Divided Attention

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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

Mind - Formative
Divided Attention

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PURPOSE

Bill Meyer, the exhibit developer, created 2 versions of Divided Attention, one in which the balls, which visitors try to track, move slowly and the other in which the balls move more quickly around the screen. The speed of the balls was the only difference between the two versions.

This formative evaluation looks at:

- What did visitors do at the exhibit?
- What did visitors think about the exhibit? In particular,
  - How interesting was the experience?
  - Did visitors think the balls were moving too fast or too slow?
  - Did visitors think the tracking activity is challenging enough?
  - Did visitors discover anything new about themselves and how their mind works at this prototype?

Figure 1. Divided Attention Prototype - Introductory screen

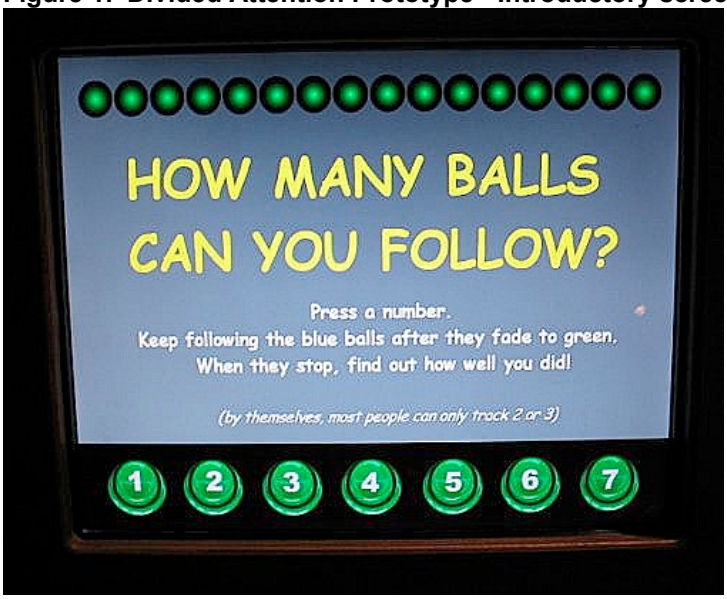


Figure 2. Divided Attention Prototype - Right before the balls start moving

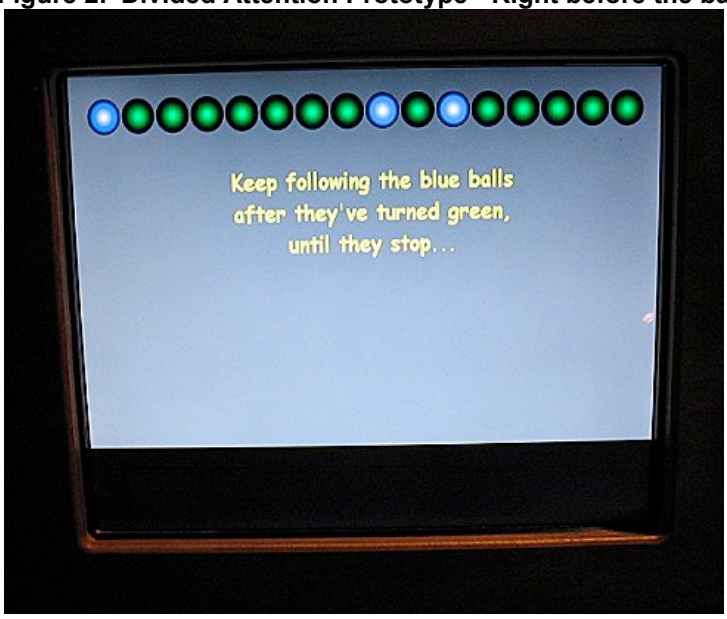
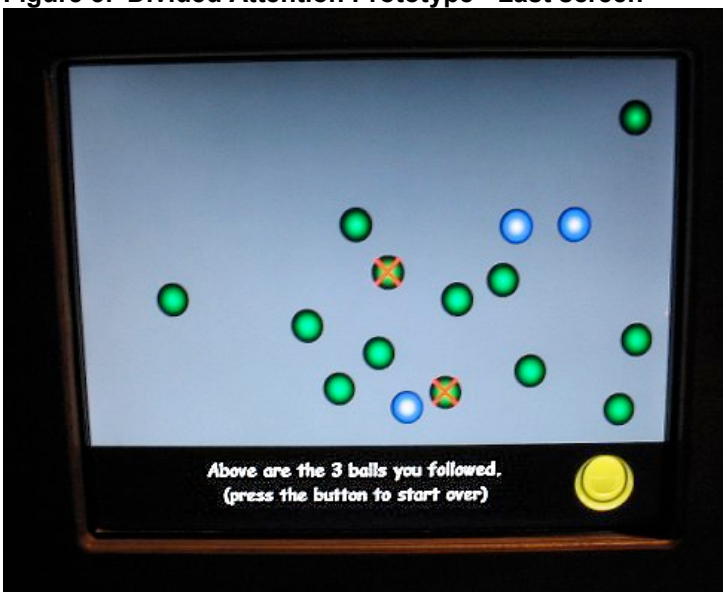


Figure 3. Divided Attention Prototype - Last screen



METHOD

- We switched between the 2 versions of Divided Attention every hour during data collection.
- An evaluator stood nearby the exhibit and observed every other visitor, who was 8 years old or older, that approached the exhibit. In particular, she made note of the version being

used, demographic information, the number of balls visitor chose to track, and the number of games[1] the visitor played.

- She then approached the visitor she just observed for an interview as that visitor was leaving the exhibit. The interview questions can be found in Appendix A.

DATA COLLECTED

- N=36

Age Group	Fast Version	Slow Version	Total
Adult	7	12	19
Teen	5	3	8
Child	5	4	9
Total	17	19	36

Gender	Fast Version	Slow Version	Total
Female	9	10	19
Male	8	9	17
Total	17	19	36

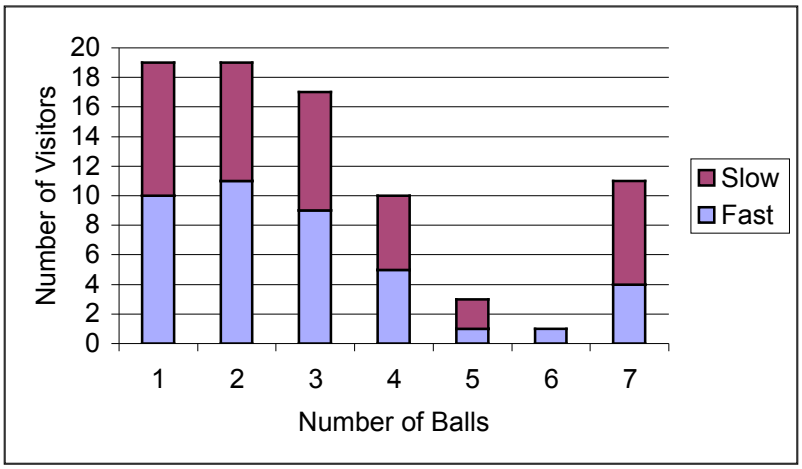
RESULTS

How visitors used the exhibit

- On average visitors chose to track 3 balls. There was no statistical difference between the number of balls visitors tried to track for the fast and the slow versions. (Mann-Whitney U = 128.5; p > .05.)

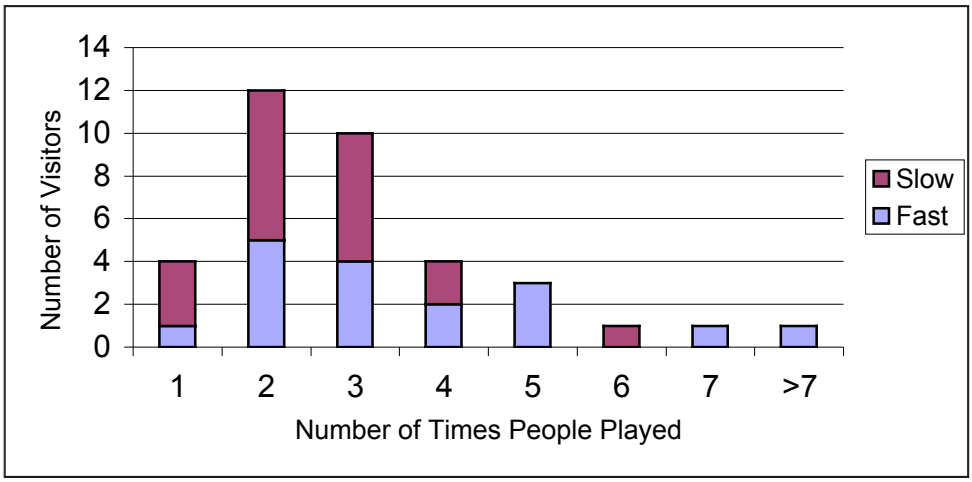
[1] A game starts when the visitor selects the number of blue balls s/he wants to track and ends when the exhibit reveals which balls were the 'blue' balls that the visitor was supposed to follow.

Figure 4. Histogram of the number of balls visitors chose to track. Overall: mean = 3.08 and median = 3. Fast version: mean = 2.88 and median = 2. Slow version: mean = 3.28 and median = 3.



- About half of the visitors started with 1 ball. There was no difference in the number of balls visitors started with between the fast and the slow versions. (Mann-Whitney U = 148.0; p > .05.)
- Visitors chose to play 3 games, median. There was no difference between the fast and slow versions. (Mann-Whitney U = 116.0; p > .05.)

Figure 5. Histogram of the number of times a visitor played a 'game'. Overall: mean = 3.08 and median = 3. Fast version: mean = 3.65 and median = 3. Slow version: mean = 2.58 and median = 2.



- The strategies visitors described using to keep track of all the balls fell into the following categories[2]:
  - Using fingers to follow the balls (7/33; 4 fast, 3 slow).
  - Grouping the balls spatially (5/33; 3 fast, 2 slow)
  - Peripheral vision (5/33; 3 fast, 2 slow).
  - One at a time, looking at one ball then another, then another (2/33; 1 fast, 1 slow)
  - Divide and conquer – each visitor in a group followed a subset of the blue balls (1/33)
  - Drawing geometric shapes using the blue balls as the vertices (1/33)
  - Guessing (1/33)
  - Giving up on 'lost' balls to pay attention to the others (1/33)
- About 40% (13/33) of the visitors we interviewed could not articulate any strategy beyond simply watching the balls.

What visitors thought

- On average, visitors found the exhibit experience *Somewhat Interesting.* This was regardless of which version they used.

Interest Rating	Fast Version	Slow Version	Total
Interesting	2	6	8
Somewhat Interesting	9	7	16
Neutral	4	2	6
Somewhat Uninteresting	1	1	2
Uninteresting	0	0	0

- Visitors found the exhibit interesting because
  - It's challenging to follow the balls (9/33; 5 Slow and 4 Fast)
  - It showed visitors something about their own minds (7/33; 3 Slow and 4 Fast). For example

    Visitor9-Slow: It's interesting to see how we keep track of everything… And it's more of a test on yourself.

    Visitor6-Slow: It's a game, which makes your brain really start working. As you do it, your brain really goes faster.

    Visitor18-Slow: … You immediately assume you're going to do better than it says is the usual result.

    Visitor7-Fast: I guess it's wondering why you can't group things together more than 4 or 3--what's so special about 3? I was close on 4 but I never got it.

[2] 33 of the 36 visitors we observed answered this question.

Visitor10-Fast: I don't know… It allowed you to see how many things can your mind track--something you didn't know before.

  - Visitors liked testing themselves (4/33; 3 Slow and 1 Fast)
  - Visitors liked to improve their skill (1/33; 1 Fast)
- 7/33 (with 4 Slow and 3 Fast) did not articulate a reason beyond saying that the exhibit was interesting.

- On the other hand, visitors also thought the exhibit was not interesting because
  - It wasn't challenging enough (2/33; 1 Slow and 1 Fast)
  - They didn't' see any point in replaying the game (2/33; 1 Slow and 1 Fast)
  - Visitors weren't sure what the activity was trying to show. (1/33; 1 Fast)
  - It was too difficult (1/33; 1 Fast)
  - It made them feel inadequate (1/33; 1 Slow)

Visitor3-Slow: Because to me, I equate it with being smart: Can I track 2 balls at once? I can only follow one.

Were the Balls Moving at the Right Speed?

- A large majority of visitors thought the balls were moving at about the right speed. This was regardless of whether that visitor played with the fast or the slow version. Fisher's Exact Test, $p = .1026 > .05$.[3]

Perceived Speed	Fast Version	Slow Version	Total
About the right speed	13	16	29
Too fast	3	0	3
Too slow	1	0	1
Total	17	16	33

Was it the Right Difficulty Level?

- A majority of the visitors thought that the exhibit was at the right level of difficulty, neither too easy nor too hard. There was no difference between the fast and the slow version. Fisher's Exact Test, $p = .7283 > .05$.[4]

[3] We grouped the 'Too fast' and 'Too slow' responses for the Fisher's Exact Test.
[4] We grouped the 'Too easy' and 'Too hard' responses to run the Fisher's Exact Test.

Perceived Difficulty	Fast Version	Slow Version	Total
About the right level	11	9	20
Too easy	3	4	7
Too hard	3	3	6
Total	17	16	33

Did the activity show visitors anything new about their minds

- 25/33 (about 75%) of the visitors we talked with said that the exhibit showed them something new about themselves and how their minds work. In particular, they found out:
  - Something about multitasking and keeping track of many things. (9/33; 3 Fast, 6 Slow)
  - How 'well' they themselves perform. (7/33; 3 Fast and 4 Slow)
  - How we concentrate. (5/33; 3 Fast, 2 Slow)
  - Something about the mind (other than concentration or multitasking). (4/33; 3 Fast, 1 Slow)

    Visitor5-Fast: It's like my mind is getting better all the time.

    Visitor6-Fast: It just shows you how your mind tries to organize things.

    Visitor16-Fast: Just how the human mind works. It's quite incredible.

    Visitor19-Slow: It shows that you tend to look at patterns. It's pattern recognition. If you can't get past 2, you're not recognizing patterns.
  - The factors that affect how many balls you can follow. (2/33; 1 Fast and 1 Slow)

    Visitor7-Fast: I think the amount of time the balls stay green after turning from blue sets the limit on how many you can follow.

    Visitor5-Slow: Don't take your eye off the ball
  - Something about vision. (2/33; 1 Fast and 1 Slow)

    Visitor2-Fast: Possibly, if I tried more than one. How I look at things, how narrow my vision gets.

    Visitor7-Slow: I think it's more abstract, because things change... It probably tells you about your eyesight, your peripheral vision.

- About half (12/25) the visitors who reported learning something new made their discovery while at the exhibit. The others reflected on their experience during the interview itself.

Visitors' suggestions for improvement

- Visitors thought that the exhibit could be improved in the following ways:
  - Allow more than one person to see the monitor. (1 visitor)

    Visitor2-Fast: I'm not sure. Possibly make it bigger, so the people around you can see what you're doing.

- Make the balls move differently. (1 visitor)

  Visitor4-Fast: Maybe have the balls go all different places.

- Track your eye movement. (1 visitor)

  Visitor8-Fast: Just add information. Maybe you could track your eyes. Like, your eye movement.

- Make it more attractive. (2 visitors)

  Visitor9-Fast: Maybe make the whole thing more colorful.

  Visitor10-Fast: It doesn't really appeal yet, just the thing there (the console)--it should attract attention.

- Vary the …

  Visitor8-Slow: It'd be more interesting to try out different geometric shapes. Or another dimension.

  Visitor18-Slow: Allow people to choose different colors. Would it be easier to track them?

  Visitor1-Slow: In addition to being able to track the balls, to [be able to] click the buttons 'faster' or 'slower' at the beginning.

- Ask thought provoking questions.

  Visitor14-Slow: Maybe some of the questions that you see on other exhibits, like 'try this' or some of the questions like you asked me.

SUMMARY

- On average, visitors tried to track 3 balls and played 3 games. We found no difference in visitor behavior between the fast and the slow versions of Divided Attention.
- Furthermore, visitors found the exhibit *Somewhat Interesting,* thought the exhibit was challenging but not too difficult, and felt that the balls were moving at the 'right' speed, regardless of which version they looked at.
- The above findings indicate that there is no preference for one version over the other.
- Overall, we found that about 60% (20/33) of the visitors we interviewed were able to articulate a strategy beyond simply 'trying to track the balls'. This suggests that visitors are thinking about how they may be following the balls and, furthermore, may be open to experimenting with other strategies we suggest.
- Most visitors thought that they discovered something new about themselves and how their minds work at this exhibit. In particular, the exhibit showed them something about multitasking, their own task performance, concentration, or some other aspect of the mind. However, about half the visitors reflected on their experience only during the interview as prompted by our questions. In fact, one visitor suggested that the exhibit includes "questions like you asked me" as a future improvement to the current prototype.
- The next iterations of Divided Attention can explore different ways for the exhibit itself to help visitors reflect on their experience and its connection to their minds. Some possibilities include encouraging visitors to try and reflect on different strategies coupled with open-

ended questions that help guide visitors to thinking about how different strategies reveals ways in which they think.

ACKNOWLEDGEMENTS

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APPENDIX A

Questions

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

Uninteresting	Somewhat Uninteresting	Neutral	Somewhat Interesting	Interesting
1	2	3	4	5

2. What made it _____ for you?

3. How many balls did you try to follow?

4. Did you feel that the balls were moving
   - ☐ Too fast
   - ☐ Too slow
   - ☐ About the right speed

5. Did you feel that tracking the balls was
   - ☐ Too hard
   - ☐ Too easy
   - ☐ About the right level of difficulty

6. Can you remember: how did you try to follow the balls? [Did you try a certain strategy? Did you try different ways of keeping track of the balls?]

7. Did the activity show you anything new about yourself or how your mind works?
   [If YES]
   a. What did it show you?

   b. Did you think of that just now or before now?

8. Do you have any suggestions for improving that exhibit?