please wait**.

Stage 3 – five choice release and point (practice phase)

Say this:

Now we are going on to pointing with five choices. After you press down the pad, the spot will appear in any one of five circles. Let go of the button and touch the circle where you saw the spot appear. Again we will begin with some practice.

Press **SPACE** to begin stage 3.

Prompt with the following if the subject doesn't appear to have understood:

The spot might appear in any of the five circles. Touch the circle as quickly as you can after you see the spot appear.

You can prompt with:

Press the button down.
Try not to let go until after you see the spot.
Use the same hand to press the button and touch the screen.

As with simple reaction time, if the subject has responded correctly on at least 4 out of 5 trials the computer will pause and display: **GOOD - Please wait**, ready to move on to the test phase. However, if the subject has made 2 or more errors, the computer will display **Please wait and** a second and final block of practice will be given.

Stage 4 – five choice release and point (test phase)

Say this:

Good. Now there will be five circles again. Remember, touch the circle where you saw the spot as soon as you can, but don't let go of the button until you see the spot.

Press to begin stage 5.

You can prompt with:

Press the button down.
Try not to let go until after you see the spot.

The test ends at the end of this stage.

Chapter 17

Rapid Visual Information Processing (RVP)

This test is sensitive to dysfunction in the parietal and frontal lobe areas of the brain and is also a sensitive measure of general performance.

RVP description

RVP is a test of visual sustained attention.

- ! **This test uses a press pad. If no press pad is available, and you wish to evaluate the test, you can use the right hand (or secondary) button on your mouse. Always test subjects using a press pad.**

Display

A white box appears in the centre of the computer screen, inside which digits, from 2 to 9, appear in a pseudo-random order, at the rate of 100 digits per minute. The test is in two parts; a 'warm-up' practice stage which lasts for two minutes and is not scored, and a test stage which lasts for three minutes.

RVP

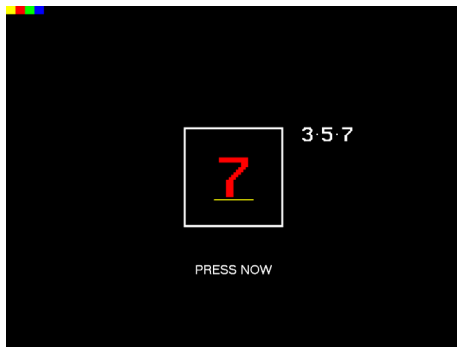


Figure 17-1 The RVP test screen in the training stage

Task

Subjects are requested to detect target sequences of digits (for example, 2-4-6, 3-5-7, 4-6-8) and to register responses using the press pad. Target sequences occur at the rate of 16 every 2 minutes.

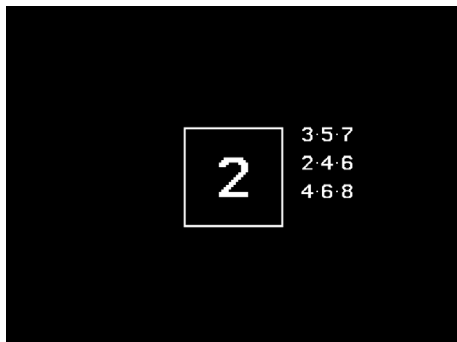


Figure 17-2 The RVP test screen in the test stage

For scoring purposes, CANTABeclipse calculates the number of responses recorded as having occurred within 1800 milliseconds of the final digit presentation for each of the target sequences. CANTABeclipse also records the number of false alarms, defined as occasions upon which the subject incorrectly identified a target sequence, as well as misses.

RVP modes

The RVP test has three modes:

- 123
- 357
- clinical

Clinical mode

The clinical mode is intended for adults and older children, and contains three target sequences – 2-4-6, 4-6-8 and 3-5-7. There are 27 targets in total during assessed blocks.

The test is divided into blocks as follows. Note that there is only a gap (and a ‘Please wait’ screen) between the practice stage and the test stage, and that the first block in the test stage, where the new targets are introduced, is a practice block. You can view the outcome measures by block using the CANTABeclipse Results Manager. Please refer to the *CANTABeclipse Software User Guide* for more information.

Stage	Block number	Block type	Block comprises
Practice	1	Practice	100 presentations, full prompts, coloured and underlined stimuli – target(s): 3 5 7
	2	Practice	50 presentations, some prompts, underlined stimuli – target(s): 3 5 7
	3	Practice	50 presentations – target(s): 3 5 7
Please wait			
Test	4	Practice	100 presentations – target(s): 3 5 7, 2 4 6, 4 6 8
	5	Assessment	100 presentations – target(s): 3 5 7, 2 4 6, 4 6 8
	6	Assessment	100 presentations – target(s): 3 5 7, 2 4 6, 4 6 8
	7	Assessment	100 presentations – target(s): 3 5 7, 2 4 6, 4 6 8

123 mode

The 123 mode is intended for younger children (aged 4-8) and contains one target sequence, 1-2-3.

The structure is the same as the clinical mode test, with 7 blocks, divided into a training stage and a test stage, and there are 24 targets in total during assessed blocks.

357 mode

The 357 mode is intended for older children (aged 7-14) and contains one target sequence, 3-5-7.

The structure is the same as the clinical mode test, with 7 blocks, divided into a training stage and a test stage, and there are 24 targets in total during assessed blocks.

RVP clinical mode administration script

This test has a training stage followed by a test stage.

- ! **The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24.**

Training stage

When the RVP start screen is displayed, press **SPACE**. The computer will display the words **Please wait**, with the sequence '3 5 7' to the right.


Now give the following instruction:

You are going to see some numbers appearing one at a time in a box in the centre of the computer screen. What you have to do is to look for a target sequence of three numbers and press the button whenever you spot the target.

The target sequence will be a '3' immediately followed by a '5', immediately followed by a '7'. It is only when you see the last number of the sequence that you should press the button.

To begin with, you will know that a sequence has begun because the target sequence will appear in red and be underlined in yellow. There will also be a 'beeping' sound if you press the button correctly. As the practice sequence progresses you will find that these cues and the 'beeping' sound will gradually be phased out.

RVP

Now press  to begin the practice session.

If the subject responds too early say:

Wait until you see the last digit before pressing the button.

The upper left hand corner of the screen displays four small coloured "overseer boxes". The red box and the green box will disappear at the same time when the sequences are no longer highlighted in red and the **PRESS NOW** prompt is no longer displayed.

When this happens, say:

Now the sequences will only be underlined in yellow.

The yellow and blue boxes disappear at the same time when the underlining ends, the beeping stops, and the feedback messages saying **GOOD** or **TOO LATE** are no longer displayed.

When the yellow and blue overseer boxes also disappear, say:

Now you will have to spot the sequences yourself. There will be no underlining or beeping.

At the end of 2 minutes the training stage will end and the computer will again display **Please wait**.


Test stage

When the screen reads **Please wait** and displays three sequences of numbers, give the following instructions:

This time we will do the same thing, but there will now be two other sequences you have to remember, 2-4-6 and 4-6-8 as well as 3-5-7.

Whenever you see any of these three target sequences you should press the button when the third digit appears. The test will last for four minutes, so please try to concentrate until the end. The target sequences will remain on the screen to help you remember them. However, try to concentrate on the box in which the numbers are changing.

Please respond as quickly as you can whilst trying to avoid making mistakes. Take a few seconds to familiarise yourself with the three different sequences, 3-5-7, 2-4-6, and 4-6-8. Remember there will be no colour, no underlining, and no beeping sound.

When the subject is ready, make sure the press pad is still in position and then press  to run the test stage.

After four minutes the test will end.


RVP

RVP 123 or 357 mode administration script

This test has a training stage followed by a test stage.

- ! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24.

Training stage

When the RVP start screen is displayed, press .

The computer will display the words **Please wait**, with the sequence '1 2 3' or '3 5 7' to the right.

Now give the following instruction:

You are going to see some numbers appearing one at a time in a box in the centre of the computer screen. What you have to do is to look for a target sequence of three numbers and press the button whenever you spot the target.

Make sure you give the correct target sequence (1 2 3 or 3 5 7):

The target sequence will be a '1' immediately followed by a '2' immediately followed by a '3'

OR

The target sequence will be a '3' immediately followed by a '5', immediately followed by a '7'.

It is only when you see the last number of the sequence that you should press the button.

To begin with, you will know that a sequence has begun because the target sequence will appear in red and be underlined in yellow. There will also be a 'beeping' sound if you press the button correctly. As the practice sequence progresses you will find that these cues and the 'beeping' sound will gradually be phased out.

Now press  to begin the practice session.

If the subject responds too early say:

Wait until you see the last number before pressing the button.

The upper left hand corner of the screen displays four small coloured "overseer boxes". The red box and the green box will disappear at the same time when the sequences are no longer highlighted in red and the **PRESS NOW** prompt is no longer displayed.

When this happens, say:

Now the sequence will only be underlined in yellow.

The yellow and blue boxes disappear at the same time when the underlining ends, the beeping stops, and the feedback messages saying **GOOD** or **TOO LATE** are no longer displayed.

When the yellow and blue overseer boxes also disappear, say:

Now you will have to spot the sequence yourself. There will be no underlining or beeping.

At the end of 2 minutes the training stage will end and the computer will again display **Please wait**.

Test stage

When the screen reads **Please wait**, give the following instructions:

This time we will do the same thing again. Whenever you see the last number of the sequence you should press the button.

The test will last for four minutes, so please try to concentrate until the end. The target sequence will remain on the screen to help you remember it. However, try to concentrate on the box in which the numbers are changing.

Please respond as quickly as you can whilst trying to avoid making mistakes. Remember there will be no colour, no underlining, and no beeping sound.

When the subject is ready, make sure the press pad is still in position and then press **SPACE** to run the test stage.

After four minutes the test will end.

Chapter 18

Stockings of Cambridge (SOC)

SOC description

SOC is a test of spatial planning and spatial working memory, which gives a measure of frontal lobe function.

Display

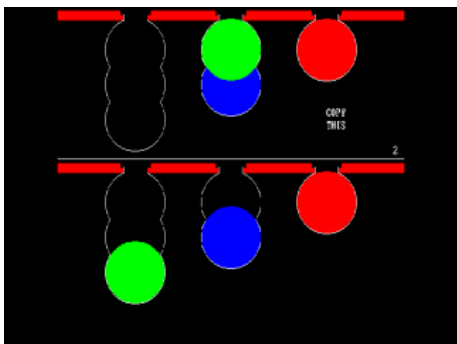


Figure 18-1 The SOC task screen

The subject is shown two displays containing three coloured balls. The displays are presented in such a way that they can easily be perceived as stacks of coloured balls held in stockings or socks suspended from a beam. This arrangement makes the 3-D concepts involved apparent to the subject, and fits with the verbal instructions.

Task

The subject must use the balls in the lower display to copy the pattern shown in the upper display. The balls may be moved one at a time by touching the required ball,

then touching the position to which it should be moved. The time taken to complete the pattern and the number of moves required are taken as measures of the subject's planning ability.

At first it is only necessary to move one ball, the number being increased in steps to four moves. At this point, a procedure controlling for motor performance is inserted. The upper display moves one ball at a time, repeating the moves made by the subject in the corresponding previous planning phase. The subject must follow the upper display by moving the balls in the lower display. Again, the number of moves increases from 2 to 4. The difference in time taken to complete (but more especially, to initiate) each problem is taken as an index of the additional time taken to plan the solution of the copying, as distinct from the yoked following task.

A second block of planning problems of 2, 4, and 5 moves follows, and the test is completed with a second block of motor control problems. Should the subject make more than double the number of moves necessary for the simplest solution, the problem is terminated. Should the computer terminate three problems in a row, the entire test ends. There is no time limit.

The first problem is for demonstration by the tester. After that, subjects must make all the moves themselves.

SOC test modes

The SOC test has one mode:

- clinical

SOC administration script

Problem 1 (example)

With the SOC start screen displayed, press to begin the test, and say:

I am going to show you how this works.
You can see that there are two
arrangements...

Point to these two arrangements.

...of coloured balls, like snooker or pool balls, hanging in stockings (or socks), one at the top of the screen and one at the bottom. The idea is to make this bottom arrangement look like the top one. Touch the ball you want to move.

Touch the blue ball.

Now you can see that the ball is flashing and waiting to be moved somewhere. Now I will move it where it should go.

Touch the blue ball and move it into its correct position.

Now you can see that the top and the bottom patterns look the same.

Indicate the comparison with a gesture.

The computer will give the message **Finished** followed shortly by **New pattern**.

Press  to display the next problem.

Problem 2 (example)

During the second problem, the following additional points should be made.

There are some rules that you need to remember. You can't move a ball that is beneath another ball, like this green one. If you want to move it you have to move the ball on top first...

Demonstrate this on screen by touching the green ball, which will not flash.

Touch the red ball and show that it cannot be moved into the empty space above it, and leave it flashing.

... and you can't move a ball into thin air like this red one.

Indicate the red flashing ball.

Also, if I touch a ball...

Touch the red ball again, to stop it flashing.

...but change my mind about moving it, I can touch it again to switch it off.

Indicate this.

Like a real ball they won't just hang in mid-air, but they will sit at the bottom of the pocket.

Point to the number on the right-hand side of the screen.

The number here...

The subject can now attempt this problem. Give the following instructions:

...tells you how many moves to make.

Now look at the top pattern and decide what you have to move at the bottom to copy it. Don't start until you think you know which move to make. Touch the ball you want to move. Now touch where you want to move it to.

It is possible that a subject will make a mistake at this level, in which case they can make further moves in an attempt to arrange the balls appropriately. These moves are limited to a fixed number at each level of problem. The computer will display **TOO MANY** if this number is exceeded, or **FINISHED** if the test is completed within this number.

At the end of the problem, the computer displays **New pattern**.

Problems 3 and 4

There are two more one-move problems.

Press **SPACE** to start problems 3 and 4 when **New pattern** is displayed.

The following prompts can be used:

Touch the one you want to move.
Touch where it should go.
Touch it again if you change your mind.

Remember, the time the subject takes to do each problem is one of the things being measured, so don't use these prompts unless you are absolutely sure the subject doesn't know what to do.

For problem 4 the subject is required to move the ball from the left- to the right-hand column.

If the subject does not do this, use the following instruction:

You can move the ball on the left...

Point.

...directly to this place on the right.

Point.

You can jump over the middle.

Problems 5 and 6

Next come 2 two-move problems.

Emphasise that the subject should think out the solution before starting.

While **New pattern** is displayed, instruct the subject with the following before starting problem 5:

This is a two-move problem. For this next one you will have to move two balls. Don't start until you think you know which moves to make. Try to get it right first time. Think about it and when you are ready, make your two moves.

Press SPACE to start each problem.

If the subject makes the correct move, prompt with:

Now move the other one.

Remember, if the subject makes the wrong move, encourage the subject to keep making moves until either too many have been made or the problem is solved.

If the subject tries to make inappropriate moves, give these instructions:

You cannot move a ball if it has another one on top of it.

And/or:

You cannot move a ball to a place with an empty space because it would drop to the bottom.

It is important to instruct the subject if inappropriate moves are made. Be quick to give these instructions, to ensure that the subject does not get confused and think that the lack of response is due either to the way they are touching the screen or to some other problem.

Problems 7 to 12 (2 at each of 2, 3 and 4 moves)

While **New pattern** is displayed, before each problem, tell the subject the number of moves (**N**) that are required by saying:

This is an **N** move problem. Think carefully about how you can make the bottom half of the display look like the top half using **N** moves. When you are ready, make your moves.

Press **SPACE** to start each problem.

After Problem 12 the computer will display the message **Please wait** instead of **New pattern**.

Motor Control test

This is the motor control test, so subjects should be encouraged to move the balls in the lower display promptly as the upper display changes. Therefore, you must indicate the change and encourage them to move the ball in the lower display if they have missed seeing a ball move in the upper display.

While the computer displays **Please wait**, say:

Now you will have to do something different. The computer is going to move the balls in the top half of the screen, one at a time. I'd like you to copy what it does in the bottom half of the screen. When the computer makes a move you must follow what it does.

Press SPACE. The problem will be displayed, and one of the balls will quickly move to a new position.

Follow what the computer does at the top by moving the balls in the bottom. Make the same move that the computer does. Have a go.

Use the following instructions:

Move the red ball.

Move the green ball.

If the subject makes a mistake, he/she will have to correct the error before the next move by the upper display. Note that the aim is to get the subject to **follow** the upper pattern, not to treat it as a series of one move planning problems.

If necessary, one of the following prompts may be used:

Follow what the computer does.

Move the ball.

Next one.

You can't move that one.

You can't put it there.

The computer will display **New pattern** at the end of each of these motor control patterns. At each **New pattern** prompt, press **SPACE** to start the next motor control pattern.

At the end of the yoked motor control patterns, the computer will display **Please wait**.

Problems 13 to 20 (2 each at 2 and 4 moves, 4 of 5 moves)

Now say:

Now we will go back to what you were doing before. There will be a couple of two move problems to get you back into the swing of things, then they will get a bit harder, so again you need to plan what you are going to do before you move any of the balls. You have to make the bottom look like the top.

Press **SPACE** to start each problem.

The next two problems require two moves (these are practice problems to get the subjects back into problem-solving set).

You will need to make two moves to do this one.

These are followed by two test problems with four moves and four with five moves. Use the prompts listed above where necessary but do not repeat the rules.

Motor Control test (second session)

The test ends with another block of yoked motor control problems. Use the same instructions and prompts as in the previous motor control block. See page 163.

The test ends when this block is completed.

Now you are going to do what you were doing before, where you have to copy what the computer does. When the computer moves a ball, you have to move the corresponding ball in the bottom half of the screen. Ready?

Chapter 19

Spatial Recognition Memory (SRM)

SRM description

SRM is a test of spatial recognition memory in a forced-choice paradigm.

This test is primarily sensitive to dysfunction in the frontal lobe, and relatively insensitive to temporal lobe damage.

Display

A white square is shown on the screen in various locations.

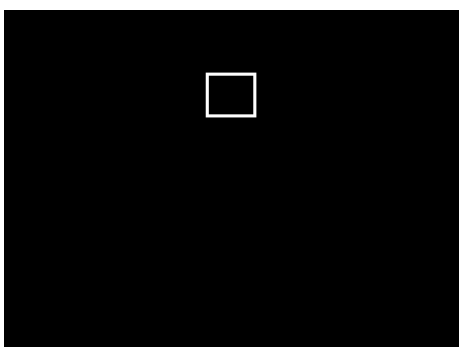


Figure 19-1 The SRM presentation phase

Task

In the presentation phase, a white square is shown on the screen in five different locations. Each appearance of a square marks a location on the screen which the subject must later remember.

In the recognition phase, the square reappears in the same five locations as in the presentation phase, in reverse order. On each appearance, it is paired with an identical distractor square in a location not used in the presentation phase. The subject must touch the square in the location that has appeared before, whilst ignoring the distractor. This is one block.

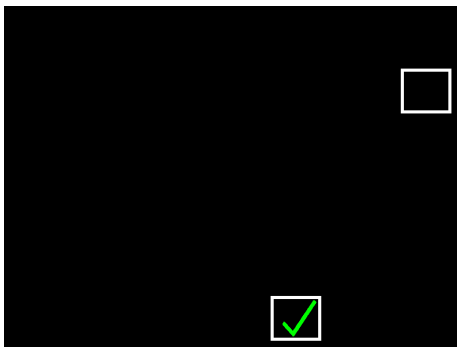


Figure 19-2 The SRM recognition phase

This block is repeated three more times, each time with five new locations.

SRM test modes

The SRM test has five modes:

- clinical
- parallel1
- parallel2
- parallel3
- parallel4

The same test administration script is used for each of these modes.

SRM administration script

With the SRM start screen displayed, give the following instructions before going into the test:

In a moment, a series of five small squares will appear, one by one in different places on the screen. Look at them carefully and try to remember where they appear. The order is not important. At the end, you will have to remember **where** they were, **so it's their place on the screen** you have to remember. Are you ready?

Press 

Make sure that the subject is looking at the screen; if they are not, use the prompt:

Keep looking.

When the choice stage begins, use the following instructions:

Now there are two squares . Touch the one that is in the same place as before.

Use the following prompts as necessary:


Touch the one that was in the same place as before.

Which one? Touch it.

At the end of the session the computer will display **Please wait**.

At this point give the following instructions:

Now I would like you to do the same thing again with the square appearing in different places. Again, try to remember **where** it appears on the screen.

Press  to start the next sub-test.

Continue until the four blocks are completed. In between each one the computer will display **Please wait**.

The test ends after the last block.

Chapter 20

Simple Reaction Time (SRT)

SRT

SRT description

SRT is a test which measures simple reaction time – through delivery of a known stimulus to a known location to elicit a known response. The only uncertainty is with regard to when the stimulus will occur, by having a variable interval between the trial response and the onset of the stimulus for the next trial.

- ! This test uses a press pad. If no press pad is available, and you wish to evaluate the test, you can use the right hand (or secondary) button on your mouse. Always test subjects using a press pad.

Display

The stimulus is a simple square on the screen.

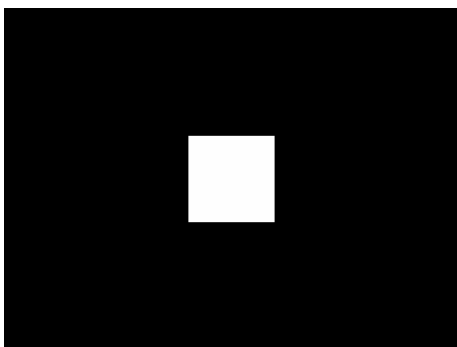


Figure 20-1 The SRT task screen

Task

As soon as the subject sees the square on the screen, they must press the button on the press pad.

There is a practice stage (block 1) of 24 trials and two assessment stages (block 2 and block 3), each of 50 trials.

SRT test modes

The SRT test has one mode:

- clinical

SRT administration script

- ! The press pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of their dominant hand resting gently on the response button. Please refer to Figure 2-1 on page 24.**

Stage 1 (practice stage)

With the SRT start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable.

Now explain the first part of this test:

A square will appear on the screen.
As soon as you see the square, press the button on the press pad as quickly as you can.

Press **SPACE** to start the first stage of the test.

Every time the subject presses the button correctly, the computer will beep and display **GOOD**. If the subject makes an error the computer will give a lower pitched beep and display one of the messages below.

- If the subject presses the button **TOO SOON**, prompt with:
- If the subject presses the button **TOO LATE**, prompt with:

Try not to press the button until after you see the square.

Try and press the button a little quicker.

After 24 trials the computer will pause and display: **Please wait**.

Stage 2 – (first assessment phase)

Explain this part of the test:

Now you will see the square again. Press the button on the press pad, as you did before.

Press **SPACE** to begin stage 2.

If the subject makes errors, you can use the prompts from Stage 1 (above) to help them.

At the end of this stage (50 trials) the computer will display **Please wait**. This is to allow the subject a brief rest between the two assessed stages. This rest should be no longer than 30 seconds.

Stage 3 – (second assessment phase)

Explain this part of the test:

Now you will see the square again. Press the button on the press pad, as you did before. This is the last part of the test.

Press to begin stage 3.

This stage has 50 trials, after which the test ends.

Chapter 21

Spatial Span (SSP)

SSP description

SSP is a computerised version of the Corsi Blocks task, assessing working memory capacity. This gives a measure of frontal lobe functioning.

Display

A pattern of white boxes is shown on the screen. Some of the boxes change in colour, one by one, in a variable sequence.

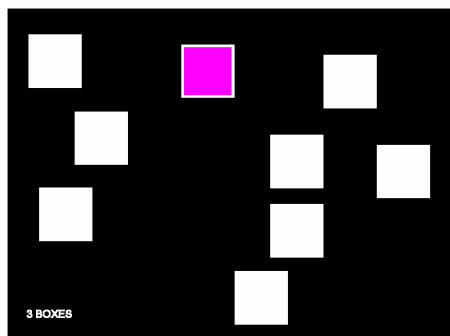


Figure 21-1 The full-screen display for SSP

Task

In the clinical mode, at the end of the presentation of each sequence, a tone indicates that the subject should touch each of the boxes coloured by the computer - in the same order as they were originally presented. In the reverse mode the tone indicates that the subject should touch each of the boxes coloured by the computer - in the reverse order to the order in which they were originally presented. In both modes, the

number of boxes in the sequence is increased from a level of 2 at the start of the test to a final level of 9. There are three possible sequences at each level, but as soon as the subject passes a sequence at each level they will immediately progress to the next level, not necessarily performing all three sequences at each level. If all three sequences at any level are completed unsuccessfully, the test will terminate. The sequence and colour used change from sequence to sequence to minimise interference.

SSP test modes

The SSP test has two modes:

- clinical
- reverse

SSP clinical administration script

With the SSP start screen displayed, press . The screen will display **Practice trial 1 of 2**. Say:

For this test you will see some boxes on the screen and these will change colour one by one. What you have to do is remember the order in which the boxes change colour.

Now press to start the test.

Trial 1 (demonstration)

One by one the two white boxes will change colour. The second will be followed by a tone. *Demonstrate this whilst at the same time instructing the subject.*

Say to the subject:

To begin with two boxes will change colour. Look at the boxes and remember the order in which they change colour. This one changed colour first (point to first box) and this one changed colour second (point to second box).

After the tone, say to the subject:

The noise means that the sequence has finished. Now the idea is to touch the boxes in the same order that they changed colour, as I am doing. This one changed colour first. And this one changed colour second.

Demonstrate by touching the boxes in the correct sequence. At the end of the trial the computer will display **FINISHED** followed by **Practice trial 2 of 2**. Press SPACE to continue.

Trial 2 (practice)

Now, instruct the subject as follows:

Now I would like you to have a go. Two boxes will again change colour and as before you have to remember the order.

When the tone sounds, say to the subject:

Now touch them in the same order you saw them change colour.
Which one changed colour first?
And which one changed colour second?

If necessary, say:

Make sure you take your finger away from the screen between touches, but wait between each touch until you see the box change colour.

The following prompts may be given:

Keep looking.
Take your finger away from the screen
between touches.

At the end of the trial the computer will display **FINISHED** followed by **NEW SET**.

Trial 3 onwards

Press **SPACE** to continue with each new trial when **NEW SET** is displayed.

Repeat the instructions as necessary.

At each new level indicate how many boxes will change colour (use the number in the left hand corner of the computer screen as a reminder). The subject should have acquired the procedure and it is probable that they will not need prompting.

Be sure to emphasise the need to withdraw the finger from the screen after each response and, if necessary, to wait until the box just touched turns white again before touching the next one. Also emphasise that the subject should wait until the auditory signal occurs before responding and specify for each level how many boxes will change colour. If the subject makes an obvious mistake or appears confused, repeat the essential instructions.

If the subject makes mistakes in all sequences at a particular level the test will terminate.

SSP reverse mode administration script

With the SSP start screen displayed, press SPACE. The screen will display **Practice trial 1 of 2**. Say:

For this test you will see some boxes on the screen and these will change colour one by one. What you have to do is remember the order in which the boxes change colour.

Now press SPACE to start the test.

Trial 1 (demonstration)

One by one the two white boxes will change colour. The second will be followed by a tone. *Demonstrate this whilst at the same time instructing the subject.*

Say to the subject:

To begin with, two boxes will change colour. Look at the boxes and remember the order in which they change colour. This one changed colour first (point to first box) and this one changed colour second (point to second box).

After the tone, say to the subject:

The noise means that the sequence has finished. Now the idea is to touch the boxes in the **reverse** order to the order in which you saw them change colour, as I am doing. This one changed colour last. And this one changed colour before that one.

Demonstrate by touching the boxes in the correct sequence. At the end of the trial the computer will display **FINISHED** followed by **Practice trial 2 of 2**. Press **[SPACE]** to continue.

Trial 2 (practice)

Now, instruct the subject as follows:

Now I would like you to have a go. Two boxes will again change colour and as before you have to remember the order.

When the tone sounds, say to the subject:

Now touch them in the **reverse** order to the order in which you saw them change colour.

Which one changed colour last?

And which one changed colour before that?

If necessary, say:

Make sure you take your finger away from the screen between touches, but wait between each touch until you see the box change colour.

The following prompts may be given:

Keep looking.

Take your finger away from the screen between touches.

At the end of the trial the computer will display **FINISHED** followed by **NEW SET**.

Trial 3 onwards

Press **SPACE** to continue with each new trial when **NEW SET** is displayed.

Repeat the instructions as necessary.

At each new level indicate how many boxes will change colour (use the number in the left hand corner of the computer screen as a reminder). The subject should have acquired the procedure and it is probable that they will not need prompting.

Be sure to emphasise the need to withdraw the finger from the screen after each response and, if necessary, to wait until the box just touched turns white again before touching the next one. Also emphasise that the subject should wait until the auditory signal occurs before responding and specify for each level how many boxes will change colour. If the subject makes an obvious mistake or appears confused, repeat the essential instructions.

If the subject makes mistakes in all sequences at a particular level the test will terminate.

SSP

Chapter 22

Stop Signal Task (SST)

SST description

SST is a classic stop signal response inhibition test, which uses staircase functions to generate an estimate of stop signal reaction time.

This test gives a measure of an individual's ability to inhibit a prepotent response.

- ! SST requires specific audio hardware for accurate performance. Please refer to www.cantabeclipse.com/accurateaudiohardware to check your system's compatibility before testing subjects.

Display

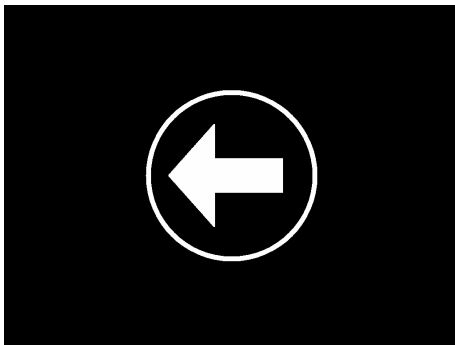


Figure 22-1 The SST task screen

The task screen for SST shows a white ring, displayed to alert the subject, and then a visual stimulus displayed within the ring after a fixed 500ms delay, consisting of an arrow pointing to the left or to the right.

Task

This test consists of two parts.

In the first part, the subject is introduced to the press pad, and told to press the left hand button when they see a left-pointing arrow, and the right hand button when they see a right-pointing arrow. There is one block of 16 trials for the subject to practice this.

In the second part, the subject is told to continue pressing the buttons on the press pad when they see the arrows, as before, but, if they hear an auditory signal (a beep), they should withhold their response and not press the button.

There are 5 assessed blocks, each of 64 trials. Each block is divided into four sub-blocks of 16 trials for analysis purposes only – there is no gap between these sub-blocks and they are not evident to the subject. Every sub-block contains twelve ‘go’ trials, with no auditory stop signal, and four ‘stop’ trials, with an auditory tone played following the ‘stop signal delay’ (SSD) period, which is measured from the onset of the arrow stimulus. The twelve go trials and four stop trials are given in a random order within each sub-block, but all trials from one sub-block take place before the next sub-block begins. In each sub-block, exactly one stop trial derives from each of four series (staircases), which at the start of the test are as follows:

Series number	Initial SSD (delay after visual stimulus)	Go stimulus
1	100ms	left arrow
2	200ms	right arrow
3	400ms	left arrow
4	500m	right arrow

The timing of the auditory stop signal changes throughout the test, depending on the subject’s past performance, so that stopping occurs approximately 50% of the time for each subject. The shorter the SSD, the more likely it is that the subject will be able to hold off responding to the arrow. Note that for some subjects the SSD may become negative: that is, the auditory signal occurs before the onset of the arrow stimulus. The timing of the four series is expected to converge as the test proceeds.

At the end of every assessed block, a feedback screen is displayed showing a graphical representation of the subject's performance, which the test administrator should explain to the subject, as well as encouraging them to go faster.

Feedback screen

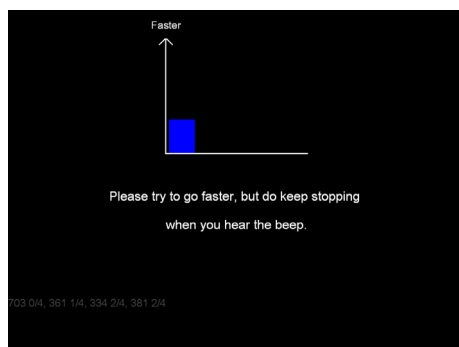


Figure 22-2 The SST feedback screen at the end of the first assessed block

After the first assessed block, a screen similar to the above is shown. The blue bar on the graph is a visual representation to the subject of the speed of their responses – the taller the bar, the faster their response.

Below the graph is a message to the subject – in this case, the subject has been going reasonably quickly and has been reasonably good at stopping at the beep. The message reinforces that the subject should try to go faster, and continue to stop at the beep. Various messages are displayed, depending on whether the subject is pressing the buttons too slowly and/or failing to stop at the beeps sufficiently.

Read this message to the subject, emphasising that pressing the buttons quickly and stopping at the beep are both important.

If your study design requires that you should explain the series of grey numbers below the graph, please refer to *Additional feedback information* on page 186.

At the end of each assessed block, an additional blue bar is displayed on the feedback screen. You can use this to show the subject how their speed of response is improving

(or not). An additional sequence of numbers, representing the subject's performance in the most recent block, is also displayed.

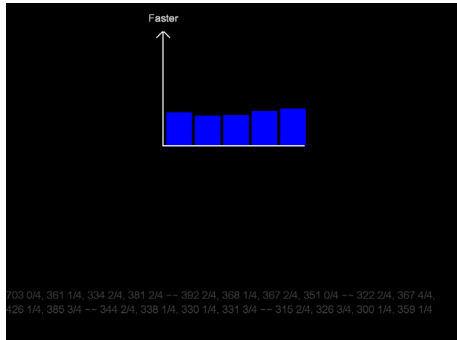


Figure 22-3 The SST feedback screen at the end of the fifth assessed block

At the end of the fifth assessed block, a graph similar to the one above is shown, with five vertical columns, and five sequences of numbers below it (each block is separated by two ~ characters) so if you wish you can explain to the subject how their performance changed during the test.

Additional feedback information

Additional feedback information, in the form of grey numbers, is displayed on the feedback screen below the feedback message. These online analysis numbers provide the opportunity to researchers to give additional feedback to the subjects when monitoring performance on a block-by-block basis is an integral part of the study design.

Generally, it is sufficient to explain the feedback message (in white) and the graph to the subject.

703 0/4, 361 1/4, 334 2/4, 381 2/4

Figure 22-4 A sequence of numbers from the SST feedback screen at the end of the first assessed block

An enlarged example of the number sequence shown on Figure 22-2 is shown above, with enhanced contrast so it is clearly legible.

The sequence contains four pairs of numbers; each pair of numbers relates to one sub-block and gives the mean reaction time (in milliseconds) for correct ‘go’ trials (ones where there was no beep) and the number of successful ‘stop’ trials, together with the total number of stop trials.

The first pair of numbers, in this case 703 0/4, is for the first sub-block of 16 trials. 703 is the mean reaction time in milliseconds for correct ‘go’ trials, and 0/4 is the number of successful ‘stop’ trials (trials where the subject responded correctly to the auditory signal by not pressing the button).

The second pair of numbers, in this case 361 1/4, applies to the second sub-block of 16 trials.

334 2/4 applies to the third sub-block of 16 trials.

381 2/4 applies to the fourth sub-block of 16 trials.

So, during this block, the subject improved at stopping when they heard the beep, but their reaction time on the correct trials was reasonably good. It also appears that the effort of concentrating on the beeps had the effect of slowing down their reaction time for the correct ‘go’ trials.

703 0/4, 361 1/4, 334 2/4, 381 2/4 -- 392 2/4, 368 1/4, 367 2/4, 351 0/4 -- 322 2/4, 367 4/4, 426 1/4, 385 3/4 -- 344 2/4, 338 1/4, 330 1/4, 331 3/4 -- 315 2/4, 326 3/4, 300 1/4, 359 1/4

Figure 22-5 A sequence of numbers from the SST feedback screen at the end of the fifth assessed block

The subject whose results are shown above was reasonably fast in the first block, and was not too good at stopping at the beep (only five stops in 16 stop trials). In the second block, the subject was a little slower, but was still bad at stopping at the beep (again, five stops in 16 stop trials). In the third block, the subject was slightly faster but better at stopping (ten stops in 16 stop trials), and in the fourth block, the subject was faster again, but poorer at stopping (seven stops out of 16 trials). In the fifth block, the subject’s speed had increased again, but their ability to stop was no better or worse (seven stops in 16 stop trials).

SST test modes

The SST test has one mode:

- clinical
 - ! This test uses a 2-button press pad. If no press pad is available, and you wish to evaluate the test, you can use the **F7** and **F8** keys on your computer keyboard. Always test subjects using a press pad.
 - ! Because the auditory stop signal is a very important part of this test, you should set the volume level for your PC so that it is at an easily audible level for the subject before you run the test. For some tablet PCs or laptop PCs with built-in speakers, you may need to set the volume level to maximum using the Windows taskbar or control panel.
 - ! It is vital that the volume setting is identical for all subjects whose results will be compared. The simplest way of doing this is to use the same hardware and volume setting to test each subject.

SST administration script

- ! The press-pad is used in this test. Ensure it is in front of the screen, and that the subject can reach it comfortably with the index finger of each hand resting gently on each button. Please refer to Figure 2-2 on page 25.
- ! Try to distract the subject as little as possible during this test, as they will find the test much easier if they are allowed to concentrate on the screen. In particular, make sure you are seated out of the subject's line of sight.

! During the administration of this test, you will need to explain the feedback graph to the subject. Please ensure that you are familiar with this graph (refer to the Feedback screen information on page 185) before you administer the test to any subjects.

Stage 1 (training)

With the SST start screen displayed, give the subject the press pad and show them how it works. Let them try it until they are comfortable, using the index finger of the left hand to press the left button and the index finger of the right hand to press the right button. Their fingers should be resting lightly over the buttons on the press pad but not pressing down.

Now explain the first part of this test:

Get ready to respond when you see a circle on the screen. An arrow will appear in the circle, pointing either to the left or to the right.

When you see the arrow pointing to the left, press the **left** button on the press pad.

When you see the arrow pointing to the right, press the **right** button on the press pad.

Press the buttons as quickly as you can, whilst trying to avoid making mistakes.

Press **SPACE** to begin the test.

If the subject presses the correct button there is no feedback, but if the subject presses the wrong button the word **WRONG** is displayed on the screen.

There are 16 practice trials.

At the end of this stage the screen displays **Please wait**.

Second stage (stop task)

Explain this stage to the subject while the screen is displaying **Please wait**.

You should emphasise to the subject that responding as fast as possible to the arrows AND trying their best to stop at the beep are equally important.

Press **SPACE** to start the stage.

If the subject becomes frustrated or distressed at being unable to stop at the beep, reassure them sympathetically:

At the end of the stage a feedback screen is shown. Explain this to the subject as follows, making sure that you have previously read the information about the feedback screen on page 185.

Now you have to do the same as before, pressing the left button when you see the left arrow and the right button when you see the right arrow, BUT, if you hear a BEEP, you must STOP yourself and DO NOT press either button.

You won't always be able to stop, but sometimes you will. Try your best.

It's not an easy test – just try your best.

You can see a graph on the screen – this shows how fast you have been pressing the buttons. [your performance shows...]

From now on, please try and go even faster, pressing the correct buttons, and remember to stop when you hear the beep.

Further stages

Continue with the test as for the second stage, pressing **SPACE** to start the next stage after explaining the feedback for the stage which has just been completed to the subject.

At the end of each stage, the graph is shown again, with an additional blue bar representing the stage which has just been completed. There are five assessed stages; the graph for the fifth and final assessed stage shows five blue bars.

Press **SPACE** to end the test.

SST

Chapter 23

Spatial Working Memory (SWM)

SWM description

SWM is a test of the subject's ability to retain spatial information and to manipulate remembered items in working memory.

It is a self-ordered task, which also assesses heuristic strategy. This test is a sensitive measure of frontal lobe and 'executive' dysfunction.

Display

The test begins with a number of coloured squares (boxes) being shown on the screen. The aim of this test is that, by process of elimination, the subject should find one blue 'token' in each of a number of boxes and use them to fill up an empty column on the right hand side of the screen. The number of boxes is gradually increased from three to eight boxes. The colour and position of the boxes used are changed from trial to trial to discourage the use of stereotyped search strategies.

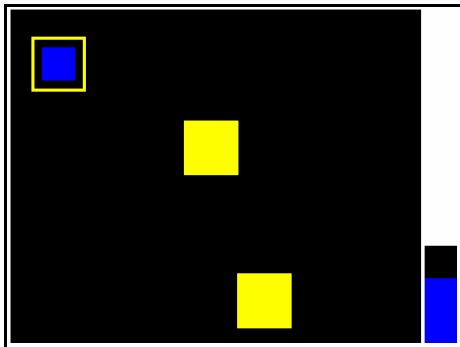


Figure 23-1 The SWM task screen (3 boxes)

Task

The subject must touch each box in turn until one opens with a blue token inside (a search). When a blue token has been found, the subject has to place it in the right column ('home') by touching the right-hand side of the screen.

The subject must then begin a new search for the next blue token. It may be in any of the boxes that so far have been empty. This is repeated, until a blue token has been found in every box on the current screen.

Touching any box in which a blue token has already been found is an error.

The subject decides the order in which the boxes are searched. The computer determines the number of empty boxes that must be visited (discounting errors). Performance at the harder levels of this task is enhanced by the use of a heuristic search strategy.

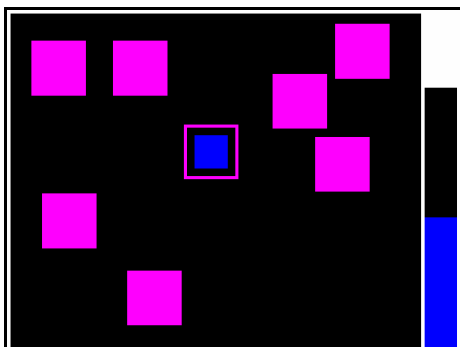


Figure 23-2 The SWM test screen (8 boxes)

SWM test modes

The SWM test has one mode:

- clinical

SWM administration script

When the test starts, three red boxes will be displayed on the screen and on the right hand side is a black area called 'home'. Refer to the coloured squares as 'boxes' to get across the idea that the blue tokens may be hidden inside them. Demonstrate with the first trial and then let the subject practise on the second trial.

Set 1 – Three coloured boxes

With the SWM start screen displayed, press **SPACE** to display the SWM task screen and say:

For this test you will see some coloured boxes on the screen. What you have to do on each go is to look for a blue token that the computer has hidden inside one of the boxes. Only one token will be hidden at a time. You have to collect enough blue tokens to fill the black hole ('home') on the right of the screen. To look inside a box all you have to do is touch it like this.

Touch the box in the middle of the screen. (Use this box to avoid alerting the subject to any kind of organised sequential strategy).

This box does not have a blue token in it so I shall try a different box.

Touch another box.

This box has a blue token inside it and now I am going to move it over here to fill the black hole (touch the black hole on the right hand side of the screen).

The following instruction is of crucial importance and must be strongly emphasised.

Now I have found a blue token in this box...

Point to the one where you found the blue token.

...there will **never** be one in there again, so **I must not go back to it**. There are two more blue tokens to find, but the computer **never** uses the same box twice for the blue token, so I must touch another one.

Touch another.

There is no token inside this box so I will try another.

Touch the box you have not yet found a token in to reveal the blue token and then touch the right hand side of the screen.

Now I have found two tokens and the last one must be in here.

Touch the only box you have not yet found a token in to reveal the blue token and then touch the right hand side of the screen.

Now I have found all three tokens and I have finished because I have filled up the black hole completely with blue tokens.

The computer will display **COMPLETE** and play a short tune. After a pause the words **NEW SET** will appear.

Now say:

Now you try, please.

Set 2

Press **SPACE** and three yellow boxes will appear.

Touch one of the boxes to search for a blue token.

The subject should touch one of the boxes that will open up to reveal a blue token.

Now you have got one blue token to fill the black hole.

The subject should transfer the token by touching on 'home'.

Look for another one but remember that it will be in a different box this time.

The subject should touch one of the other boxes and will not find a blue token this time.

Try another one.

The subject should touch the remaining box which has not yet been searched and this time will find a blue token.

If necessary, say:

The subject should then touch the box in which a token has not yet been found and use the token found to fill the black hole.

If the subject touches the correct box, give encouragement.

If the subject makes a mistake, say:

Good, now you have found the second blue token.

Now put the token in the black hole.
Now you only have one more token to find.

Remember not to return to a box where you got a blue token, as the computer will never hide it in that box again.

Set 3

Press **SPACE** to go on to the next trial.

For Set 3, repeat the essential instructions used in practice as follows (however, if the subject has clearly understood the instructions, let them proceed without prompt).

Prompt if the subject returns to a box where they already found a blue token with:

Remember not to return to a box where you have already found a blue token, as the computer will never hide it in that box again.

Now say:

Look for a blue token... try another... there it is – put it in the black hole and look for another blue token... it will be in a different box from where you found the other one... put it on the right to fill the hole.

Give the following prompt if they open an empty box:

Bad luck, try again.

Give the following prompt if they open one with a blue token:

Good. Now put it in the black hole or home and find the other two.

There will be one more practice set with 3 boxes and then the computer will move onto the test trials which will include four with 4 boxes, 4 with 6 boxes, and four with 8 boxes.

Now there are **N** boxes and **N** blue tokens to find.

After the first blue token has been found use the instruction:

You have **N-1** more to find

Avoid reminding the subject of this from now on.

Use the following prompts:

Put it on the right/home.
Look for another one.

After the 4th 8-box trial, the test ends.

Chapter 24

Verbal Recognition Memory (VRM)

VRM description

The VRM test assesses immediate and delayed memory of verbal information under free recall and forced choice recognition conditions.

In the VRM test, the subject is shown a list of 12 (or 18, depending on the mode) words and then asked to:

- produce as many of the words as possible immediately following the presentation
- recognise the words they have seen before from a list of 24 (or 36) words containing the original 12 (or 18) words and 12 (or 18) distractors
- following a delay of 20 minutes, recognise the words they have seen before from another list of 24 (or 36) words containing the original list and 12 (or 18) new distractors.

Display

In the presentation phase, one word at a time is shown on the screen.

If you want to make the words look larger on the screen, refer to the *Options* section of the *CANTABclipse Software User Guide*, which explains how to use large fonts in verbal tests.



Figure 24-1 The VRM presentation phase with words at normal size (left) and large size (right)

In the free recall phase, the screen is turned away from the subject and towards the administrator, so that the administrator can record words produced by the subject.

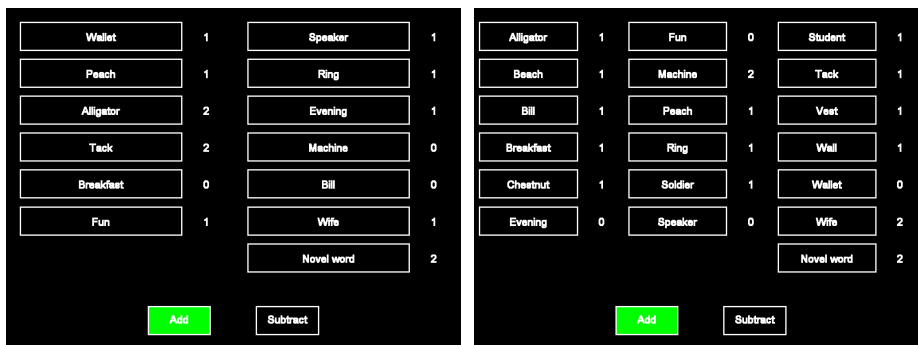


Figure 24-2 The VRM free recall phase screen for 12-word modes (left) and 18-word modes (right)



Figure 24-3 The VRM recognition phase (and delayed recognition phase) screen with words at normal size (left) and large size (right)

Task

The subject is asked to recall as many of the words as possible, then recognise the words when shown them together with an equal number of distractor words.

VRM test modes

There are 20 modes for the VRM test; ten 12-word modes (below) and ten 18-word modes, whose names differ by having ‘-18-words’ at the end, for example ‘clinical-immediate-18-words’:

- clinical-immediate
- parallel1-immediate
- parallel2-immediate
- parallel3-immediate
- parallel4-immediate
- clinical-delayed
- parallel1-delayed
- parallel2-delayed

- parallel3-delayed
- parallel4-delayed

The immediate setups (which comprise the presentation phase, free recall and the recognition phase) should always be run before the delayed setups (which comprise the recognition phase only) in a battery. Clinical and parallel setups have different word lists.

! Always use a delayed setup that matches the immediate setup, so that the word lists match.

The delayed setups are designed so that you can run the recognition phase of the test 20 minutes after the initial presentation of the patterns, to test delayed verbal recognition memory. You may wish to run other tests between the main part and the delayed part of the VRM test. However, please ensure that:

- The tests take around 20 minutes to run.
- The tests do not have a significant verbal component. Most of the CANTABeclipse tests are suitable for this purpose, with the exception of AGN and GNT.
- The tests do not have a significant episodic memory component (for example, PAL). Tests such as IED, SOC, RTI, RVP, MTS, SSP or SWM could be suitable.
- You have carefully considered any possible interference effects.

VRM immediate administration script

Presentation phase

With the VRM start screen displayed, say this:

You are going to see some words appearing on the screen, one by one. I would like you to read each word aloud and try to remember it as best you can. You do not need to remember the order in which the words appear.

Press **SPACE** to start the test.

If the subject reads a word incorrectly, correct them before the word disappears from the screen.

No, it says “Banana”, not “Beetle”.

When all 12 (or 18) words have been presented, a white square is displayed in the bottom right hand corner of the screen.

Free recall phase

Turn the screen away from the subject, and towards you for the free recall phase.

The subject must not be able to see the screen after you have turned it away from them.

Press **SPACE** to display the free recall screen, which has a list of all the 12 (or 18) words.

Say to the subject:

Can you now tell me as many words as you can from that list you have just seen.

To register the subjects' response, simply touch each word on the screen as they produce it.


If the subject perseverates, record the number of repetitions by touching the word each time they repeat it.

If a novel word is produced, touch 'Novel word' each time they produce a novel word.

If you touch the wrong word by mistake, touch the Subtract button, then touch the word again.

If the subject has not produced all the words on the list, prompt them by saying:

Can you remember any other words?

At the end of the free recall phase, press  to clear the screen.

Once the screen is clear, except for a white square displayed at the bottom, turn the screen back towards the subject for the immediate recognition phase.

Immediate recognition phase

Say to the subject:

You are now going to see some more words, some of which you saw in the last list, and some of which you have not seen. For each word, I would like you to say whether you have seen it before or not.

When the first word comes up, say:

Have you seen this word before or not?
Touch 'Yes' if you have, or 'No' if you haven't.

Encourage the subject to make their response by touching 'Yes' or 'No' underneath the word.

If the subject is unsure whether they have seen a word before or not, encourage them to have a guess.

Just have a guess.

The test ends after the subject has touched 'Yes' or 'No' under the final word. (There are 24 or 36 words in the recognition phase, depending on the mode chosen)

VRM delayed administration script

Delayed recognition phase

To be run 20 minutes after the first (immediate) part of the test.

Say to the subject:

A short while ago, you saw some words. We are now going to see how many of those you can remember.

You will see some words, some of which you have seen earlier today, and some of which you have not seen. For each word, I would like you to say whether you have seen it before or not.

When the first word comes up, say.

Have you seen this word before or not?
Touch 'Yes' if you have, or 'No' if you haven't.

Encourage the subject to make their response by touching 'Yes' or 'No' underneath the word.

If the subject is unsure whether they have seen a word before or not, encourage them to have a guess.

Just have a guess.

The test ends after the subject has touched 'Yes' or 'No' under the final word. (There are 24 or 36 words in the recognition phase, depending on the mode chosen)

Chapter 25

Description of Outcome Measures

Outcome measures are calculated from the detailed data stored in CANTABeclipse when each test is run.

Each measure pertains to a particular test, and has a single value for each run of that test (for example, 'Percent Correct' during the assessment part of a whole test).

In this chapter, the outcome measures are arranged by test, in alphabetical order, and are then, if appropriate, grouped within the test by measure type.

- ! **References to methods of calculation of the measures generally refer to the clinical modes of the tests concerned. Please be aware that some tests have different parallel modes.**

AGN (Affective Go/No-go)

There are three main outcome measures for the AGN test:

- AGN Mean correct latency
- AGN Total commissions
- AGN Total omissions

Each of these outcome measures can have various options applied to it in the Results Manager Summary Template Definition window (see the *CANTABeclipse Software User Guide*) to filter the results used in the calculation of each measure. Some examples of this are given below. If no options are applied to a measure (the option columns are left blank), all the assessed blocks are used for calculation of that measure.

- Option 1 is shift/non-shift (a shift block is when the subject's response orientation must shift valence between blocks, for

example Neg-Pos; a non-shift block is when the subject's response orientation remains the same between blocks, for example Pos-Pos)

- ❑ Option 2 is target type (positive/neutral/negative)
- ❑ Option 3 is block number (1 to 18 for the assessed blocks)

Combining options is possible, but needs to be done with some care. Combining options 1 and 2 for shift and target type is fine – for example, you might wish to calculate mean correct latency for all shift blocks where the target type is positive – but it is possible to combine options 1 and 3 and options 2 and 3 incorrectly (for example, block 4 is never a shift block, but it is possible to set option 1 to shift and option 3 to block 4) so that you will not get meaningful results.

Option 2 also needs to be applied with care – if the AGN test is run in the pos-negped mode, which never has neutral stimuli, specifying a neutral target type will not give meaningful results.

Latency

AGN Mean correct latency

If all options are left blank, this is the mean time taken to respond correctly to each target word stimulus in all the assessed blocks.

AGN Mean correct latency (shift or non-shift)

If option 1 is set to shift or non-shift, this is the mean time taken to respond correctly to each target word stimulus in shift blocks or non-shift blocks.

AGN Mean correct latency (by positive, neutral or negative target type)

If option 2 is set to a target type (positive, neutral or negative) this is the mean time taken to respond correctly to each target word stimulus in the blocks with targets matching this target type.

AGN Mean correct latency (block n)

If option 3 is set to a block number n, this is the mean time taken to respond correctly to each target word stimulus in that block.

Total commissions

A commission is an incorrect response (a button press) to a distractor stimulus

AGN Total commissions

If all options are left blank, this is the total number of responses to distractors in all assessed blocks.

AGN Total commissions (by shift)

If option 1 is set to shift or non-shift, this is the total number of responses to distractors in shift blocks or non-shift blocks.

AGN Total commissions (by positive, neutral or negative target type)

If option 2 is set to a target type (positive, neutral or negative) this is the total number of responses to distractors in the blocks with targets matching this target type.

AGN Total commissions (block n)

If option 3 is set to a block number n, this is the total number of responses to distractors in block n.

Total omissions

An omission is an incorrect response (no response) to a target stimulus.

AGN Total omissions

If all options are left blank, this is the total number of missed responses to targets in all assessed blocks.

AGN Total omissions (by shift)

If option 1 is set to shift or non-shift, this is the total number of missed responses to targets in shift blocks or non-shift blocks.

AGN Total omissions (by positive, neutral or negative target type)

If option 2 is set to a target type (positive, neutral or negative) this is the total number of missed responses to targets in the blocks with targets matching this target type.

AGN Total omissions (block n)

If option 3 is set to a block number n, this is the total number of missed responses to targets in block n.

BLC (Big/Little Circle)

There are five outcome measures for the BLC test:

BLC Mean correct latency

This is the speed of response, which shows how quickly the subject touched the correct stimulus after it was displayed on the screen. Latency is measured in milliseconds.

BLC Percent correct

This is the number of correct responses expressed as a percentage of total responses. BLC Percent correct gives an overall indicator of task performance on Big/Little Circle. This is useful, as some subjects suffering considerable cognitive difficulties may still be able to attempt Big/Little Circle.

BLC Total correct

This is the total number of correct responses made out of a possible 40 in the clinical mode.

BLC Total errors

This measure is the number of occasions upon which the subject made an incorrect response out of a possible 40 in the clinical mode.

BLC Total attempts

This is the total number of attempts made to touch the correct stimulus (40 in the clinical mode if the test was completed; fewer if the test was aborted).

CGT (Cambridge Gambling Task)

The Cambridge Gambling Task has six outcome measures, each of which can have one or two options applied to it. The available options are:

- Gamble type
- Ratio chosen.

Gamble type, if selected, restricts the trials used to calculate the measure to those of the specified gamble type, ascending or descending. If the Gamble type option is left blank, all trials will be used to calculate the measure.

Ratio chosen, if selected, restricts the trials used to calculate the measure to those of the specified ratio, which may be 9:1, 8:2, 7:3 or 6:4, where the first number is the number of boxes of the chosen colour. For some measures, an extended set of ratios are available: 9:1, 8:2, 7:3, 6:4, 5:5 as before, and then ratios where the lower number is the number of boxes of the chosen colour 6:4 (4 chosen), 7:3 (3 chosen), 8:2 (2 chosen) and 9:1 (1 chosen). :

CGT Quality of decision making

Most of the gamble trials offer a choice on which more of the locations are of one colour than the other. On these trials, the subject may choose to gamble on the more likely, or the less likely, colour. This measure is the proportion of these trials on which the subject chose to gamble on the more likely outcome. The measure is only calculated for non-practice trials. Option 1, Gamble Type, and option 2, Ratio, may be applied to this measure.

CGT Deliberation time

The mean latency from presentation of the coloured boxes to the subject's choice of which colour to bet on. Deakin et al. (2004) note that rapid decisions are a component of reflection impulsivity, although they point out that CGT is not a task in which delay increases the information available to the subject, the general context for reflection impulsivity. The measure is only calculated for non-practice trials. Option 1, Gamble Type, and option 2, Ratio, may be applied to this measure.

CGT Risk taking

This measure reports the mean proportion of the current points total (the nominal percentage, between 5% and 95%, which is used to calculate the stake displayed in the stake box) that the subject chose to risk on gamble test trials for which they had chosen the more likely outcome, i.e. trials on which they had more chance of winning than losing. The measure is only calculated for non-practice trials. Option 1, Gamble Type, and option 2, Ratio, may be applied to this measure.

CGT Risk adjustment

Subjects will typically gamble more of their current points when the odds are strongly in their favour. This measure reflects the tendency to bet a higher proportion of their points on trials when the large majority of the boxes are the colour chosen than when a smaller majority of the boxes are of the colour chosen.

In standard modes with ten boxes, it is calculated (using the nominal percentage, between 5% and 95%) as twice the mean proportion risked on trials when nine of the boxes matched the colour chosen, plus the mean proportion risked on trials when eight of the boxes matched the colour chosen minus the mean proportion risked on trials when seven of the boxes matched the colour chosen, minus twice the mean proportion risked on trials when six of the boxes matched the colour chosen. This is then divided by the mean proportion risked over all of these trials.

The measure is only calculated for non-practice trials. Option 1, Gamble Type, may be applied to this measure.

CGT Delay aversion

Subjects who are unable or unwilling to wait will bet larger amounts when the possible bet amounts are presented in descending order than they do when the amounts are presented in ascending order. This measure reflects this tendency. It is calculated by subtracting the Risk Taking measure, calculated for ascending gamble trials, from the Risk Taking measure, calculated for descending trials. The measure is only calculated for non-practice trials. Option 1, Ratio, may be applied to this measure.

CGT Overall proportion bet

This measure reports the average proportion of the current points total (using the nominal percentage, between 5% and 95%) that the subject chose to risk on each gamble test trial, including trials on which they bet on the less likely outcome, and trials on which both outcomes were equally likely. The measure is only calculated for non-practice trials. Option 1, Gamble Type, and option 2, Ratio, may be applied to this measure.

CRT (Choice Reaction Time)

There are thirteen main outcome measures for the CRT test, which may be divided into the following categories:

- Latency (response speed)
- Correct responses
- Incorrect responses (wrong button pressed)
- Commissions (responses that are too early)
- Omissions (responses that are too late or missing)

Each of these outcome measures can have various options applied to it in the Results Manager Summary Template Definition window (see the *CANTABclipse Software User Guide*) to filter the results used in the calculation of each measure. Some examples of this are given below. If no options are applied to a measure (the option columns are left blank), all the assessed blocks are used for calculation of that measure.

- Option 1 is 'block number' – in the clinical mode, block 1, 2 or 3.
- Option 2 is 'block type' – can be set to assessed/practice/combined, to determine whether assessment blocks only, practice blocks only or both types of blocks (combined blocks) are used.
- Option 3 is 'LeftRight'. If this is not set, all trials are included; if set to 'left chosen', only trials where the subject responded with the left button are included, if set to 'right chosen' only trials where the subject responded with the right button are included. If it is set to 'left correct', only trials where the left button was the correct response to make are included, and if set to 'right correct', only trials where the right button was the correct response to make are included.
- Option 4 is 'correctness', and applies to the latency measures only. If it is not set, both correct and incorrect (but not omission or commission) trials are included; if it is set to 'correct', only trials

that had a correct response are included; if it is set to ‘incorrect’, only trials that had an incorrect response are included.

Combining options is possible, with care – for example, if you set option 1 to ‘block 1’, which is a practice block and option 2 to ‘assessed’ you will exclude all the trials, as there are no assessed trials in block 1.

You can create a template to produce a summary datasheet containing, for example, CRT Mean latency for both the left and the right correct button presses in block 1, block 2 and block 3.

Latency

CRT Mean latency

The mean latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

CRT Median latency

The median latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

CRT Maximum latency

The maximum latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

CRT Minimum latency

The minimum latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

CRT S.D. latency

The sample standard deviation of the latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

Correct

For a correct response, the subject must press the correct button within the response window. Option 4, ‘correctness’, does not apply to these measures. For Option 3,

'LeftRight', 'left chosen' is equivalent to 'left correct' and 'right chosen' is equivalent to 'right correct'.

CRT Total correct trials

The number of trials (that have not been filtered out through options set in the template) for which the trial outcome was correct.

CRT Percent correct trials

The percentage of trials (that have not been filtered out through options set in the template) for which the trial outcome was correct.

Incorrect

For an incorrect response, the subject pressed the wrong button within the response window. Option 4, 'correctness', does not apply to these measures. For option 3, 'LeftRight', 'left correct' and 'right correct' do not apply to these measures.

CRT Percent incorrect trials

The percentage of trials (that have not been filtered out through options set in the template) for which the trial outcome was incorrect.

CRT Total incorrect trials

The number of trials (that have not been filtered out through options set in the template) for which the trial outcome was incorrect.

Commissions

A commission error is recorded when the subject presses a button too soon. Option 4, 'correctness', does not apply to these measures.

CRT Percent commission trials

The percentage of trials (that have not been filtered out through options set in the template) for which the trial outcome was a commission error.

CRT Total commission errors)

The number of trials (that have not been filtered out through options set in the template) for which the trial outcome was a commission error.

Omissions

An omission error is recorded when the subject presses a button too late. Option 4, 'correctness', does not apply to these measures.

CRT Total omission errors

The number of trials (that have not been filtered out through options set in the template) for which the trial outcome was an omission error.

CRT Percent omission trials

The percentage of trials (that have not been filtered out through options set in the template) for which the trial outcome was an omission error.

DMS (Delayed Matching to Sample)

The outcome measures for the DMS test can be divided into three groups:

- Numbers and percentages correct
- Latency
- Statistical analysis

Numbers and percentages correct

DMS Total correct

This measure reports the total number of trials in which the subject selected the correct stimulus on their first response.

DMS Total correct (all delays)

This measure reports the total number of trials in which the subject selected the correct stimulus on their first response when the target stimulus and the three distractors were presented after the stimulus had been hidden, with delays of 0ms, 4000ms and 12000ms.

DMS Total correct (simultaneous)

This measure reports the number of trials for which the subject selected the correct stimulus in simultaneous trials (when the stimulus was left in view whilst the target stimulus and the three distractors were simultaneously presented).

DMS Total correct (0ms delay)

This measure reports the total number of trials for which the subject selected the correct stimulus when the target stimulus and the three distractors were presented after 0 ms delay.

DMS Total correct (4000ms delay)

This measure reports the total number of trials for which the subject selected the correct stimulus when the target stimulus and the three distractors were presented after 4000ms delay.

DMS Total correct (12000ms delay)

This score reports the total number of trials for which the subject selected the correct stimulus when the target stimulus and the three distractors were presented after 12000ms delay.

DMS Percent correct

This measure reports, as a percentage, the total number of trials upon which a correct selection was made on the subject's first response.

DMS Percent correct (simultaneous)

This measure reports, as a percentage, the number of occasions upon which the subject selected the correct stimulus in trials when the stimulus was left in view whilst the target stimulus and the three distractors were simultaneously presented.

DMS Percent correct (all delays)

This measure reports, as a percentage, the number of occasions upon which the subject selected the correct stimulus in trials when the target stimulus and the three distractors were presented after the stimulus had been hidden, with delays of 0ms, 4000ms and 12000ms.

The percentage of correct solutions for all delay conditions will give a good overall impression of visual memory ability, when compared with the percentage of correct

solutions for the simultaneous condition. The discrepancy between percent correct (simultaneous) and percent correct (all delays) indicates the increased memory load of the delay conditions.

DMS Percent correct (0ms delay)

This measure reports, as a percentage, the number of occasions upon which the subject selected the correct stimulus in trials when the target stimulus and the three distractors were presented after the stimulus had been hidden, with a delay of 0ms.

DMS Percent correct (4000ms delay)

This measure reports, as a percentage, the number of occasions upon which the subject selected the correct stimulus in trials when the target stimulus and the three distractors were presented after the stimulus had been hidden, with a delay of 4000ms..

DMS Percent correct (12000ms delay)

This measure reports, as a percentage, the number of occasions upon which the subject selected the correct stimulus in trials when the target stimulus and the three distractors were presented after the stimulus had been hidden, with a delay of 12000ms.

Latency

DMS Mean correct latency

This measure reports the average speed of response in all trials where the subject selected the correct stimulus.

DMS Mean correct latency (simultaneous)

This measure reports the average speed of response in trials where the stimulus was left in view whilst the target stimulus and distractors were presented simultaneously. Latency is measured in milliseconds.

DMS Mean correct latency (all delays)

This measure reports the average speed of response in trials where the target stimulus and distractors were presented after a delay after the stimulus had been hidden, with delays of 0ms, 4000ms and 12000ms. Latency is measured in milliseconds.

DMS Mean correct latency (0ms delay)

This measure reports the average speed of correct responses in trials where the target stimulus and distractors were presented after the stimulus had been hidden, with a delay of 0ms.

DMS Mean correct latency (4000ms delay)

This measure reports the average speed of correct responses in trials where the target stimulus and distractors were presented after the stimulus had been hidden, with a delay of 4000ms.

DMS Mean correct latency (12000ms delay)

This measure reports the average speed of correct responses in trials where the target stimulus and distractors were presented after the stimulus had been hidden, with a delay of 12000ms.

Statistical analysis

Elliott *et al.* (*Psychological Medicine* 1996: 26; 975-989) have identified that patients with unipolar depression have an increased likelihood of making an error having solved the previous problem incorrectly.

More information on Signal Detection Theory (SDT) used when calculating A' and B'' is given in the RVP section later in this chapter.

DMS Prob error given correct

This measure reports the probability of an error occurring when the previous trial was responded to correctly and is used in calculations of A' and B'' (*A prime* and *B double prime*).

DMS Prob error given error

This measure reports the probability of an error occurring when the previous trial was responded to incorrectly and is used in calculations of A' and B'' (*A prime* and *B double prime*).

DMS A'

This is an automatic analysis of the probability of an error given an error. The A' (*A prime*) measure is part of the nomenclature used in signal detection theory and indicates the subject's sensitivity to errors, regardless of error tendency. The result

ranges from 0 to 1, with a high score indicating that the subject made many errors following errors.

DMS B''

This is an automatic analysis of the probability of an error given an error. The B'' (*B double prime*) measure is part of the nomenclature used in signal detection theory and indicates the strength of trace required to elicit an error (range -1.00 to +1.00). A low score shows that the subject is making many errors whereas a score nearing +1.00 shows that the subject is likely to make errors only if they have just made an error. In the context of performance on DMS this can be conceived of as the strength of the effect of an error (e.g. 'emotional reaction') needed to generate an immediately following error.

GNT (Graded Naming Test)

There are six outcome measures for the Graded Naming Test:

GNT total correct

This measure reports the number of objects correctly identified by the subject.

GNT total errors

This measure reports the number of objects incorrectly identified by the subject.

GNT total attempts

This measure reports the number of objects which the subject attempted to identify.

GNT percent correct

This measure reports the percentage of objects correctly identified by the subject.

GNT Normative z-score

This measure reports the number of standard deviations from the mean score, based on the revised norms as given in Warrington EK. 1997 The graded naming test: a restandardisation. *Neuropsychol Rehab.* 7:143–146.

GNT Normative percentile

This measure reports the percentile in the normative database in which the subject's results fall, again, based on the revised norms as given in Warrington EK. 1997.

IED (Intra-Extra Dimensional Set Shift)

The outcome measures for the IED test may be divided into the following groups:

- ❑ Errors
- ❑ Numbers of trials and stages completed

Errors

IED Pre-ED errors

This measure records the number of errors made prior to the extra-dimensional shift of the task. Errors are defined as instances when the subject fails to select the stimulus that is compatible with the current rule.

IED EDS Errors

Errors made in the extra-dimensional stage of the task are labelled EDS errors, as they have been committed at the stage where the subject is required to make an extra-dimensional shift. Errors committed at the reversal stage following the EDS stage are not included.

IED Total errors

This is a measure of the subject's efficiency in attempting the test. Thus, whilst a subject may pass all nine stages, a substantial number of errors may be made in doing so. It is crucial to note that subjects failing at any stage of the test have, by definition, had less opportunity to make errors. The IED Total errors (adjusted) measure attempts to compensate for this.

IED Total errors (adjusted)

This is a measure of the subject's efficiency in attempting the test. Thus, whilst a subject may pass all nine stages, a substantial number of errors may be made in doing so. It is crucial to note that subjects failing at any stage of the test by definition have had less opportunity to make errors. Therefore, this adjusted score is calculated by adding 25 for each stage not attempted due to failure. This value of 25 is used since subjects must complete 50 trials to fail a stage and half of these could be correct by chance alone.

IED Completed stage errors

This is the number of errors made on stages successfully completed. Subjects failing at any stage of the ID/ED shift will have less opportunity to make errors than those who finish, or get closer to finishing, the task. It would therefore be misleading to simply compare errors made in circumstances where different stages were reached (see IED Total errors (adjusted)).

IED errors (block 1)

This is the total number of errors made in block 1, when only one perceptual dimension is present. Failure at this stage of the task indicates impairment in simple discrimination learning.

IED errors (block 2)

This is the total number of errors made in block 2. This measure, taken together with IED errors (blocks 5, 7 and 9), provides a good measure of reversal learning and can be sensitive to impairment shown in disorders such as frontal variant frontotemporal dementia (fvFTD) (Rahman *et al* (1999) *Brain* **122** 1469-1493).

IED errors (block 3)

This is the total number of errors made in block 3, when two perceptual dimensions are present (shape and line), but they are not yet truly 'compound' (the two dimensions are physically and perceptually separated).

IED errors (block 4)

This is the total number of errors made in block 4, when two perceptual dimensions are present and one has been superimposed on the other – they are 'compound'.

IED errors (block 5)

This is the total number of errors made in block 5. This measure, taken together with IED errors made at blocks 2, 7 and 9, provides a good measure of reversal learning and can be sensitive to impairment shown in disorders such as fvFTD (Rahman *et al* (1999) *Brain* **122** 1469-1493).

IED errors (block 6)

This is the total number of errors made in block 6: the number of errors taken to successfully complete an intradimensional shift (the shift of attention to a novel exemplar within a previously relevant perceptual dimension). Taken together with

performance at the extradimensional shift, IED errors (block 8), these two measures give a good indication of attentional ‘flexibility’.

IED errors (block 7)

This is the total number of errors made in block 7. This measure, taken together with IED errors (blocks 2, 5 and 9), provides a good measure of reversal learning and can be sensitive to impairment shown in disorders such as fvFTD (Rahman *et al* (1999) *Brain* **122** 1469-1493).

IED errors (block 8)

This is the total number of errors made in block 8: the number of errors taken to successfully complete an extradimensional (ED) shift (the shift of attention to a novel exemplar of a previously unrewarded perceptual dimension). Taken together with the performance at the intradimensional (ID) shift, IED errors (block 6), these two measures can give a relative measure of attentional ‘flexibility’.

Performance at this stage is sensitive to cognitive deficits in Parkinson’s disease (see Downes *et al.* (1989) *Neuropsychologia*, **27**, 1329-1343) but can also be sensitive to pharmacological manipulation of dopamine function by, for example, sulpiride (Mehta *et al* (1999) *Psychopharmacology*, **146** (2) 162-74).

IED errors (block 9)

This is the total number of errors made in block 9. This measure, taken together with IED errors (blocks 2, 5 and 7), provides a good measure of reversal learning and can be sensitive to impairment shown in disorders such as fvFTD (Rahman *et al* (1999) *Brain* **122** 1469-1493).

Numbers of trials and stages completed

IED Stages completed

This is the total number of stages the subject completed successfully. There are nine stages to be completed in this task in the clinical mode. Subjects completing all stages are deemed to have ‘passed the test’. There are two key stages, the intra-dimensional shift (stage 6) and the extra-dimensional shift (stage 8). Analysis of stage reached has often been conducted using the likelihood ratio method for contingency tables which yields a likelihood ratio statistic $2\hat{I}$ (for further details of this analysis see Robbins, T.

1977 in Iversen, LL. *et al.* (Eds.) *The Handbook of Psychopharmacology*. Vol. 7, pp. 37-82: Plenum Press: New York).

IED Total trials

This is the number of trials completed on all attempted stages. Note that subjects failing at any stage of the test have had less opportunity to complete trials – the IED Total trials (adjusted) measure attempts to compensate for this.

IED Total trials (adjusted)

This is the number of trials completed on all attempted stages with an adjustment for any stages not reached. The adjustment adds 50 for each stage not attempted due to failure at an earlier stage.

IED Completed stage trials

This is the number of trials undertaken on all successfully completed stages.

IST (Information Sampling Task)

The seven outcome measures for the IST test may be divided into the following groups:

- Errors
- Latency
- Other

There is one option for these measures, win condition, which must be set to decreasing or fixed.

Errors

IST Discrimination errors

This is the number of trials where the subject chose a colour that was not in the majority at the point of decision, for the specified win condition. Even if the colour chosen was revealed to be the correct colour, this is considered to be an error, as the subject made a decision which was not logically based on the evidence available to the subject at the time.

IST Sampling errors

This is the number of trials where the subject chose a colour that was not in the overall majority but was in the majority at the point of decision, for the specified win condition.

Latency

IST Mean box opening latency

Box opening latency is the time elapsed between the subject opening a box and then opening a subsequent box, or, for the first box opened, the time elapsed from the start of the trial to the first box opening. This measure calculates the mean of these latencies for the specified win condition.

IST Mean colour decision latency

Colour decision latency is the time elapsed between the start of a trial and the point at which the subject selects the colour they believe to be in the overall majority. This measure calculates the mean of these latencies for the specified win condition.

Other

IST Mean P(Correct)

This is the mean of a per-trial probability value over all trials with the specified win condition. The value is the probability that the colour chosen by the subject at the point of decision would be correct, based only on the evidence available to the subject at that time, and assuming each box has a 0.5 probability of assuming a particular colour. Thus, the value for each trial is:

$$P(\text{correct}) = \frac{\sum_{k=A}^Z \binom{Z}{k}}{2^Z}$$

Where:

Z = number of unopened boxes

and

A = ((number of boxes + 1)/2) – (number of opened boxes of the chosen colour)

(i.e. the minimum number of the unopened boxes that must be of the chosen colour for it to be the correct colour)

IST Mean number of boxes opened per trial

This measure gives the mean number of boxes opened per trial for the specified win condition.

IST Total correct

This is the number of trials for which the subject correctly chose the colour that was in the overall majority for the specified win condition.

MOT (Motor Screening)

There are two outcome measures for the MOT test:

MOT Mean latency

Latency is defined as the time taken for the subject to touch the cross after it appeared. The arithmetic mean is calculated from the latencies of the ten crosses presented to which the subject correctly responded. Latency is measured in milliseconds.

MOT Mean error

This is a measure of the accuracy of the subject's pointing. It measures the mean distance between the centre of the cross and the location the subject touched on the screen, for the ten crosses presented to which the subject correctly responded. The distance is measured in "pixel units" for compatibility with CANTAB for Windows results, based on a screen resolution of 640 x 350 pixels.

MTS (Match to Sample Visual Search)

The outcome measures for the MTS test may be divided into two groups:

- Correct numbers/percentages
- Latencies

Correct numbers/percentages

MTS Total correct

This is the number of correct responses out of a possible 48 assessed trials in the clinical mode. As this task includes speed and accuracy demands, subjects may trade-off speed of response in favour of accuracy, or vice versa.

MTS Percent correct

This is the number of correct responses expressed as a percentage. As this task includes speed and accuracy demands, subjects may trade-off speed of response in favour of accuracy, or vice versa.

Latencies

All latencies are measured in milliseconds.

MTS Mean correct reaction time

This latency measure summarises the time taken to respond to trials correctly, from the time the choices appear, until the time the subject releases the button on the press pad.

MTS Mean correct movement time

This latency measure gives the time taken to respond to trials correctly, from the time the subject releases the button on the press pad until the time the subject touches the screen.

MTS Mean error reaction time

This latency measure summarises the time taken to respond to trials incorrectly, from the time the choices appear, until the time the subject releases the button on the press pad.

MTS Mean error movement time

This latency measure gives the time taken to respond to trials incorrectly, from the time the subject releases the button on the press pad until the time the subject touches the screen.

MTS Mean reaction time (n choices)

This latency measure gives the mean reaction time to make correct responses for trials with n choices available, from the time the n choices appear, until the time the subject releases the button on the press pad. In the clinical mode, n, which you specify in the Option 1 column in the Summary Template editor, may be 1, 2, 4 or 8. See *Summary Templates* in the CANTABeclipse Results Manager chapter of the *CANTABeclipse Software User Guide* for further information.

MTS Mean movement time (n choices)

This latency measure gives the mean movement time to make correct responses for trials with n choices available, from the time the subject releases the button on the press pad until the time the subject touches the screen. In the clinical mode, n, which you specify in the Option 1 column in the Summary Template editor, may be 1, 2, 4 or 8. See *Summary Templates* in the CANTABeclipse Results Manager chapter of the *CANTABeclipse Software User Guide* for further information.

MTS Mean reaction time change (2-8)

This is the mean additional reaction time to make correct responses with 8 stimuli rather than 2. It is calculated by taking the mean of the reaction times (from the time the choices appear until the time the subject releases the button on the press pad) in all trials with 8 choices to which the subject responded correctly first time, and subtracting the mean of the reaction times on all trials with 2 choices to which the subject responded correctly first time.

MTS Mean movement time change (2-8)

This is the mean additional movement time to make correct responses with 8 stimuli rather than 2. It is calculated by taking the mean of the movement times (from the time the subject releases the button on the press pad until the time the subject touches the screen) in all trials with 8 choices to which the subject responded correctly first time, and subtracting the mean of the reaction times on all trials with 2 choices to which the subject responded correctly first time.

OTS (One Touch Stockings of Cambridge)

There are four outcome measures for the OTS test. Each of these outcome measures can have option 1, moves, applied to it in the Results Manager Summary Template Definition window (see the *CANTABclipse Software User Guide*) to restrict the results used in the calculation of the measure to, for example, 2-move problems. OTS Mean latency to first choice has an additional option (option 2) that may be set, to specify whether the first choice was correct or incorrect.

If no option is applied to a measure (all the option columns are left blank), all the assessed problems are used for calculation of that measure.

OTS Problems solved on first choice

This measure gives the number of problems which were solved on the subject's first choice. If option 1 is applied, and n moves selected, the results used to calculate this measure are limited to n-move problems. The result is an integer, and higher is better.

OTS Mean choices to correct

This measure gives the mean number of unique box choices that the subject made on each problem to make the correct choice. The result ranges between 1 and the number of boxes displayed on the screen (6 or 7, depending on the test mode). The lower the number, the better. If option 1 is applied, and n moves selected, the results used to calculate this measure are limited to n-move problems.

OTS Mean latency to first choice

This measure gives the mean latency, measured from the appearance of the balls on the screen until the box was touched. If option 1 is applied, and n moves selected, the results used to calculate this measure are restricted to n-move problems, and if option 2 is applied, the results used to calculate this measure are restricted to those where the first choice was correct or those where the first choice was incorrect. These options may be applied together or separately.

OTS Mean latency to correct

This measure gives the mean latency, measured from the appearance of the balls on the screen until the correct box was touched. If option 1 is applied, and n moves selected, the results used to calculate this measure are restricted to n-move problems.

PAL (Paired Associates Learning)

The outcome measures for the PAL test may be divided into the following groups:

- Errors
- Trials
- Memory scores
- Stages completed

Errors

Errors are made in PAL when the subject selects a box that does not contain the target stimulus.

PAL Total errors

This measure reports the total number of errors. Note that subjects failing at any stage of the test have had less opportunity to make errors than subjects who complete the test - the PAL Total errors (adjusted) measure attempts to compensate for this.

PAL Total errors (n shapes)

In the clinical mode, n may be 1, 2, 3, 6 or 8, and refers to the number of stimuli in the boxes. Possible settings for n for this measure, which you specify in the Option 1 column in the Summary Template editor, are described below. See *Summary Templates* in the CANTABeclipse Results Manager chapter of the *CANTABeclipse Software User Guide* for further information.

PAL Total errors (1 shape)

This measure reports the total number of errors made at the two 1-pattern stages in the clinical mode (when there is a stimulus in one of the six boxes).

PAL Total errors (2 shapes)

This measure reports the total number of errors made at the two 2-pattern stages in the clinical mode (when there is a stimulus in two of the six boxes).

PAL Total errors (3 shapes)

This measure reports the total number of errors made at the two 3-pattern stages in the clinical mode (when there is a stimulus in three of the six boxes).

PAL Total errors (6 shapes)

This measure reports the total number of errors made at the 6-pattern stage in the clinical mode (when there is a stimulus in each of the six boxes).

PAL Total errors (8 shapes)

This measure reports the total number of errors made at the 8-pattern stage (when there is a stimulus in each of the eight boxes).

PAL Total errors (adjusted)

This measure reports the total number of errors, with an adjustment for each stage not attempted due to previous failure. This adjustment is calculated by summing the number of patterns not attempted and subtracting the number of patterns divided by the number of boxes from it. This result is then multiplied by the number of trials allowed for the stage (ten in the clinical mode). Note that for aborted runs, the adjustment is based on the stages, trials and responses not attempted due to the abort, with each missed response giving rise to an adjustment of $1 - 1 / \text{number of boxes}$.

PAL Total errors (n shapes, adjusted)

In the clinical mode, n may be 1, 2, 3, 6 or 8, and refers to the number of stimuli in the boxes. Possible settings for n for this measure, which you specify in the Option 1 column in the Summary Template editor, are described below. See *Summary Templates* in the CANTABeclipse Results Manager chapter of the *CANTABeclipse Software User Guide* for further information. Note that for aborted runs, the adjustment is based on the stages, trials and responses not attempted due to the abort, with each missed response giving rise to an adjustment of $1 - 1 / \text{number of boxes}$.

PAL Total errors (1 shape, adjusted)

This measure reports the total number of errors made at the two 1-pattern stages (when there is a stimulus in one of the 6 boxes), with an adjustment added for those who have not completed the first stage. Subjects not reaching the second one-pattern stage are allocated the score 18 (one for each error made and an adjustment of 8). The maximum value for this measure (if the subject makes all possible responses incorrectly) is 19.

PAL Total errors (2 shapes, adjusted)

This measure reports the total number of errors made at the two 2-pattern stages (when there is a stimulus in two of the 6 boxes), with an adjustment for those who have not reached these stages. Subjects not reaching these stages are allocated the number 34 (17 for each of the 2-pattern stages in the clinical mode). The maximum value for this measure (if the subject makes all possible responses incorrectly) is 38.

PAL Total errors (3 shapes, adjusted)

This measure reports the total number of errors made at the two 3-pattern stages (when there is a stimulus in three of the 6 boxes), with an adjustment for those who have not reached these stages. Subjects not reaching these stages are allocated the number 50 (25 for each of the 2-pattern stages in the clinical mode). The maximum value for this measure (if the subject makes all possible responses incorrectly) is 57.

PAL Total errors (6 shapes, adjusted)

This measure reports the total number of errors made at the 6-pattern stage (when there is a stimulus in each of the 6 boxes), with an adjustment for those who have not reached this stage. This adjustment is calculated by summing the number of patterns not attempted (6) and subtracting the number of patterns (6) divided by the number of boxes (6) from it. This result is then multiplied by the total number of possible trials (10). Thus subjects not reaching this stage are allocated the number 50. The maximum value for this measure (if the subject makes all possible responses incorrectly) is 60.

The number of errors at the 6-pattern stage of PAL is able to differentiate with 98% accuracy between patients with Alzheimer's disease and non-demented controls (Swainson *et al.* (2001) *Dementia and Geriatric Cognitive Disorders*, **12** (4), 265-280).

PAL Total errors (8 shapes, adjusted)

This measure reports the total number of errors made at the 8-pattern stage (when there is a stimulus in each of eight boxes), with an adjustment for those who have not reached this stage. This adjustment is calculated by summing the number of patterns not attempted (8) and subtracting the number of patterns (8) divided by the number of boxes (8) from it. This result is then multiplied by the total number of possible trials (10). Thus subjects not reaching this stage are allocated the number 70. The

maximum value for this measure (if the subject makes all possible responses incorrectly) is 80.

Errors at the 8 pattern stage gives a more specific measure of performance on the most difficult stage of the PAL task than total errors, or total errors (adjusted) and is particularly suited to measuring memory and new learning ability in high-functioning individuals or in situations where one might be concerned about ceiling effects (for example, following cognitive enhancement in young healthy volunteers).

PAL Mean errors to success

This measure summarises, for all stages, the mean number of errors made before the stage was successfully completed. It is calculated by summing the total errors for all attempted stages and dividing the result by the number of successfully completed stages.

Trials

PAL Mean trials to success

This is calculated by calculating the total number of trials required (maximum score = 10 trials per stage) to locate all the patterns correctly in all stages attempted, and dividing the result by the number of successfully completed stages.

PAL Total trials

This measure represents the total number of trials required (maximum score = 10 trials per stage) to locate all the patterns correctly in all stages. When using this measure it is important to analyse the data with reference to the PAL Stages completed score. This is because subjects who fail to complete the test will have had fewer PAL Total trials, simply because they had less opportunity to make errors than subjects who completed the test. One possible way of dealing with this is to add the maximum score of 10 trials for each stage not attempted due to an earlier failure (see PAL Total trials (adjusted)).

PAL Total trials (adjusted)

This measure represents the total number of presentations required (maximum score = 10 trials per stage) to locate all the patterns correctly in all stages. When using this measure it is important to analyse the data with reference to the PAL Stages completed score. This is because subjects who fail to complete the test will have had

fewer PAL Total trials simply because they had less opportunity to make errors than subjects who completed the test. One possible way of dealing with this is to add the maximum score of 10 trials for each stage not attempted due to an earlier failure and this is what this measure shows. Please note that if this adjustment is made to a dataset in which large numbers of subjects have failed, this will have the effect of markedly reducing variance in later stages. Note that for aborted runs, the adjustment is made based on the subject failing the stage on which the test was aborted, so each of the 10 trials from that stage will count as part of the adjusted score.

Memory scores

PAL First trial memory score

This measure is the number of patterns correctly located after the first trial, summed across the stages completed (range 0-26 in the clinical mode, with 26 meaning all the patterns were correctly located for all stages first time).

Stages completed

PAL Stages completed

This is a key indicator of the subject's overall success, recording how many stages were successfully completed. When analysing other outcome measures from PAL it is crucial that analyses are conducted with reference to the number of stages completed. Clearly a subject that fails prior to the successful completion of the 8-pattern stage will have had less opportunity to make errors than a subject who completes the test.

PAL Stages completed on first trial

This is the number of stages passed on the first trial (out of a maximum of 8 stages in the clinical mode). This relates to the PAL first trial memory score.

PRM (Pattern Recognition Memory)

The outcome measures for the PRM test can be divided into two groups:

- Numbers and percentages correct and incorrect
- Latency

Various options can be applied to these measures –see individual measure descriptions below. For general information on options, please see *Summary Templates* in the CANTABeclipse Results Manager chapter of the *CANTABeclipse Software User Guide*.

Numbers and percentages correct and incorrect

PRM Number correct

This is the number of correct responses (out of a maximum of 24 in the clinical mode).

Option 1 for this measure has three possible settings:

- blank (i.e. no option 1 applied) – all trials used to calculate this measure
- correct (results calculated from correct trials only)
- incorrect (results calculated from incorrect trials only)

Option 2 for this measure has three possible settings:

- blank (all trials used to calculate this measure)
- block 1 (all trials in block 1 used to calculate this measure)
- block 2 (all trials in block 2 used to calculate this measure)

Option 3 for this measure has five possible settings:

- blank (all trials are used to calculate this measure)
- right chosen (all trials where the right pattern was chosen are used to calculate this measure)
- left chosen (all trials where the left pattern was chosen are used to calculate this measure)
- right correct (all trials where the right pattern was correct are used to calculate this measure)
- left correct (all trials where the left pattern was correct are used to calculate this measure)

PRM Percent correct

This is the number of correct responses, expressed as a percentage.

This is a good indicator of overall performance on a test of visual short-term recognition memory, which is impaired in disorders such as mild to moderate Alzheimer's disease (Swainson *et al.* (2001) *Dementia and Geriatric Cognitive Disorders*, **12** (4), 265-280).

This measure again has three possible options:

Option 1 may be correct or incorrect (but may not be blank for this measure). If correct is chosen, the measure calculates the percentage of trials in which a the subject's response was correct. If incorrect is chosen, the measure calculates the percentage of trials in which the subject's response was incorrect.

Option 2 is the same as option 2 for PRM Number correct (above)

Option 3 is the same as option 3 for PRM Number correct (above)

Latency

PRM Mean correct latency

This is the mean time taken to respond correctly. Latency is scored in milliseconds.

Options 1 to 3 for this measure are the same as for PRM Number correct (above) and option 4, which may not be blank, has three possible settings for the formula used to calculate this measure:

- arithmetic mean
- geometric mean
- sample standard deviation.

RTI (Reaction Time)

The outcome measures for the RTI test may be divided into the following groups:

- Reaction time

- Movement time
- Accuracy score
- Error score

Reaction time

RTI Simple reaction time

This is the speed with which the subject releases the press pad button in response to the onset of a stimulus in a single location. Reaction time latency is measured in milliseconds and tends toward a positive skew. Five-choice reaction time latencies are reliably observed to be longer than in simple reaction time. It should be remembered that subjects engaged in reaction time tasks have the opportunity to make a variety of errors. Most are errors of commission ('too soon', 'inaccurate' and 'wrong circle'), but it is possible to make an error of an omission by not responding ('too late'). Latency tasks that contain accuracy demands require a trade-off between speed and accuracy and so analysis of RT tasks need to consider making reference to both speed and accuracy.

RTI Five-choice reaction time

This is the speed with which the subject releases the press pad button in response to a stimulus in any one of five locations. Choice reaction time latency is measured in milliseconds and tends toward a positive skew. Five-choice reaction time latencies are reliably observed to be longer than in simple reaction time. It should be remembered that subjects engaged in reaction time tasks have the opportunity to make a variety of errors. Most are errors of commission ('too soon', 'inaccurate' and 'wrong circle'), but it is possible to make an error of an omission by not responding ('too late'). Latency tasks that contain accuracy demands require a trade-off between speed and accuracy and so analysis of RT tasks need to consider making reference to both speed and accuracy.

Five-choice reaction time, taken together with five-choice movement time, allows us to separate out any speeding or slowing of motor function from any speeding or slowing of cognitive function (see Reikkinen *et al* (1998) *European Journal of Neuroscience*, **10**, 1429-1435 and Gooday *et al* (1995) *Psychopharmacology*, **119**, 295-298 for more detail).

Movement times

RTI Simple movement time

This is the time taken to touch the stimulus after the press pad button has been released in trials where stimuli appear in one location only. Movement time latency is measured in milliseconds and is usually normally distributed.

RTI Five-choice movement time

This is the time taken to touch the stimulus after the press pad button has been released in trials where the stimuli has been presented in one of five possible locations. Movement time latency is measured in milliseconds and is usually normally distributed for correct responses.

Five-choice movement time, taken together with five-choice reaction time, allows us to separate out any speeding or slowing of motor function from any speeding or slowing of cognitive function (see Reikkinen *et al* (1998) *European Journal of Neuroscience*, **10**, 1429-1435 and Gooday *et al* (1995) *Psychopharmacology*, **119**, 295-298 for more detail).

Accuracy scores

RTI Simple accuracy score

This is the total number of trials where the response is recorded as correct, for assessment trials where the stimuli appear in one location only.

RTI Five-choice accuracy score

This is the total number of trials where the response is recorded as correct, for assessment trials where the stimuli appear in one of five locations.

Error scores

All error score measures have Option 1, 'error type', where the type of error is specified. Possible settings for error type, and the feedback message displayed during the test for that response type, are:

- Incorrect location (feedback message WRONG) where the incorrect circle is touched – this setting does not apply to simple

reaction time trials as there is only one circle which the subject can be touch).

- Inaccurate (Feedback message INACCURATE) where the subject does not touch the circle with sufficient precision.
- Premature (Feedback message TOO SOON) where the subject touches the circle too early, before the response window starts.
- No response (Feedback message TOO LATE) where the subject touches the circle after the response window has ended.

RTI Simple error score

This is the total number of trials where the response status is recorded as the specified error type, for assessment trials where stimuli appear in one location only.

RTI Five-choice error score

This is the total number of trials where the response status is recorded as the specified error type, for assessment trials where the stimuli appear in one of five locations.

RVP (Rapid Visual Information Processing)

The nine outcome measures for the RVP test may be divided into the following groups:

- Hits, misses, false alarms and rejections
- Probabilities and sensitivity calculated using SDT
- Latency

The outcome measures may additionally be reported on a per-block basis so that you can see any variations in performance during the test. The structure of the test is described in *RVP modes* on page 149. You use the Option 1 column in the Summary Template Editor window to specify for which block you wish to calculate a measure. See *Summary Templates* in the CANTABeclipse Results Manager chapter of the *CANTABeclipse Software User Guide* for further information.

Hits, misses, false alarms and rejections

RVP Total hits

This score represents the number of occasions upon which the target sequence is correctly responded to (within a response window of 1800 milliseconds for the clinical mode). This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

RVP Total misses

This score reports the number of occasions the subject fails to respond to a target sequence within the response window. This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

RVP Total false alarms

This records the number of times the subject responds outside the response window of a target sequence. This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

RVP Total correct rejections

This is the number of stimuli that were correctly rejected, i.e. the number of stimuli that were not part of a target sequence and were not responded to. This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

Probabilities and sensitivity calculated using SDT

The data from vigilance tasks such as RVP lend themselves to analysis using the principles of Signal Detection Theory (SDT). The standard methodology of SDT allows for the analysis of the two main components of the decision making process, the acquisition of information and the criterion required for a response. In the case of RVP, the optimal pattern of response is to maximise sensitivity so that no targets are missed and no false alarms are committed. Clearly speed of response is a factor, as subjects placing a premium on speed rather than accuracy will tend to be less accurate in their detection of targets and their correct rejections.

A number of texts on the topic of SDT are available. Interested readers may wish to browse:

- ❑ Saghal A (1987) Some limitations of indices derived from signal detection theory: evaluation of an alternative index for measuring bias in memory tasks. *Psychopharmacology*, 91, 517-520.
- ❑ Swets, J.A. (1996) 'Signal detection theory and ROC analysis in psychology and diagnostics.' LEA: Hove.
- ❑ McNicol, D (1972) 'A primer of Signal Detection Theory.' London; George Allen & Unwin Ltd.

RVP Probability of hit

The probability of a 'hit' or $p(\text{hit})$, (the subject responding correctly), is calculated from $\text{hits}/(\text{hits}+\text{misses})$. This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

RVP Probability of false alarm

The probability of a false alarm or $p(\text{fa})$ (the subject responding inappropriately), is equal to $\text{total false alarms}/(\text{total false alarms} + \text{total correct rejections})$. This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

RVP A'

A' (*A prime*) is the signal detection measure of sensitivity to the target, regardless of response tendency (range 0.00 to 1.00; bad to good). In essence, this measure is a measure of how good the subject is at detecting target sequences using $p(\text{hit})$ and $p(\text{fa})$. This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

RVP A' has been shown to be sensitive to both neurological damage (such as Alzheimer's disease), and pharmacological manipulation, such as by the cholinergic agonist, nicotine (Sahakian *et al* (1989) *British Journal of Psychiatry* 154: 797-800).

RVP B''

B'' (*B double prime*) is the signal detection measure of the strength of trace required to elicit a response (range -1.00 to +1.00). Thus, it is the tendency to respond regardless of whether the target sequence is present, and uses the $p(\text{hit})$ and $p(\text{fa})$ results.

A score close to +1.00 indicates that the subject gave few false alarms. But if $p(\text{hit})=1$ (the subject scored 100% hits) the value of B'' is always -1.00 (minus one). This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

Latency

RVP Mean latency

This measure details the mean time taken to respond and is reported in milliseconds. It only includes correct responses made within the response window of 1800 milliseconds. This score is calculated from blocks 5, 6 and 7 only, unless a single block is specified.

Response latency in the RVP task is a good indicator of sustained attentional function and can be sensitive enough to detect changes following pharmacological manipulation, such as administration of nicotine (Sahakian *et al* (1989) *British Journal of Psychiatry* 154: 797-800).

SOC (Stockings of Cambridge)

The outcome measures for the SOC test may be divided into the following groups:

- Problems solved in minimum moves
- Mean moves for 2, 3, 4 and 5-move problems
- Initial thinking time for 2, 3, 4 and 5-move problems
- Subsequent thinking time for 2, 3, 4 and 5-move problems

Interaction of SOC outcome measures

Please note that initial thinking time and subsequent thinking time may well interact both with one another and with other SOC measures, such as Minimum Move Solutions. For example, some impulsive subjects may record very brief initial thinking time latencies, but fail to solve any of the presented problems.

Problems solved in minimum moves

SOC Problems solved in minimum moves

This is a fundamental measure, recording the number of occasions upon which the subject has successfully completed a test problem in the minimum possible number of moves. For the clinical mode, this is scored out of a possible 12 problems, since eight practice problems are excluded from the calculation (the first six problems in the first block and the first two problems in the second block).

This is a succinct expression of overall planning accuracy in SOC (see Robbins *et al* (1998) *Journal of the International Neuropsychological Society*, **4**, 474-490).

For this measure, you can choose to apply it to all the assessed problems by not specifying the number of moves in option 1, or you may use option 1 to specify the number of moves (2, 3, 4 or 5) for the assessed problems for which you wish to calculate the result.

Mean moves for n-move problems

These measures all describe the mean number of moves required by the subject to solve problems where the solution can be reached in a minimum number of moves given in the title of the outcome measure. Possible values for n are 2, 3, 4 or 5.

SOC Mean moves (2 moves)

This is calculated from a possible two 2-move problems in the clinical mode.

SOC Mean moves (3 moves)

This is calculated from a possible two 3-move problems in the clinical mode).

SOC Mean moves (4 moves)

This is calculated from a possible four 4-move problems in the clinical mode).

SOC Mean moves (5 moves)

This is calculated from a possible four 5-move problems in the clinical mode).

Mean initial thinking time for n-move problems

Subjects are encouraged to plan their moves before actually enacting the solution to the problems. Initial thinking time is the difference in time taken to select the first ball

for the same problem under the copy and follow conditions. Therefore, these measures give an indication of the time taken to plan the problem solution. Possible values for n are 2, 3, 4 or 5.

SOC Mean initial thinking time (2 moves)

This score may be 0 if the subject is slower in the ‘follow’ condition.

SOC Mean initial thinking time (3 moves)

This score may be 0 if the subject is slower in the ‘follow’ condition.

SOC Mean initial thinking time (4 moves)

This score may be 0 if the subject is slower in the ‘follow’ condition.

SOC Mean initial thinking time (5 moves)

This score may be 0 if the subject is slower in the ‘follow’ condition. Looking at the initial and subsequent thinking times at the highest level of difficulty decreases the possibility of ceiling effects and as such, provides a larger potential for measuring improvements in performance (see Coull *et al* (1995) *Psychopharmacology*, **120**, 311-321).

Mean subsequent thinking time for n-move problems

Possible values for n are 2, 3, 4 or 5. These measures reflect the subject’s speed of movement after the initial move has been made for n-move problems. They are obtained by calculating the difference in time between selecting the first ball and completing the problem for the same problem under the two conditions (copy and follow), and then dividing this result by the number of moves made.

SOC Mean subsequent thinking time (2 moves)

This score may be 0 if the subject is slower in the ‘follow’ condition.

SOC Mean subsequent thinking time (3 moves)

This score may be 0 if the subject is slower in the ‘follow’ condition.

SOC Mean subsequent thinking time (4 moves)

This score may be 0 if the subject is slower in the ‘follow’ condition.

SOC Mean subsequent thinking time (5 moves)

This score may be 0 if the subject is slower in the ‘follow’ condition.

Looking at the initial and subsequent thinking times at the highest level of difficulty decreases the possibility of ceiling effects and as such, provides a larger potential for measuring improvements in performance (see Coull *et al* (1995) *Psychopharmacology*, **120**, 311-321).

SRM (Spatial Recognition Memory)

There are three outcome measures for the SRM test. Various options can be applied to these measures –see individual measure descriptions below. For general information on options, please see *Summary Templates* in the CANTABeclipse Results Manager chapter of the *CANTABeclipse Software User Guide*.

SRM Number correct

This is the number of correct responses (out of a possible 20 in the clinical mode).

Option 1 for this measure has three possible settings:

- blank (i.e. no option 1 applied) – all trials used to calculate this measure
- correct (results calculated from correct trials only)
- incorrect (results calculated from incorrect trials only)

Option 2 for this measure has five possible settings:

- blank (all trials used to calculate this measure)
- block 1 (all trials in block 1 used to calculate this measure)
- block 2 (all trials in block 2 used to calculate this measure)
- block 3 (all trials in block 3 used to calculate this measure)
- block 4 (all trials in block 4 used to calculate this measure)

Option 3 should always be left blank for this measure.

SRM Percent correct

This is the number of correct responses, expressed as a percentage.

This measure again has two possible options:

Option 1 may be correct or incorrect (but may not be blank for this measure).

Option 2 is the same as option 2 for SRM Number correct (above). (Option 3 should always be left blank for this measure.)

SRM Mean correct latency

This is the mean time to respond correctly. Latency is scored in milliseconds.

Options 1 and 2 for this measure are the same as for SRM Number correct (above), Option 3 should always be left blank, and option 4, which may not be blank, has three possible settings for the formula used to calculate this measure:

- arithmetic mean
- geometric mean
- sample standard deviation.

SRT (Simple Reaction Time)

There are eleven main outcome measures for the SRT test, which may be divided into the following categories:

- Latency (response speed)
- Correct responses
- Commissions (responses that are too early)
- Omissions (responses that are too late or missing)

Each of these outcome measures can have various options applied to it in the Results Manager Summary Template Definition window (see the *CANTABeclipse Software User Guide*) to filter the results used in the calculation of each measure. Some examples of this are given below. If no options are applied to a measure (the option columns are left blank), all the assessed blocks are used for calculation of that measure.

- Option 1 is 'block number' – in the clinical mode, block 1, 2 or 3.

- ❑ Option 2 is 'block type' – can be set to assessed/practice/combined, to determine whether assessment blocks only, practice blocks only or both types of blocks (combined blocks) are used.
- ❑ Option 3 should always be blank in the Summary Template Definition window for SRT measures.
- ❑ Option 4 is available for the latency measures, but should always be blank (or 'correct' - both options have the same effect) in the Summary Template Definition window for SRT measures.

Combining options is possible, with care – for example, if you set option 1 to 'block 1', which is a practice block and option 2 to 'assessed' you will exclude all the trials, as there are no assessed trials in block 1.

You can create a template to produce a summary datasheet containing, for example, SRT Mean latency for block 1, block 2 and block 3.

Latency

SRT Mean latency

The mean latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

SRT Median latency

The median latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

SRT Maximum latency

The maximum latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

SRT Minimum latency

The minimum latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

SRT S.D. latency

The sample standard deviation of the latency of response (from stimulus appearance to button press) on the trials that were not filtered out through options set in the template.

Correct

For a correct response, the subject must press the button within the response window. Options 1 to 3 may be applied to these measures.

SRT Total correct trials

The number of trials (that have not been filtered out through options set in the template) for which the trial outcome was correct.

SRT Percent correct trials

The percentage of trials (that have not been filtered out through options set in the template) for which the trial outcome was correct.

Commissions

A commission error is recorded when the subject presses the button too soon. Options 1 to 3 may be applied to these measures.

SRT Percent commission trials

The percentage of trials (that have not been filtered out through options set in the template) for which the trial outcome was a commission error.

SRT Total commission errors

The number of trials (that have not been filtered out through options set in the template) for which the trial outcome was a commission error.

Omissions

An omission error is recorded when the subject presses the button too late. Options 1 to 3 may be applied to these measures.

SRT Total omission errors

The number of trials (that have not been filtered out through options set in the template) for which the trial outcome was an omission error.

SRT Percent omission trials

The percentage of trials (that have not been filtered out through options set in the template) for which the trial outcome was an omission error.

SSP (Spatial Span)

The outcome measures for the SSP test may be divided into the following groups:

- Span length
- Errors
- Number of attempts
- Latency

Span length

SSP Span length

This is the longest sequence successfully recalled by the subject. The subject has three attempts at each level. The maximum score possible is 9 in the clinical mode.

Span length is sensitive to the detrimental effects of disorders such as Chronic Fatigue (Joyce *et al* (1996) *Journal of Neurology, Neurosurgery and Psychiatry*, **60**, 495-503), but is also sensitive to drug manipulations. For example, it can be enhanced by bromocriptine (Mehta *et al* (2001) *Psychopharmacology* **159**, 10-20).

Errors

SSP Total errors

This is defined as the number of times the subject selected an incorrect box. The maximum score possible is 97 in the clinical mode.

SSP Total usage errors

This measure reports the number of times the subject selected a box not in the sequence being recalled. The maximum score possible is 39 in the clinical mode.

Number of attempts

SSP Number of attempts (span length n)

This measure reports the number of attempts that the subject made for the span length specified by Option 1, which can be set to a number from 2 to 9. Alternatively, if Option 1 is left blank, the measure will report the total number of attempts the subject made across all spans.

Latency

SSP Mean time to first response (span length n)

This is the mean time the subject took to initiate problems of the span length specified by Option 1, which can be set for a number from 2 to 9, or left blank to report the mean time to first response over all assessed span lengths. The time is measured from the end of the presentation phase (the moment the final box closes) until the subject touches the screen. Attempts undertaken on spans that the subject did not pass are included in this calculation.

SSP Mean time to last response (span length n)

This is the mean time the subject took to complete problems of the span length specified by Option 1, n (i.e. make n responses), which can be set for a number from 2 to 9, or left blank to report the mean time to first response over all assessed span lengths. The time is measured from the end of the presentation phase (the moment the final box closes) to the time of the subject's final response on a given attempt. Attempts undertaken on spans that the subject did not pass are included in this calculation.

SST (Stop Signal Task)

The SST test has five outcome measures, each of which can have at least one option applied to it.

SST Direction errors

Every trial where the subject pressed the wrong button (the left button when the right arrow was shown on the screen, or vice versa) counts as a direction error.

Option 1 for this measure is trial type – this must be either stop and go, stop, or go, to restrict the measure to all trials (stop and go), stop trials only (stop) or go trials only (go).

Option 2 for this measure is the sub-block number (either specify a particular sub-block from 1 to 21, or else leave this blank and the total for all 20 assessed sub-blocks is returned). Note that the initial practice block comprises a single sub-block (1) in the clinical mode, remaining blocks comprising sub-blocks 2-5, 6-9, 10-13, 14-17 and 18-21.

Option 3 is left/right – either leave this blank (for all trials), or select left chosen or right chosen, for trials where a particular button was chosen, or left correct or right correct, for trials where a particular button was correct.

SST Proportion of successful stops

The proportion of successful stops (the number of times the subject stopped successfully, divided by the total number of stop signals).

Option 1 for this measure, sub-blocks from end, is the number of sub-blocks from the end for which you wish to start the calculation – the default value for n is 'last half', which will cause this measure to be calculated using the last half of the assessed sub-blocks in the test. You may specify a value ranging from 'last sub-block' to 'last 20 sub-blocks'.

Option 2 for this measure is SSD, stop signal delay – you may either leave this blank, to include all stop signal delays, or select a stop signal delay (-250 to 500 milliseconds) to restrict the trials included in the calculation to just those that used the chosen SSD. If you use this option you should take care in setting option 1 – you might wish to set it to 'last 20 sub-blocks' initially, so that you can examine the proportion of successful stops for particular SSDs over the whole of the assessed part of the test. As the series converge as the test progresses, many of the SSDs in the list will not be applicable to later sub-blocks.

SST RT on GO trials

This is the reaction time on Go trials, calculated according to the formula selected in option 1. The trials used for calculating this measure may be restricted using options 2, 3 and 4.

Option 1, algorithm, is the formula used to calculate the reaction time – the default is median, which is a key measure, and the other options are mean (the arithmetic mean), minimum, maximum, and standard deviation (this is the sample, or unbiased, standard deviation).

Option 2, sub-block, is the sub-block number for which you wish to calculate this measure (either specify a particular sub-block from 1 to 21, or else leave this blank and the value for all 20 assessed sub-blocks is calculated). Note that the initial practice block comprises a single sub-block (1) in the clinical mode, remaining blocks comprising sub-blocks 2-5, 6-9, 10-13, 14-17 and 18-21.

Option 3 is left/right – either leave this blank (to calculate the measure for all trials), or select left chosen or right chosen, to calculate the measure for trials where a particular button was chosen, or left correct or right correct, to calculate the measure for trials where a particular button was correct.

Option 4 is button pressed – this can be either correct (to calculate the measure for trials where the correct button was pressed), incorrect (to calculate the measure for trials where the incorrect button was pressed) or correct or incorrect, to calculate the measure for all trials.

SST SSD (50%)

This is the stop signal delay at which the subject was able to stop 50% of the time. It is calculated as the arithmetic mean of the *measured* SSD, or failed-stop reaction time if applicable, from completed assessment stop trials.

Option 1 for this measure, sub-blocks from end, is the number of sub-blocks from the end for which you wish to start the calculation – the default setting is 'last half' which will cause this measure to be calculated using the last half of the assessed sub-blocks in the test. You may specify a value ranging from 'last sub-block' to 'last 20 sub-blocks'.

Option 2 for this measure is the series number – in each sub-block there are 4 stop trials with different delays, one from each of series 1 to 4. If you leave this blank then data from all series are used; or you may specify a particular series.

SST SSRT

Stop Signal Reaction Time is an estimate of the length of time between the go stimulus and the stop stimulus at which the subject is able to successfully inhibit their response on 50% of trials.

This measure is calculated from two other SST measures – the SST RT on GO trials measure and the SST SSD (50%) measure. These measures are both calculated using the default options, unless these are overridden by option 1 which may be set for this measure.

Option 1 for this measure, sub-blocks from end, is the number of sub-blocks from the end for which you wish to start the calculation – the default setting is ‘last half’ which will cause this measure to be calculated using the last half of the assessed sub-blocks in the test. You may specify a value ranging from ‘last sub-block’ to ‘last 20 sub-blocks’. Note that option 1 only affects the calculation of the SSD (50%) part of the SSRT; the median RT is always calculated over all assessment GO trials.

SWM (Spatial Working Memory)

The outcome measures for the SWM test may be divided into the following groups:

- Errors (between, within, double and total)
- Strategy
- Latency

Errors

SWM Between errors

Between errors are defined as times the subject revisits a box in which a token has previously been found. This is calculated for trials of four or more tokens only.

This measure is sensitive to pharmacological manipulation by, for example, diazepam (Coull *et al* (1995) *Psychopharmacology*, **120**, 311-321), but also sensitive to disorders such as ADHD (Kempton *et al* (1999) *Psychological Medicine*, **29**, 527-538).

SWM Between errors (n boxes)

Possible values for n are 4, 6 and 8 in the clinical mode. The possible outcome measures for these values of n, specified using Option 1, are described below.

SWM Between errors (4 boxes)

This measure records between errors for 4-box problems only.

SWM Between errors (6 boxes)

This measure records between errors for 6-box problems only.

SWM Between errors (8 boxes)

This measure records between errors for 8-box problems only.

SWM Within errors

Within errors are defined as the number of errors made within a search, i.e. the number of times a subject revisits a box already found to be empty during the same search. This is calculated for trials of four or more tokens only.

SWM Within errors (n boxes)

Possible values for n are 4, 6 and 8 in the clinical mode. The possible outcome measures for these values of n, specified using Option 1, are described below.

SWM Within errors (4 boxes)

This measure records within errors made in 4-box trials.

SWM Within errors (6 boxes)

This measure records within errors made in 6-box trials.

SWM Within errors (8 boxes)

This measure records within errors made in 8-box trials.

SWM Double errors

These are occasions where the subject has committed an error that can be categorised as both a within and a between error. This is calculated for trials of four or more tokens only.

SWM Double errors (n boxes)

Possible values for n are 4, 6 and 8 in the clinical mode. The possible outcome measures for these values of n, specified using Option 1, are described below.

SWM Double errors (4 boxes)

These are occasions where the subject has committed an error that can be categorised as both a within and a between error, summarised for 4-box problems.

SWM Double errors (6 boxes)

These are occasions where the subject has committed an error that can be categorised as both a within and a between error, summarised for 6-box problems.

SWM Double errors (8 boxes)

These are occasions where the subject has committed an error that can be categorised as both a within and a between error, summarised for 8-box problems.

SWM Total errors

This is the number of times a box is selected that is certain not to contain a blue token and therefore should not have been visited by the subject, i.e. *between errors + within errors - double errors*.

SWM total errors (n boxes)

Possible values for n are 4, 6 and 8 in the clinical mode. The possible outcome measures for these values of n, specified using Option 1, are described below.

SWM total errors (4 boxes)

This is the number of times a box is selected that is certain not to contain a blue token and therefore should not have been visited by the subject, i.e. *between errors + within errors - double errors*, summarised for 4-move problems.

SWM total errors (6 boxes)

This is the number of times a box is selected that is certain not to contain a blue token and therefore should not have been visited by the subject, i.e. *between errors + within errors - double errors*, summarised for 4-move problems.

SWM total errors (8 boxes)

This is the number of times a box is selected that is certain not to contain a blue token and therefore should not have been visited by the subject, i.e. *between errors* + *within errors* - *double errors*, summarised for 8-move problems.

Strategy

SWM Strategy

Owen *et al.* (Neuropsychologia 1990: 28; 1021-1034) have suggested that an efficient strategy for completing this task is to follow a predetermined sequence by beginning with a specific box and then, once a blue token has been found, to return to that box to start the new search sequence.

An estimate of the use of this strategy is obtained by counting the number of times the subject begins a new search with a different box for 6- and 8-box problems only. A high score represents poor use of this strategy and a low score equates to effective use. Thus, for the clinical mode, the minimum strategy score is 1 for each stage (i.e. 8) and the maximum is 1 for each search (i.e. 56).

It has been shown to be sensitive to cognitive dysfunction in disorders such as Chronic Fatigue (see Joyce *et al* (1996) *Journal of Neurology, Neurosurgery and Psychiatry*, **60**, 495-503).

Latency

The latency measures all have option 1, number of boxes, which can be applied to them. The possible values for n are 4, 6 and 8 in the clinical mode, which restricts the calculation of the measure to 4-box, 6-box or 8-box problems. If this option is left blank the mean latency across 4, 6 and 8-box problems (all the assessed problems) is returned.

SWM Mean time to first response (n boxes)

This is the mean time between the problem being presented to the subject and the subject first touching the screen to open a box, for problems with the specified number of boxes.

SWM Mean token-search preparation time (n boxes)

This is the mean time between token-search touches, for problems with the specified number of boxes. This is calculated, for the first touch for a problem, from the time between the problem being presented to the subject and the subject first touching the screen to open a box, and for subsequent touches, from the time between a token being placed in the 'home' area and the time the next box is touched.

SWM Mean time to last response (n boxes)

This is the mean time for the subject's last response for a problem, for problems with the specified number of boxes. This is calculated from the time between the problem being presented to the subject and the subject's last screen touch to open a box to locate the final token for the problem.

VRM (Verbal Recognition Memory)

There are 5 outcome measures for the VRM test. The Free recall measures apply only to the immediate modes of the test; the Recognition measures apply to any mode:

VRM Free recall – total correct

In the free recall phase, the total number of distinct words correctly recalled from the presentation phase. Range: 0 to 12 (or 0-18 for the 18-word modes)

VRM Free recall - total novel words

In the free recall phase, the total number of words recalled that did not appear in the presentation phase. Range: 0 upwards – no upper limit.

VRM Free recall - total perseverations

In the free recall phase, the total number of times that the subject repeats the recall of a previously correctly recalled word from the presentation phase. Range: 0 upwards – no upper limit.

VRM Recognition - total correct

In the recognition phase, the total number of words that the subject correctly recognises from the presentation phase. Option 1 can be applied to this measure. If it is left blank, the total of all words correctly identified (both correctly recalled targets and correctly rejected distractors) will be returned (maximum 24 or 36, depending on

the mode); 'correct targets' will return the number of targets correctly identified (maximum 12 or 18, depending on the mode), and 'correct distractors' will return the number of distractors that were correctly rejected (maximum 12 or 18, depending on the mode).

VRM Recognition – total false positives

In the recognition phase, the total number of times the subject responds 'yes' incorrectly to a distractor word. Range: 0 to 12 or 18, depending on the mode.

Glossary

Battery	A battery is a selection of one or more tests in a given order, each running in a specified mode.
Battery tab	The part of the CANTABeclipse Control Centre where you create and select batteries of tests and single tests to run.
Clinical mode	You should use a clinical mode if you wish to run a test only once with a particular subject, and if you wish to compare results with norms for those tests that have norms.
Control Centre	The CANTABeclipse window where you enter subject details, set up batteries of tests and from where you start tests and batteries.
csv	CSV stands for comma-separated values; a csv file is a plain text file in which individual data fields on each line are delimited by commas. CSV files may be opened with OpenOffice, Excel or other spreadsheet applications.
Datasheet	A grid-like arrangement of data values suitable for import into third-party products such as spreadsheet and statistical analysis packages.

Detailed data	The most comprehensive data output format available for analysing the actions of a subject and the behaviour of the system during a test run. Subject responses to stimuli are specified on a response-by-response basis. In detailed data, each data field usually assumes more than one value during a given test (for example, response time, or screen location chosen).
Full screen mode	Occupying the whole of the computer screen. Tests in CANTABeclipse are run in full-screen mode, where the PC screen is completely blank except for the test stimuli displayed.
Mode	A collection of settings that determine the way in which the test operates, such as its length, level of difficulty, feedback to the subject, and the stimuli used.
Mouse mode	You can run tests or batteries (for evaluation purposes only) in mouse mode, when a crosshair cursor which you can move with the mouse is displayed on the screen.
Normative database	A database containing data from control subjects against which the results from tests may be compared to assist in interpretation.
Outcome measures	Each outcome measure relates to a particular test and has a single value for each run of that test.
Parallel mode	Some tests are supplied with parallel modes for repeated testing. If a subject is to be tested more than once with these tests, you should use a different parallel mode each time.

Press pad	An input device used for some of the CANTABeclipse tests, which registers whether or not a button is being pressed.
Recommended measures templates	Templates supplied with CANTABeclipse with default settings for summary datasheets or reports.
Results Manager	The CANTABeclipse window where you display, retrieve and output results collected from running tests.
Session tab	The part of the Control Centre where you enter information relating to testing sessions.
Software key	Also known as a dongle, this is a device which fits into your PC's USB port so the software knows that you are an authorised user of the system.
Standard score data	Standard scores result from the comparison of subject data against normative data.
Stimulus set	The collection of CANTAB stimuli (for example shapes, patterns, numbers) used in a particular test.
Subject	Someone to whom a test is administered.
Subject tab	The part of the CANTABeclipse Control Centre where you select existing subjects, create subject IDs, record subject specific information , add user defined fields and change option settings
Summary datasheet or report	A file containing summary outcome measures for all test results selected in the CANTABeclipse Results Manager's test result area.
Summary results or summary data	Consist of a value (or, in some cases, values) for each outcome measure. These are output as a report or

datasheet, as specified by the summary template.

Test administrator

Someone who administers the tests to subjects.

Test run area

The area on the right of the Results Manager window where test result records are displayed for selection according to the criteria selected in the test result filters window.

Touch screen

A computer screen which is sensitive to touch and may be used as an input device.

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