**Participant Instructions**

Here, we include scripts for/descriptions of instructions given to participants during Experiments 1-4 of Al-Fawakhiri et al.’s 2023 resubmission to *The Journal of Neurophysiology*. This document is supplementary, so please refer to the methods section of the manuscript if terminology is not clear.

Instructions that the experimenter spoke to participants are indicated by hanging-indent formatting and preceded by the “**Experimenter:**” string. Bracketed information in these sections indicated parts of the conversation that could vary depending on the participant.

Events in the experiment are bracketed and described by italicized text.

Text instructions that appeared on the screen are bracketed, centered, and not italicized. During the experiment, this text was displayed on the monitor as white, 24 pt, Arial font on a black background. Other experimental stimuli (*e.g.*, the cursor, the target, the starting location) were not displayed while the text was on the screen. Participants would read the text, and the experimenter would provide the explanation in the part of the script that follows the text instructions. Then, the experimenter would press a button to remove the text instructions from the screen, restore the other experimental stimuli, and resume the task.

**Experiment 1**

[*Beginning of Experiment. Baseline Phase.*]

**Experimenter:** This is the tablet. The way you interact with it is by moving this air hockey paddle like you would use a mouse, but it only works on this surface, and you will see your cursor up here. [Demonstrate using the air hockey paddle on the tablet and point to the screen over it.] For the duration of this experiment I want you to only look at the screen, not at the tablet below. You’re going to be playing a game that is like a simplified version of Fruit Ninja. [check familiarity with Fruit Ninja]. When a fruit, or in this game, a target, appears somewhere on the screen, you will have to try to slice through the middle of it as quickly and accurately as you can, slicing through it in a straight line. In order to get the fruit/ target to show up you must bring your hand to a central starting location. The way you find this spot is by making the hollow guide circle shrink-- once your hand is very close to the central starting location, you will see a cursor showing you where your hand is and you want to finish bringing that cursor to fill in the central circle on the screen. After that, the target will show up on the screen and you want to slice through it.

To start, you won't see your hand while you're trying to slice the target, but later on a small white dot will show up showing you how your hand moved.

[*Start task.*

*The following instructions are displayed on the screen:*

Slice through the target with your hand.

For now, you will not see where your hand is.]

**Experimenter:** [Remind participant how to find the starting location, if necessary.] Remember, try to slice through the target with your hand.

[*Game begins without cursor feedback.*]

[*After the no-feedback baseline, the cursor appears*.]

**Experimenter:** The cursor on the screen shows you where your hand is moving. Remember, try to get your hand through the center of the target.

[*Game pauses before clamp tutorial phase*

*The following instructions are displayed on the screen:*

You will see the cursor again. However, it will not follow your hand movement.

Reach straight to the LEFT to see for yourself…]

**Experimenter:** Okay so now, for basically the rest of the experiment, the cursor will be broken. It used to show you where your hand was but now it will not. Instead, it will follow a predetermined path, regardless of where you go. No matter what direction you move in, the cursor will always follow a straight line path toward the target but slightly off the center. It is important that you recognize that this is not your hand and you do not control the cursor on the screen. You could go anywhere and this would happen, but I want you to always try to go to the center of the target. You won't be able to see how well you're doing and whether or not you're hitting the center, because the cursor is broken but that should be your goal. You should ignore the cursor and focus on bringing your hand to the center of the target.

The next few trials will be a little exaggerated but they’re meant to show you what I mean.

[*First clamp tutorial trial begins*]

**Experimenter:** Here, I want you to go straight to the left, instead of going to the target.

[*Cursor movement is error-clamped 45° from the target when the participant moves*

*Game pauses*

*The following instructions are displayed on the screen:*

You will see the cursor again. However, it will not follow your hand movement.

Reach straight to the RIGHT to see for yourself…]

**Experimenter:** Here, go right.

[*Second clamp tutorial trial begins.*

*The cursor movement is error-clamped 45° from the target when the participant moves*

*Game pauses*

*The following instructions are displayed on the screen:*

You will see the cursor again. However, it will not follow your hand movement.

Reach straight to the BACK (towards you) to see for yourself…]

**Experimenter:** See? It doesn’t care where you go, it will always follow a predetermined path. Now on this last one, go the opposite direction from the target.

[*Third clamp tutorial trial begins.*

*The cursor movement is error-clamped 45° from the target. when the participant moves*

*Game pauses*

*The following instructions are displayed on the screen:*

Do your best to slice through the target with your hand.

Ignore the cursor, because it goes to a pre-programmed location and does not show where your hand is.]

**Experimenter:** Ok so that was just a demonstration. For the rest of the experiment the cursor will still be broken just like that, but it will be a lot more deceptive: it will show up a lot closer to the target, but it will still be slightly off of the center of the target. You want to hit right in the middle of the target, so you should try to bring your hand to the center of the target. You will never see that happen on the screen, because the cursor is broken, but that should be your goal.

[*Error-clamp block proceeds*]

[*Upon entering the washout phase*]

**Experimenter:** Good job. Almost done here. The cursor is going to disappear for a little bit, just keep trying to bring your hand directly to the middle of the target, in a straight line.

[*When cursor feedback resumes*]

**Experimenter:** The cursor is back! It actually shows you where your hand is now-- that is the true location of your hand. Try to make the cursor hit the middle of the target!

**Experiment 2**

**Experimenter:** This is the tablet. The way you interact with it is by moving this air hockey paddle like you would use a mouse, but it only works on this surface, and you will see your cursor up here. [Demonstrate using the air hockey paddle on the tablet and point to the screen over it.] For the duration of this experiment I want you to only look at the screen, not at the tablet below. You’re going to be playing a game that is like a simplified version of Fruit Ninja. [check familiarity with Fruit Ninja]. When a fruit, or in this game, a target, appears somewhere on the screen, you will have to try to slice through the middle of it as quickly and accurately as you can, slicing through it in a straight line. In order to get the fruit/ target to show up you must bring your hand to a central starting location. The way you find this spot is by making the hollow guide circle shrink-- once your hand is very close to the central starting location, you will see a cursor showing you where your hand is and you want to finish bringing that cursor to fill in the central circle on the screen. After that, the target will show up on the screen and you want to slice through it.

There will also be some tones that play if you are within a certain distance of the center of the target. If you are close enough, you will hear a pleasant “ding”. If you are not close enough you will hear a “knock” sound (kind of like a knife slapping a cutting board). For this first part, you will not see the cursor, but you will hear the dings and knocks telling you how close you are. Always try to aim to make your hand hit the middle of the target.

[*Start task.*

*The following instructions are displayed on the screen:*

Slice through the target with your hand.

For now, you will not see where your hand is.]

**Experimenter:** [Remind participant how to find the starting location, if necessary.] Remember, try to slice through the target with your hand.

[*Game begins without cursor feedback.*]

[*After the no-feedback baseline, the cursor appears*.]

**Experimenter:** The cursor shows you where your hand is moving. Remember, try to get your hand through the center of the target.

[*Game pauses before clamp tutorial phase*

*The following instructions are displayed on the screen:*

You will see the cursor again. However, it will not follow your hand movement.

Reach straight to the LEFT to see for yourself…]

**Experimenter:** Alright, so now the cursor will be broken. It will follow a predetermined path that doesn’t reflect where your hand actually goes. It will always show that path, no matter where you actually move. You should ignore the cursor on the screen and always try to hit the center of the target. Also, the sounds will be broken-- they will reflect where the cursor on the screen goes, but, again, you don’t control that. So regardless of whether your actual hand is close to the target or far away, you will always hear the same tone for the rest of the experiment, which is based on where the cursor landed.

To make this a little clearer, the next few trials will try to show you what I mean.

[*First clamp tutorial trial begins*]

**Experimenter:** Here, I want you to go straight to the left, instead of going to the target.

[*Cursor movement is error-clamped 45° from the target when the participant moves.*

*Game pauses*

*The following instructions are displayed on the screen:*

You will see the cursor again. However, it will not follow your hand movement.

Reach straight to the RIGHT to see for yourself…]

**Experimenter:** Here, go right.

[*Second clamp tutorial trial begins.*

*The cursor movement is error-clamped 45° from the target when the participant moves.*

*Game pauses*

*The following instructions are displayed on the screen:*

You will see the cursor again. However, it will not follow your hand movement.

Reach straight BACK (towards you) to see for yourself…]

**Experimenter:** See? It doesn’t care where you go, it will always follow a predetermined path. Now on this last one, go the opposite direction from the target.

[*Third clamp tutorial trial begins.*

*The cursor movement is error-clamped 45° from the target when the participant moves.*

*Game pauses*

*The following instructions are displayed on the screen:*

Do your best to slice through the target with your hand.

Ignore the cursor, because it goes to a pre-programmed location and does not show where your hand is. Ignore the sound, since it reflects the cursor location and not your hand location.]

**Experimenter:** Alright so those trials were a little exaggerated. For the rest of the experiment the cursor will land a lot closer to the target, but it will still be broken in the same way, and you should still ignore it and try to bring your actual hand to the center of the target. You will not be able to see that on the screen, nor will you be able to tell because of the tones because both the cursor and the tones are broken now. Try your best!

[*Upon entering the washout phase*]

**Experimenter:** Alright the cursor will now disappear and the tones now tell you how far away you are from the target. So if you hear knocks, that means you’re too far away from the center of the target. If you hear dings, that means you’re close to the center of the target. I know you can’t see your hand yet, but it will come back soon.

[*When* *cursor feedback resumes*]

**Experimenter:** The cursor is back! That is where your hand actually is. You should try to bring the cursor to hit the center of the target.

**Experiments 3 and 4**

**Experimenter:** This is the tablet. The way you interact with it is by moving this air hockey paddle like you would use a mouse, but it only works on this surface, and you will see your cursor up here. [Demonstrate using the air hockey paddle on the tablet and point to the screen over it.] For the duration of this experiment I want you to only look at the screen, not at the tablet below. You’re going to be playing a game that is like a simplified version of Fruit Ninja. [check familiarity with Fruit Ninja]. When a fruit, or in this game, a target, appears somewhere on the screen, you will have to try to slice through the middle of it as quickly and accurately as you can, slicing through it in a straight line. In order to get the fruit/ target to show up you must bring your hand to a central starting location. The way you find this spot is by making the hollow guide circle shrink-- once your hand is very close to the central starting location, you will see a cursor showing you where your hand is and you want to finish bringing that cursor to fill in the central circle on the screen. After that, the target will show up on the screen and you want to slice through it. The cursor on the screen will show you how well you did.

[*Start task.*

*The following instructions are displayed on the screen:*

Slice through the target with your hand.

For now, the cursor will show you where your hand is.]

**Experimenter:** [Remind participant how to find the starting location, if necessary.] Remember, try to slice through the target with your hand.

[*Game begins with cursor feedback.*]

[*Game pauses before clamp tutorial phase*

*The following instructions are displayed on the screen:*

You will see the cursor again. However, it will not follow your hand movement.

Reach to the LEFT and observe that the cursor does NOT follow your hand.]

**Experimenter:** Okay so now, for the rest of the experiment, the cursor will be broken. It used to show you where your hand was but now it will not. Instead, it will follow a predetermined path, regardless of where you go. No matter what direction you move in, the cursor will always follow a straight line path in some direction. It is important that you recognize that this is not your hand and you do not control the cursor on the screen. You could go anywhere and this would happen. Sometimes, the target will also move partway through your movement.

The next few trials will be a little exaggerated but they’re meant to show you what I mean.

[*First clamp tutorial trial begins*]

**Experimenter:** Here, I want you to go straight to the left, instead of going to the target.

[*Cursor movement is error-clamped 45° from the target*

*Game pauses*

*The following instructions are displayed on the screen:*

The cursor will keep on doing its own thing.

The target will also jump partway through your movement.

Reach to the RIGHT and observe that the cursor does NOT follow

your hand/that the target jumps.]

**Experimenter:** Here, go right.

[*Second clamp tutorial trial begins.*

*The cursor movement is error-clamped 45° from the target when the participant moves. Partway through the movement, the target jumps to the final cursor location.*

*Game pauses*

*The following instructions are displayed on the screen:*

The cursor will keep on doing its own thing.

The target will also jump partway through your movement.

Reach straight BACK (towards you) and observe that the cursor does NOT follow

your hand/that the target jumps.]

**Experimenter:** See? The cursor doesn’t care where you go, it will always follow a predetermined path. And the target moved. Now on this last one, go the opposite direction from the target.

[*Third clamp tutorial trial begins.*

*The cursor movement is error-clamped 45° from the target when the participant moves. Partway through the movement, the target jumps 45° past the final cursor location.*

*Game pauses*

*The following instructions are displayed on the screen:*

Do your best to slice through the location that

the target initially appears with your hand. Ignore the cursor,

because it goes to a pre-programmed location and does not show where your hand is.

If the target jumps, do your best to ignore that, too.

In other words, always aim straight to the original target location.]

**Experimenter:** Good. For the rest of the experiment the cursor will be broken in this manner but it will be a little more subtle: the cursor will be closer to the target, but it still follows a predetermined path that you do not control. Do your best to ignore the cursor. It is meant to distract you from the real goal of getting your hand in the center of the target. Also on some trials, the target will change locations. I want you to ignore that, too, and keep moving straight ahead to where the target initially showed up.