

Chapter 4

Experiments and Results

4.1 Plan of Experiments

To evaluate the success of the prototype experiments were made and a group of people was invited to participate in the trials of the haptic sleeve.

The test is divided in three parts: Test of the motor control, of the pattern control and of the different intensities. The following plan was executed.

4.1.1 Test of the Motor Control

After the subject is comfortably sitting down with the sleeve in their arm, the first thing to test is the Motor Control part of the interface.

1. Activate motor 8 with an intensity of 8. Ask the user if anything is felt and where. Take note if the user said the correct place. This will show if the user can feel the vibration and introduce the user to the feeling.
2. Deactivate motor 8 and activate motor 7 and 9 simultaneously with the different intensities, such as 4 and 9, respectively. Ask if the user can differentiate the motors and their intensities, and if yes, which one does the user think is more intense?
3. Deactivate all the motors and activate motor 2, 5 and 6 with the same intensity such as 6. Can the user spot the different motors? If the user can not, which ones are complicated to distinguish?
4. Deactivate all the motors and activate motor 13 and 15 with the same intensity. Can the user place them?
5. Deactivate motor 13 and 15 and activate motor 8. Can the user distinguish and say which motors are on?

For an easier comprehension, Figure 4.1 is a state diagram that illustrates the test.

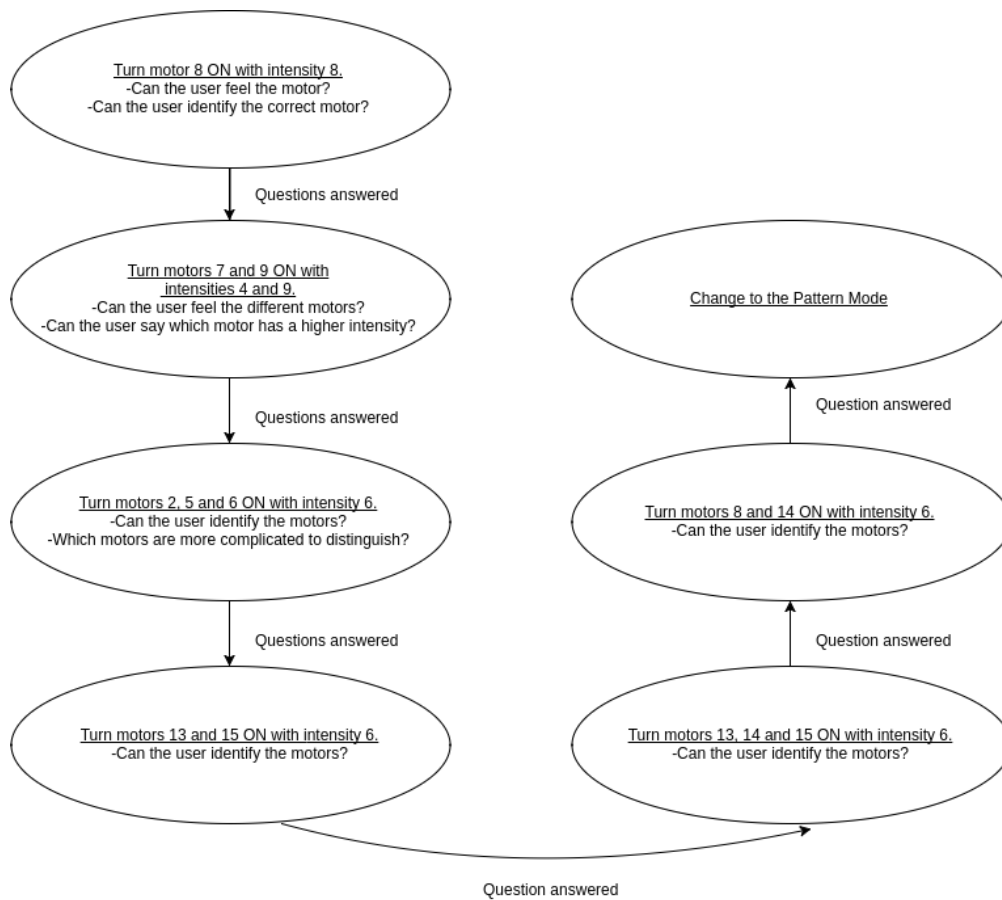


Figure 4.1: State Diagram of Motor Control Test

4.1.2 Test of the Pattern Control

The second test that should be done is on the pattern control section of the interface. This aims to show if the user is receiving the desired stimulus.

1. Deactivate all the motors that were previously activated to check the motor control. Run the shiver pattern. Can the user replicate in the other arm the stimulus using a finger? This will show if the stimulus was well received.
2. Run the tickle pattern. Can the user replicate in the other arm the stimuli using a finger?
3. Run the diagnose pattern with a delay of 3s. Ask the user to tell when the motors change.

Figure 4.2 demonstrates the test in the form of a state diagram.

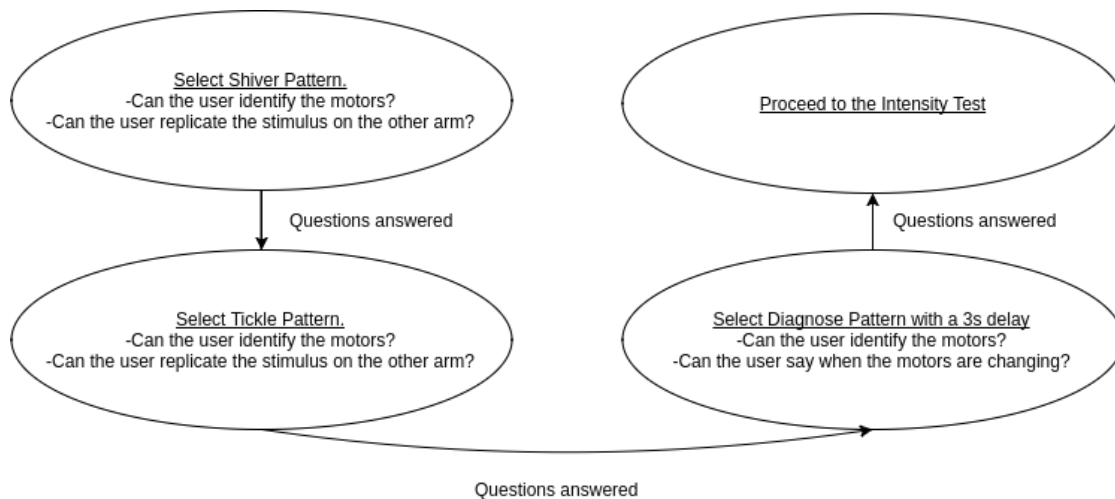


Figure 4.2: State Diagram of Pattern Control Test

4.1.3 Test of different intensities

The last test (Figure 4.3) serves to confirm that the intensity of the motor can be controlled. It also shows if the user can differentiate the contrasting intensities (which one is higher).

1. Activate motor 14 with an intensity of 3.
2. Activate the same motor with an intensity of 10. Ask the user if difference is felt. Which one is more intense?

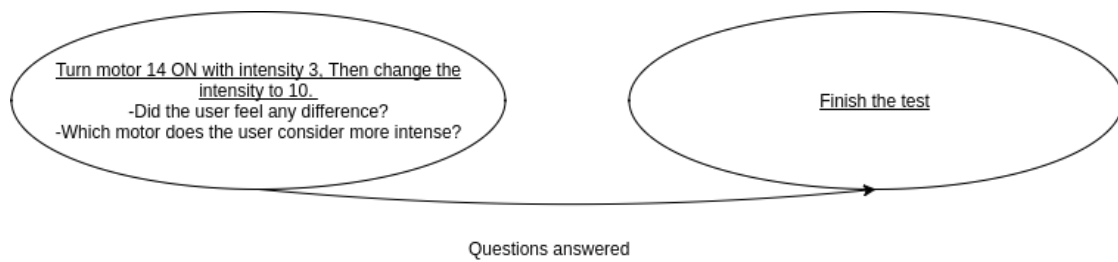
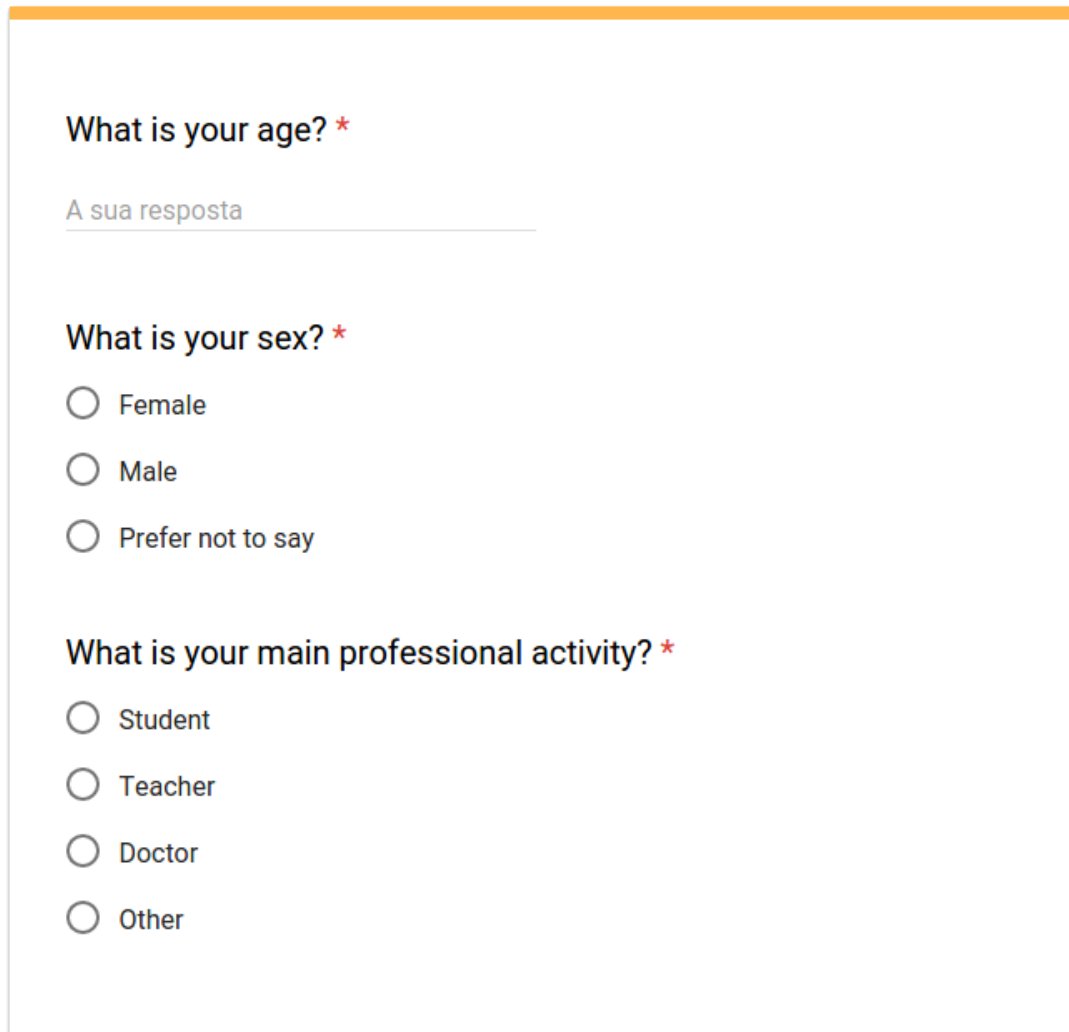


Figure 4.3: State Diagram of the Intensity Test

4.2 Questionnaire

After the test the subjects are asked to answer a small questionnaire created with recourse to google forms. The questions can be found in the next figures.



The image shows a screenshot of a Google Forms questionnaire. It contains three questions, each marked with a red asterisk to indicate it is required. The first question is 'What is your age?' followed by a text input field with the placeholder 'A sua resposta'. The second question is 'What is your sex?' followed by three radio button options: 'Female', 'Male', and 'Prefer not to say'. The third question is 'What is your main professional activity?' followed by four radio button options: 'Student', 'Teacher', 'Doctor', and 'Other'.

Figure 4.4: Introduction questions

Individual Motor Control

In the motor control interface the motors can be controlled individually with individual intensities.

Could you localize all the motors? *

☐ Yes

☐ No

If not, why do you think you couldn't?

Was the intensity too low? Were the motors too close?

A sua resposta

Could you feel the different intensities? *

☐ Yes

☐ No

Where do you think it's easier to detect the motors? *

☐ Upper hand

☐ Lower hand

☐ Arm

☐ None

Figure 4.5: Motor Control questions

Pattern Control

Did you try the shiver pattern? *

☐ Yes

☐ No

What do you think about the shiver stimuli? *
Did it feel real for you? Could you sense where the motors were? Was it too fast/slow?

A sua resposta

Did you try the tickle pattern? *

☐ Yes

☐ No

What do you think about the tickle stimuli? *
Did it feel real for you? Could you sense where the motors were? Was it too fast/slow?

A sua resposta

Figure 4.6: Pattern Control questions

Comments and Suggestions

All the comments, suggestions and opinions are welcome!

Do you have any comment/suggestion related to the individual motor control?

A sua resposta

Do you have any comment/suggestion related to the pattern control?

Any stimuli suggestion for example? Anything you think it would be useful to add?

A sua resposta

Do you have any comment/suggestion related to the interface?

Such as the interface design or if it's user friendly.

A sua resposta

Do you have any comment/suggestion related to the prototype?

Such as the motor position, material used, etc.

A sua resposta

Other comments/suggestions

A sua resposta

Figure 4.7: Comments and Suggestions page

4.3 Results