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Title: Tactile Semiautomatic Passive-Finger Angle Stimulator (TSPAS)

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Author Questionnaire

1. Microscopy: Does your protocol involve video microscopy, such as filming a complex dissection or microinjection technique? **N**

2. Software: Does the part of your protocol being filmed demonstrate software usage? **Y**

If **Yes**, we will need you to record using screen recording software to capture the steps. If you use a Mac, QuickTime X also has the ability to record the steps. Please upload all screen captured video files to your project page by the script return deadline.

Videographer: Screen captures not provided, please film

3. Filming location: Will the filming need to take place in multiple locations (greater than walking distance)? **N**

Introduction

1. Introductory Interview Statements

REQUIRED:

1.1. **Jiajia Yang**: Our method provides a new approach to measuring tactile spatial acuity **[1]**.

1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera Vid NOTE: The first 3 takes of the Jiajia Yang interview has him looking straight to camera. The Interview shots where he is looking slightly off camera start from A001_09280957_C004.mov

REQUIRED:

1.2. **Wu Wang**: Our semiautomated system is easy to operate and can be used to control the movement speed, distance, and contact duration **[1]**.

1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

Ethics Title Card

1.3. Procedures human subjects have been approved by the Institutional Review Board (IRB) at Okayama University.

Protocol

2. Detailed Equipment Composition and Function

2.1. To prepare tactile angle stimuli, use a milling machine to cut an acrylic sheet into an 8-millimeter-long, 1.5-millimeter-wide, 1-millimeter-high polyline with two equal lines **[1]** symmetrically distributed along an imaginary bisector and a 40-millimeter-long, 40-millimeter-wide, 3-millimeter-high square base **[2]**.

2.1.1. WIDE: Talent cutting sheet/Talent approaching machine with sheet or similar representative action

2.1.2. Shot of cut sheet *Video Editor: please add imaginary biscector as dotted line or similar when mentioned*

Vid NOTE: I took various shots of different cut sheets that can found in files:
A001_09281243_C020.mov
A001_09281243_C021.mov
A001_09281254_C022.mov
A001_09281258_C023.mov
A001_09281416_C038.mov

2.2. Glue the polyline to the center of the square base to create a 2D raised tactile angle stimulus **[1]**.

2.2.1. Talent gluing polyline

2.3. Make pieces with angle sizes ranging from 50- to 70-degrees in 2-degree increments **[1]** and make up to 20 pairs of discriminated angles **[2]**, including 20 identical reference angles **[3]** and 10 pairs of identical comparison angles with measured accuracies of plus or minus 0.2 degrees **[4]**.

2.3.1. Talent making pieces/shot of pieces Vid NOTE: For 2.3.1 – 2.3.2, I took various shots for this sequence, but perhaps the best shot to start with is filename: A001_09281357_C036.mov

2.3.2. Talent making angles/shot of angles

2.3.3. Shot of 20 identical reference angles OR Use 2.3.2. *Video Editor: please emphasize reference angles*

2.3.4. Shot of 20 identical comparison angles OR Use 2.3.2. *Video Editor: please emphasize comparison angles*

3. Experiment Analysis

3.1. Before beginning an experiment, in the data editing software, set the **motion type** of the device to **Increment Model [1]**, the **motion distance** to 80 millimeters, the **motion speed** to 20 millimeters/second, the **motion function** to single, and the **axis** as ID equals zero to set the electronic slide movement, distance, and speed parameters, respectively **[2]**.

3.1.1. WIDE: Talent at computer, setting motion type, with monitor visible in frame
3.1.2. SCREEN: To be provided by Authors: Parameters being set

3.2. When the software parameters have been set, have the Subject sit at a table with the apparatus **[1]** and place a blindfold on the Subject **[1]**.

3.2.1. Talent helping Subject sit at table
3.2.2. Talent blindfolding Subject/giving Subject blindfold

3.3. ~~**[1]**~~ Instruct the Subject to lightly place the right index finger at the opening of the hand plate **[2]**.

~~3.3.1. Talent fixing right hand *Videographer: Important step*~~
3.3.2. Talent instructing/Subject placing finger at opening *Videographer: Important step*

3.4. Next, clamp a pair of angles, including the reference angle and the comparison angle, onto the slide **[1]**.

3.4.1. Talent clamping angle(s) *Videographer: Important step*

3.5. Instruct the Subject to report which of the angles is larger as perceived by touch **[1]** and click the button **[2]**.

3.5.1. Talent instructing/Subject nodding *Videographer: Important step*
3.5.2. Talent clicking button *Videographer: Important step*

3.6. The pair of angles will slide passively across the index fingers at a speed of 20 millimeters/second for 80 millimeters **[1-TXT]**.

3.6.1. Angles sliding Vid NOTE: 3.5.2 take 3 can also be used here *Videographer: Important/difficult step* **TEXT: Carefully monitor to determine up or down angle passing**

3.7. If the Subject cannot identify which angle is larger, they can indicate that the angles are the same **[1]**.

3.7.1. Talent indicating angle size *Videographer: Important step*

3.8. Register the answer of the Subject as the response data **[1]**. Then replace the angles and repeat the presentation in the same manner 10 times **[2]**, recording the Subject's response after each analysis **[3-TXT]**.

3.8.1. Talent at computer, registering Subject answer *Videographer: Important step*
3.8.2. Talent replacing angle(s) *Videographer: Important step*
3.8.3. SCREEN: To be provided by Authors: Shot of Subject's response OR Shot of Subject's answer in lab notebook or similar **TEXT: Present pairs in pseudorandom order with reference angle passing first 50% of time** NOTE: Not uploaded at the time of postshoot processing

3.9. To avoid uncomfortable sensations on the index finger, have the Subject take a 3-minute break after each series of 20 trials **[1]**.

3.9.1. Talent releasing Subject hand/Subject leaning back to indicate break or similar

Protocol Script Questions

A. Which steps from the protocol are the most important for viewers to see?
3.3.-3.8.

B. What is the single most difficult aspect of this procedure and what do you do to ensure success?
3.6. is the most difficult aspect. During the period of the angle sliding across the fingerpad, you need to observe whether it moves up and down.

Results

4. Results: Representative Logistic Curve Fit

4.1. To apply the logistic curve to describe the angle discrimination threshold, the 3-alternative force-choice result must be expressed as a frequency distribution **[1]**.

4.1.1. LAB MEDIA: Figure 4 *Video Editor: please emphasize black squares*

4.2. In this coordinate, a logistic curve could be fitted by the least square method **[1]** and the angle discrimination threshold was defined as half of the difference between the angle **[2]** at accuracy rates of 25 **[3]** and 75% **[4]**.

4.2.1. LAB MEDIA: Figure 4 *Video Editor: please emphasize data line*
4.2.2. LAB MEDIA: Figure 4 *Video Editor: please emphasize dotted A0 lines*
4.2.3. LAB MEDIA: Figure 4 *Video Editor: please emphasize A1 section of graph including double arrow*
4.2.4. LAB MEDIA: Figure 4 *Video Editor: please emphasize A2 section of graph and double arrow*

Conclusion

5. Conclusion Interview Statements

5.1. **Jiajia Yang**: This technique may provide a new approach for the tactile interplay of sensory and high order processing **[1]**.

5.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera