

Nerve Speed Indicator

Formative Evaluation

Lisa Sindorf

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THIS IS **NOT** A DEFINITIVE FINAL REPORT

FORMATIVE evaluation studies like this one often:

- **are conducted quickly**, which may mean
 - small sample sizes
 - expedited analyses
 - brief reports

- **look at an earlier version** of the exhibit/program, which may mean
 - a focus on problems and solutions, rather than successes
 - a change in form or title of the final exhibit/program

Summary of Findings

- All visitors (13/13) positioned their bodies and the pillow in ways that allowed them to feel the taps. However, a few (4/13) took a little while to put the pillow on their necks; and a few (2/13) may have felt only weak taps due to their positioning, possibly causing an atypical result.
- Only one visitor (1/13) described the use instructions on the label as confusing.
- At first, many visitors (7/8) struggled with interpreting the results on the digital display. Once we added additional text and placed it near the label, most (4/5) visitors accurately described what the exhibit was about.
- Some visitors (5/13), especially those who ended up with “neck tap first,” wondered how their results compared to a typical result.
- On a 5-point scale from *not interesting* (1) to *interesting* (5), many visitors (8/13) found the exhibit *somewhat interesting* (4). A few (2/13) expressed interest in having more precise control over the exhibit.
- No visitors (0/13) mentioned that they felt their nerve speed was being judged or tested.

Based on these findings, we will:

- Consider modifying the exhibit
 - to assist visitors in positioning their bodies, and
 - to enable more in-depth exploration.
- Work with the editorial and graphics department to revise label text and graphics
 - to help visitors understand the phenomenon, and
 - to help visitors know what results are typical.

Background

Created for the Concourse Gallery’s Central Cluster, *Nerve Speed Indicator* offers visitors the chance to investigate the speed at which their own nerve impulses travel. To use this exhibit, visitors position themselves in a chair (*Figure 2*), with a neck pillow (*Figure 3*) around the neck, and a foot- and leg-rest (*Figure 1*) gently resting against the right ankle. They should feel two solenoid “tappers” deliver a gentle tap to the ankle and neck.



Figure 2: Nerve Speed Indicator Exhibit



Figure 1: Footrest and Tapper



Figure 3: Neck pillow (tapper inside)

The speed of the two tappers can be controlled via a knob on the visitor's right; a digital readout (*Figure 4*) indicates the difference (in milliseconds) between the two taps, and tells which tap came first.



Figure 4: Digital Display. Text reads: “ANKLE TAP IS FIRST. 094 millisecond wait, then neck tapped.”

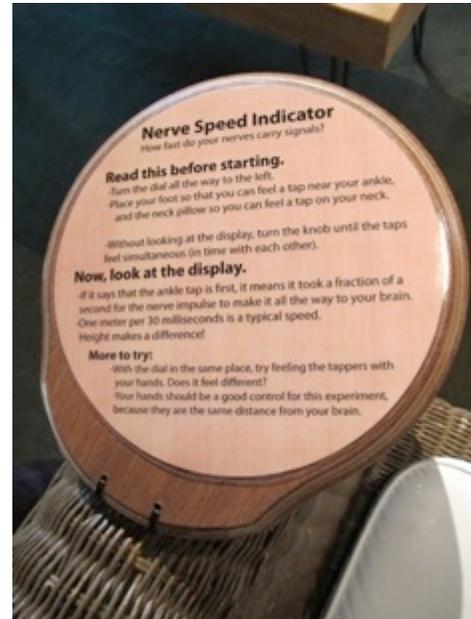


Figure 5: Version 1 Label text

Ideally, visitors follow the label directions (*Figure 5*) and start by calibrating the tappers so that they feel the ankle tap first. Then, they adjust the speed of the tappers until they perceive that the taps occur simultaneously. Due to the speed it takes nerves to transmit information, if the difference between taps is under 30 milliseconds, most users will experience the taps simultaneously, even when the ankle tap is still first. Visitors are invited to check the difference between taps with their hands.

Goals

The purpose of this formative evaluation was to determine:

- What barriers might prevent visitors from experiencing the phenomenon?
 - Can visitors position their bodies correctly?
 - Are the instructions clear and effective?
- What barriers might prevent visitors from understanding the phenomenon?
 - Is the explanation on the label clear?
 - Is the text on the digital readout (“ankle tap is first”) clear?
- What reaction do visitors have to the phenomenon?
 - Are they surprised or interested?
 - Might they feel negative, as if their nerves are bad or slow?

Methods

An evaluator selected visitors for an uncued interview by looking away, then looking back, and selecting the next visitor over 8 who sat in the chair, positioned his or her body,

and turned the dial. When the visitor finished, the evaluator approached and asked him or her some questions about the experience. See Appendix A for the interview instrument.

Data Collected

The evaluator interviewed 13 visitors: 10 adults, and 3 children; 8 males and 5 females, on Sunday February 26, 2012.

Findings

What barriers prevented visitors from experiencing the phenomenon?

Did visitors position their bodies in order to experience the phenomenon?

- All visitors (13/13) positioned their bodies and the pillow in ways that allowed them to feel the taps.
- A few visitors (4/13) took a little while to put the pillow on their necks, but eventually got there. One of the visitors who took a while to put the pillow on mentioned wanting a use diagram to help him position himself.

Visitor 1: You need a visual of how to set it up. [Tell me more?] A picture of a person with the neck thing.

- A few visitors (2/13) might have felt only a weak tap due to their position. One person didn't touch his ankle to the tapper, and one reported that boots made it harder to feel the tap. While both still reported feeling the taps, both ultimately described feeling the neck tap first (an atypical result).
- One person reported being uneasy about the cleanliness of the neck pillow; however, she did position the pillow on her neck.

Visitor 6: Look how many people used the pillow. I was thinking, "Yuk."

Were the use instructions clear and effective?

- Only one visitor (1/13) described the use instructions on the label as confusing.

Visitor 4: The first time (you do it) it's tough. The second time is easier. [What made it tough?] The directions. I missed turning the dial and what does it mean if neck is first?

These findings suggest that most visitors had little trouble using the instructions and positioning themselves in the chair. However, because accurate position is critical to experiencing the phenomenon, it will be important to make positioning as easy as possible for every visitor. To further facilitate positioning:

- We might add a use drawing
- We might engrave the neck pillow to tell them what to do with it
- We might add a leg-positioning guide

What barriers prevented visitors from understanding the phenomenon?

Was the explanation on the label clear?

Was the text on the digital readout (“ankle tap is first”) clear?

The main thing visitors seemed to struggle with was interpreting their results once they had attempted to synchronize the ankle and neck taps.

- The first 4 visitors interviewed all encountered difficulty interpreting the results on the digital readout.

Visitor 1: The display is cryptic. [Tell me more?] You need something to relate it to, like "this is what your results are." What's typical?

Visitor 2: It's telling me the time (in milliseconds) but, in comparison to what? 2 milliseconds, is that how long it takes to blink? How fast is that?

Visitor 3: It depends what this (knob) does, how it made them simultaneous. Does it actually speed up or is it your perception?

Visitor 4: It needs a better description of what it measures. It said "see if it taps at the same time," but I'm confused, it feels like the neck tap is first.

To help visitors understand the phenomenon, we added additional text: "Most people feel the signals at the same time, even though the ankle tap was first. That's because it takes a fraction of a second longer for the nerve impulse from your ankle to make it all the way to your brain." At first, we placed this additional text near the display (*Figure 4*) because visitors seemed to expect that the needed information would be found there.

- We interviewed 4 more visitors, but most (3/4) did not know what the exhibit was about, or missed the point.

Visitor 5: I don't know.

Visitor 7: I don't know. But I'd like to know more about nerves.

Visitor 8: See if you can get it to be at the same time.

- One visitor specifically mentioned wondering what a typical result would be.

Visitor 7: Is it supposed to be positive or negative? It says "ankle to neck" but which is supposed to be first?

While observing these visitors, we noticed that the new text near the display seemed to distract visitors from reading the instructions on the other label. Therefore, we moved the new text away from the display, and put it on the bottom of the existing label.

- We interviewed 5 more visitors with the new text at the bottom of the label; most (4/5) now knew that the exhibit was about the delay in nerve impulses.

Visitor 10: *The speed of electrical impulses in nerves. It's cool to relate to hot and cold coils.*

Visitor 11: *You sit down and make the beat the same. It figures out how long it took for the tap to reach your brain.*

Visitor 12: *Measuring time delay in nerve impulses across the body.*

Visitor 13: *It tests your neural system speed.*

- Although visitors now seemed to better understand the phenomenon, as in previous iterations, some (2/5) still wondered how their own results compared to a typical result.

Visitor 10: *You can make a delay before or after for the ankle or neck. You feel one further away from the nerve. Maybe you'd explore the difference between them so the range of numbers makes sense.*

Visitor 12: *You're measuring yourself. I wonder what normal is. I want to measure my own performance and compare.*

These findings suggest that clear label text, in the right place on the exhibit, can help visitors understand the phenomenon. The text we added ("Most people feel the signals at the same time, even though the ankle tap was first. That's because it takes a fraction of a second longer for the nerve impulse from your ankle to make it all the way to your brain.") helped visitors understand what the exhibit was about, but we will need to continue to adjust the text in subsequent iterations.

To help visitors interpret the digital display:

- We will incorporate the new text we wrote into the label.
- We might include some information (or change the display text) to help visitors who end up feeling a neck tap first.
- We might continue to play with ways to help visitors find the information they need to interpret the results (it could be placed on the label, or we might combine the label and display information in the same place).

To help visitors understand what a typical result might be:

- We might include text explaining what a normal delay is; e.g. "For a 6-foot person, there might be a 55 millisecond (1/55 second) delay between ankle and neck."

What reaction did visitors have to the phenomenon?

Were visitors surprised or interested?

- On a 5-point scale from *not interesting* (1) to *interesting* (5), 8/13 visitors found the exhibit *somewhat interesting* (4);

Visitor 1: It was kinda hard to find a difference in the delay. The range wasn't far enough.

Visitor 3: I'm interested in the human body.

Visitor 5: Interesting to see what it was. It taps you, but that's it.

Visitor 8: The tapping. And that it measures in milliseconds.

Visitor 10: Understanding the speed at which electrical impulses pass in your body.

Visitor 11: They feel the same, but they're not. [AE?] It's interesting because it said more people feel the ankle first. Mine was the neck.

Visitor 12: I was curious to see my perception, what I'd perceive.

Visitor 13: I was curious to know the speed of nerves transmission.

- 1 found it *interesting*;

Visitor 9: When you sit, you can make it tap harder or if you turn it lower, it taps softer.

- 2 found it *neutral*;

Visitor 4: It didn't have a lot of flashing lights. And it needs a better description of what it measures.

Visitor 7: Didn't understand it.

- 2 found it *somewhat not interesting*.

Visitor 2: It's too basic. [TMM?] It's a tap at the bottom and a tap at the top. It's not as experiential as other things here.

Visitor 6: It would have been interesting. Reading, it seems like it is, but doing it, not as much.

These findings suggest that the exhibit shows promise as being interesting to visitors. It's possible that once visitors understand the phenomenon better, they will also enjoy the exhibit more.

- A few (2/13) visitors expressed interest in having more control while experimenting with the exhibit.

Visitor 12: The granularity of the control was odd. [Tell me more?] I want more control. I can't tell if I'm affecting the knob or not. Maybe if the distance delay was greater. I turned it all the way, and the other way, and couldn't tell a difference. Turning slowly, I can't tell if it's changing. A click or something would help.

Visitor 13: The screen was blinking between 6 and 0 milliseconds. ... In the end, from a certain point, I felt no difference. [Tell me more?] From 82 (ms) to nothing, I felt no difference. I tested a bunch of them. At 33 ms I didn't feel the neck tap at all.

There are a few things we might do to satisfy visitors who want to experiment further:

- We might add a click to the dial.
- We might think about how to deal with the increments of change, especially from 0-6 milliseconds.

Did visitors feel negative, as if their nerves are bad or slow?

- We didn't hear any visitors (0/13) mention that they felt their nerve speed was being judged or tested.

Next Steps

For the next iteration of this exhibit, we plan to:

- Consider modifying the exhibit
 - to assist visitors in positioning their bodies, and
 - to enable more in-depth exploration.
- Work with the editorial and graphics department to revise label text and graphics
 - to help visitors understand the phenomenon, and
 - to help visitors know what results are typical.

These changes are discussed in more detail above.

Appendix A

Protocol and Interview Questions

Observations:

Did the visitor:

- Position their body correctly (ie ankle touching tapper, pillow contacting neck)?
 - YES NO
- Check the tappers with their hands?
 - YES NO

Other observations; anything that might prevent them from experiencing it?:

Questions:

1. How interesting did you find that experience? Would you say that was ...

Not interesting	Somewhat Not interesting	Neutral	Somewhat Interesting	Interesting
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2. What made it _____ for you?

3. Was there anything confusing or frustrating about this exhibit?

a. What about this part (*point to digital display*)?

b. What about this part (*point to label*)?

4. Was there anything new or surprising about this exhibit?
5. If you were telling a friend what this exhibit is about, what would you say?