

Lexical Decision and Item Recognition with Cattell:

***** Puzzle Task

In the next four sections, there are rows of little puzzles. You are to pick the best one of the 5 choices that are given for each puzzle. If the answer you choose is the first one in the line, click the circle next to "1" (to the left of "1"). If the answer you choose is the second, click the circle next to "2." If you choose the third, click the circle next to "3," and so on.

Each section has its own specific task instructions. When you are ready to read the instructions and do some practice examples for Section 1, click "Continue."

[they click Continue button, then next screen:]

Puzzle Task: Section 1 Examples

Instructions: Choose the answer which best continues the series. Practice examples (the first one is done for you):
(shows examples)

You will have 3 minutes to complete Section 1. When you have finished the examples, understand the instructions, and are ready to start, click "Continue."

[they click Continue button, then next screen:]

Puzzle Task: Section 1

Instructions: Choose the answer which best continues the series. [then they do task and click Done button, then next screen:]

Puzzle Task: Section 2 Examples

Instructions: Choose the figure which is different from the others. Practice examples (the first one is done for you):
(shows examples)

You will have 4 minutes to complete Section 2. When you have finished the examples, understand the instructions, and are ready to start, click "Continue."

[they click Continue button, then next screen:]

Puzzle Task: Section 2

Instructions: Choose the figure which is different from the others. [then they do task and click Done button, then next screen:]

Puzzle task: Section 3 Examples

Instructions: Choose the figure which correctly completes the design. Practice examples (the first one is done for you):
(shows examples)

You will have 3 minutes to complete Section 3. When you have finished the examples, understand the instructions, and are ready to start, click "Continue."

[they click Continue button, then next screen:]

Puzzle Task: Section 3

Instructions: Choose the figure which correctly completes the design.

[then they do task and click Done button, then next screen:]

Puzzle task: Section 4 Examples

Instructions: Choose the figure in which a dot could be placed as in the figure on the left.
Practice examples (the first one is done for you):
(shows examples)

You will have 2 and a half minutes to complete Section 4. When you have finished the examples, understand the instructions, and are ready to start, click "Continue."

[they click Continue button, then next screen:]

Puzzle Task: Section 4

Instructions: Choose the figure in which a dot could be placed as in the figure on the left.

[They do task and click Done button, then Cattell ends and it moves on to the lexical decision and memory task instructions.]

This experiment consists of two tasks: a language processing task and a memory task. It will take about 45-55 minutes to complete. If you are unable to complete the experiment once you have started, click on the "Stop Task" button in the experiment window.

READ-AND-GO INSTRUCTIONS:

For the language processing experiment (lexical decision):

1. Decide if each string of letters is a WORD in English or a NONWORD (a nonsense word). Just look at the string of letters as it is -- you don't need to try to unscramble it. Press "/" key for "WORD" and "z" key for "NONWORD." The computer will tell you if you make an error only on the first block of 30 words.

2. Make your decision as quickly and accurately as possible. Go with your first impression -- if you're not sure, take your best guess rather than thinking about it. Try to respond in under a second.

3. Keep your fingers right on the keys because we are timing your responses.

4. You will do 17 sets, with 30 items in each set. Don't stop in the middle of a set, but you can stop and rest in between sets.

For the memory experiment (item recognition):

1. Study a list of 25 words, some repeated. During the "test list" part (34 words), decide if each word was on the list you just studied or not. Press "/" key for "YES it was on the list" and "z" key for "NO it was not on the list".

2. Make your decision as quickly and accurately as possible. Go with your first impression -- if you can't remember, take your best guess rather than thinking about it. Try to respond in under a second.

3. Keep your fingers right on the keys because we are timing your responses.

4. You will do 16 sets (each set is a study list followed by a test list). Don't stop in the middle

of a set, but you can stop and rest in between sets.

[They can either click on a "Start task" button, or click on a button that says "Get detailed instructions."]

[If they choose "Get detailed instructions," they will see:]

DETAILED INSTRUCTIONS:

For the language processing experiment:

Once you start the experiment, you will see strings of letters start to appear, one at a time, in the upper left corner of the screen. As each one comes up, decide if it is a WORD in English, or a NONWORD (a nonsense word). Here are some examples:

university (WORD) dopomant (NONWORD) remient (NONWORD) bottle (WORD)

You will use the "?" key to respond "WORD" and the "Z" key to respond "NONWORD" (so, the two keys just inside the SHIFT keys). You should use the first (index) finger of each hand on those keys, because the first finger is generally people's most responsive finger. It is very important to keep your fingers right on the keys, because we are timing your responses. If it takes you time to move your finger to the key, it will look like it took you longer to make the decision.

We'd like you to make your decisions as quickly and accurately as possible. Try to respond in under a second. You should go with your first impression, rather than thinking and analyzing. If you aren't sure, make a quick guess rather than agonizing over it. Try to go quickly, but not so quickly that you start hitting the wrong key by mistake when you know the right answer.

In the first block the computer will tell you if you make an error -- it will flash the word "ERROR" on the screen briefly. If you make a mistake, just wait for the "ERROR" message to disappear before going on. We are studying how people make quick decisions between two alternatives, so we simply want to see how you respond when you are going with your first best impression. Don't let yourself get into thinking too much and analyzing what you see -- just give your first best impression, and don't worry if you make some mistakes! Everyone does!

You will be doing the experiment in sets. There will be 17 sets altogether in the language processing part, with each set consisting of 30 items. You can take a short break in between sets, then press the space bar when you are ready to start the next set.

For the memory experiment:

Once you start the experiment, you will see words start to appear, one at a time, in the upper left corner of the screen. As each word comes up, read it to yourself or out loud, and try to remember it. Some words you will only see once, but other words you will see twice during the study list. Use whatever technique helps you to remember the words (forming an image, making a phrase, etc).

There will be 25 words on the study list.

After you have finished the study list, you'll see the message "Test list. please hit space bar". Press the space bar, and then for each word that appears on the screen, decide if that word was on the list you just studied, or not. There will be 34 words for you to respond to in the test list.

You will use the "/" key to respond "YES" and the "z" key to respond "NO" (so, the two keys just inside the SHIFT keys). You should use the first (index) finger of each hand on those keys, because the first finger is generally people's most responsive finger. It is very important to keep

your fingers right on the keys, because we are timing your responses. If it takes you time to move your finger to the key, it will look like it took you longer to make the decision.

We'd like you to make your decisions as quickly and accurately as possible. Try to respond in under a second. You should go with your first impression, rather than thinking and analyzing. If you can't remember, make a quick guess rather than agonizing over it. Try to go quickly, but not so quickly that you start hitting the wrong key by mistake when you know the right answer.

The computer will not tell you whether you are right or wrong on the first block only. We are studying how people make quick decisions between two alternatives, so we simply want to see how you respond when you are going with your first best impression. Don't let yourself get into thinking too much and analyzing what you see -- just give your first best impression, and don't worry if you can't remember some of the time!

You will be doing the experiment in sets. There will be 16 sets altogether, with each set consisting of a study list followed by a test list (the part where you respond). At the end of each set you will see "To begin next study list press space bar." You can take a short break at that point, then press the space bar when you are ready to start the next set.

When you are ready to begin, put the first finger of your right hand on the "/" key and the first finger of your left hand on the "z" key. Use your thumb to press the SPACE BAR to begin. Good luck!

[Then they click the "Start task" button.]

[After the practice, they see:]

Remember:

Press the "/" key for WORD.

Press the "z" key for NONWORD.

Make your decision as quickly and accurately as possible. Go with your first impression -- if you're not sure, take your best guess rather than thinking about it. Try to respond in under a second.

YOU WILL NOT GET ERROR FEEDBACK UNTIL THE NEXT PHASE OF THE TEST.

PRESS THE SPACE BAR TO CONTINUE WITH THE TEST.

[After they finish the lexical decision task, they see these instructions for the memory task:]

This is the next (and final) test.

This is a memory task. First you will see a study list of words flashed one at a time for about a second each. Try to remember those words.

Then you will get a test list. For each word in the test list, decide whether you think it was on the list you just studied, or not. If it WAS one of the words in the study list, press the '/' key with the first finger of your right hand. If it was NOT on the list, press the 'z' key with the first finger of your left hand. Keep your fingers right on the keys (do not use one finger back and forth -- that will produce inaccurate reaction times). Respond as quickly and accurately as you can.

For the first set, it will let you know "correct" or "error" each time.

To begin the first study list, press the space bar.

[Then before the second block of trials they are told:]

You have finished the first set. From now on, you won't be told "error" or "correct" for each response. At the end of each set, you will be told how you performed, based on the percentage you got correct: excellent, very good, good, low average, or low performance. Please try your best each set to respond as quickly and accurately as possible.

[After each of the next test blocks they see:]

Your performance on the set you just did was excellent/very good/good/low average/low.

You are now XX% through the final task.

For the next set of trials, press the space bar.

[And before each test block they are reminded:]

Press '/' if the word was on the list you just saw; press 'z' if it was not.

Press the space bar to begin.

Numerosity Tasks: For the subjects who did the Cattell task along with the numerosity tasks, they saw the Cattell instructions above, followed by the instructions for the numerosity tasks.

For the subjects who did the math task, they saw these instructions:

Number Entry 1

In the next section there are numbers with boxes below them. As quickly as you can, use the keyboard to type the numbers into the box below each. To begin, click into the upper-left box, then after typing the number, use Tab to move to the boxes which follow. Do not press any other keys except zero through nine, the Tab key, and the Backspace or Delete key. Go as fast as you can, without making any mistakes.

Click the Continue button to begin. [They click Continue button, then on the next screen they do the calibration practice, then hit Continue, then:]

Math task

In the next section, there are rows of basic math problems. Your task is to answer as many as you can, correctly, in 3 minutes. Type the answer in the box below each problem. To begin, click in the box below the first problem, and type your answer. If the answer is "8", for example, press "8" on your keyboard. You can change your answer with the Delete and Backspace keys. Then press the Tab key to move to the next box. We'd like you to use the Tab key because it is faster than clicking in each box with the mouse. Do not press any other keys except zero through nine, the Tab key, and the Backspace or Delete key.

When you are ready to start the task, click the Start button. [They click Start button, then on the next screen it says Math Task and has the actual task with a 3 minute countdown timer. The Cattell task also has countdown timers for each section, all on the upper right side. They click Done, then next screen:]

Number Entry 2

As in the first section, for each number, enter that exact same number in the box below it. Start

by clicking into the top-left box. Use the keyboard to enter the numbers. Use the Tab key to move to the boxes which follow, entering the numbers above as you go. Do not press any other keys except zero through nine, the Tab key, and the Backspace or Delete key. Be as fast and accurate as possible.

When you are done, click the Continue button.

[They do this second calibration, then click Continue, then it moves on to the numerosity task instructions:]

This experiment consists of two tasks involving decisions about how many dots are on the screen. It will take about 40 minutes to complete. If you are unable to complete the experiment once you have started, click on the "Stop Task" button in the experiment window.

INSTRUCTIONS:

For the first task - "More Blue or More Yellow Dots":

1. You will see a box with blue and yellow dots flash on the screen. Decide if there are more blue dots or more yellow dots. It doesn't matter how big or small the dots are, just how many there are.

2. Use the z and / keys to respond. Use the first finger of each hand, using your left hand to press the z key for "more blue dots" and your right hand to press the / key for "more yellow dots."

3. Make your decision as quickly and accurately as possible. Go with your first impression -- if you're not sure, take your best guess rather than thinking about it. Try to respond in under a second. At first it may feel like you have to respond before the dots disappear, but you don't! Let the dots flash on and off, then respond as quickly and accurately as possible.

4. You will see whether you got an answer correct or if you made an error. You will see "too slow" if you take too long to decide and "too fast" if you try to respond while the dots are still on the screen.

5. Keep your fingers right on the keys because we are timing your responses.

6. You will do 8 sets, with 100 items in each set. Don't stop in the middle of a set, but you can stop and rest in between sets.

7. You will see some examples before you start.

For the second task - "More or Less than 25 Dots":

The second task is very similar to the first task, except you will be deciding whether there are many dots (more than 25) or few dots (fewer than 25) on the screen. It takes about the same length of time as the first task. You will see examples and instructions when you finish the first task.

[They click on the "Start task" button, do the examples, then they see:]

Here is the first task. The dots will flash briefly. After they flash on and off, press / for "more yellow dots" or z for "more blue dots". Respond quickly and accurately. Press space bar to start.

[After they finish the first numerosity task, they will see these instructions for the second numerosity task:]

Now for the final task - "More or Less than 25 Dots":

1. You will see a box with yellow dots flash on the screen. Quickly estimate whether there are "few dots" (less than 25) or "many dots" (more than 25). We don't want you to count them! Just take a look and give your best first impression.
2. Use the z and / keys to respond. Use the first finger of each hand, using your left hand to press the z key for "few" and your right hand to press the / key for "many."
3. Make your decision as quickly and accurately as possible. Go with your first impression -- if you're not sure, take your best guess rather than thinking about it. Try to respond in under a second.
4. You will see whether you got an answer correct or if you made an error. You will see "too slow" if you take too long to decide and "too fast" if you try to respond while the dots are still on the screen.
5. Keep your fingers right on the keys because we are timing your responses.
6. You will do 8 sets, with 96 items in each set. Don't stop in the middle of a set, but you can stop and rest in between sets.
7. You will see some examples before you start. Press space bar.
[They do the examples, then they see:]
Just as in the prior task, the dots will flash briefly. After they flash, press / for "many dots" (more than 25) or z for "few dots" (less than 25). Respond quickly and accurately. Press space bar to start.

Cattell: <http://140.254.96.41/PuzzleTaskLaunch.php>

Math: <http://140.254.96.41/MathTaskLaunch.php>

These links will be replaced in a few weeks because of a security upgrade of our computer systems.

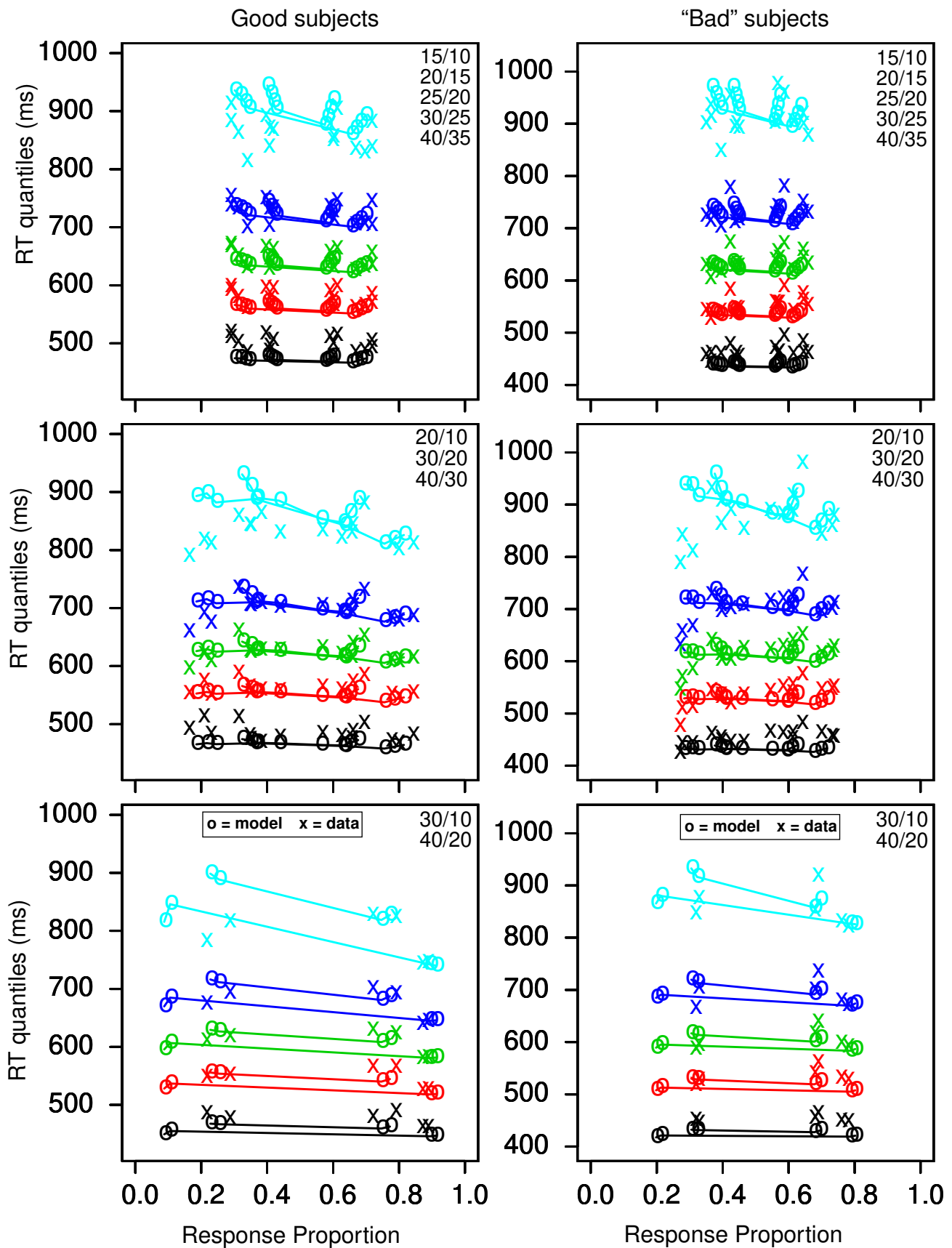


Figure S1. A plot corresponding to Figure 7 for the BY task with a common lower bound of 300 ms.

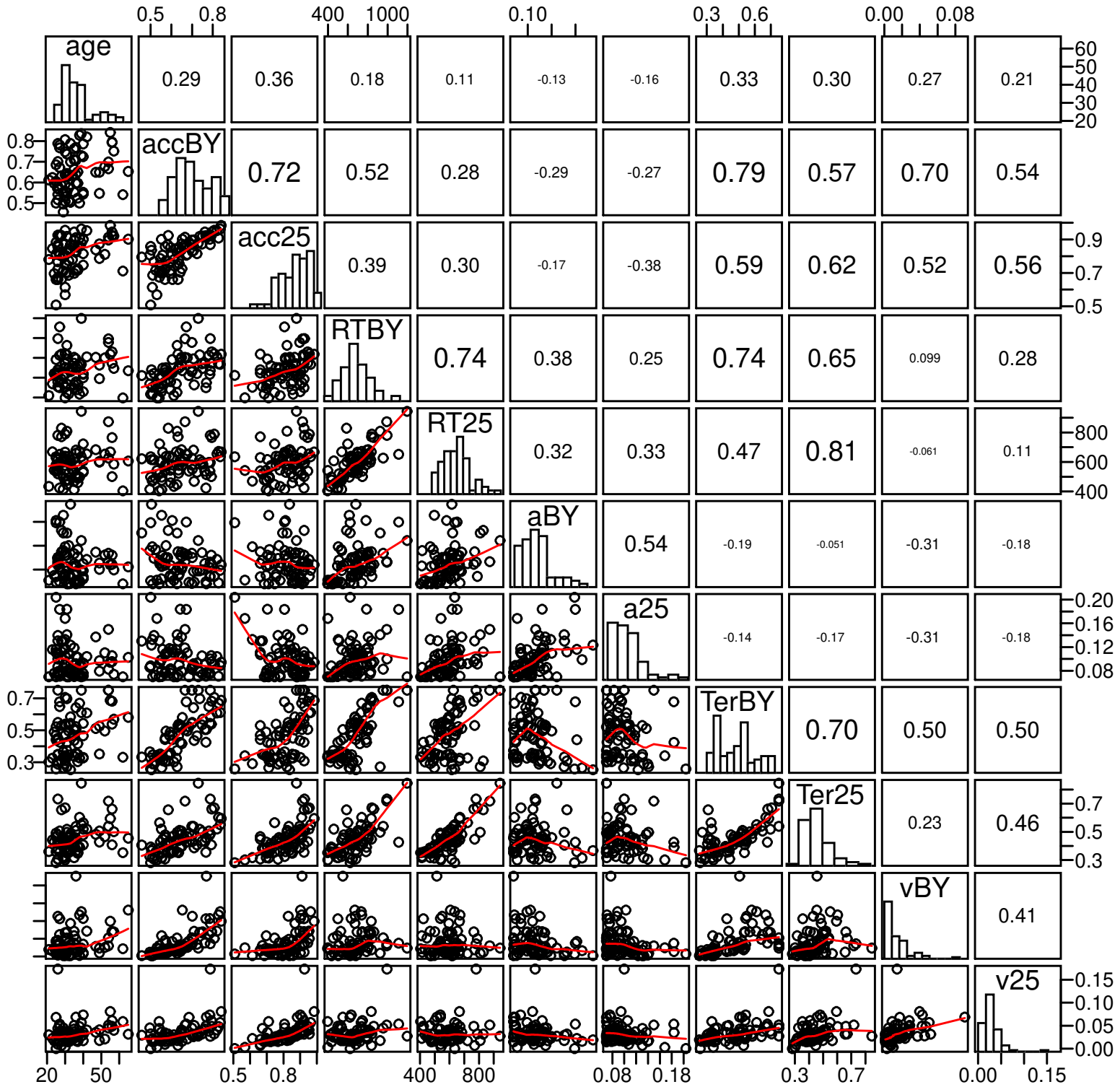


Figure S2. A plot corresponding to Figure 11 for the 74 bad subjects