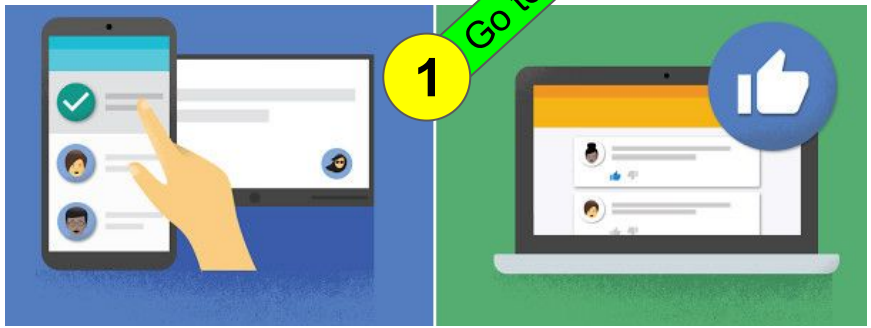


Ask a question...

Anonymous
3:01 AM

how did you measure reaction time in your code?

1 0

How did you measure reaction time in the code?

Ask a Q **2** Vote Qs ↑↓

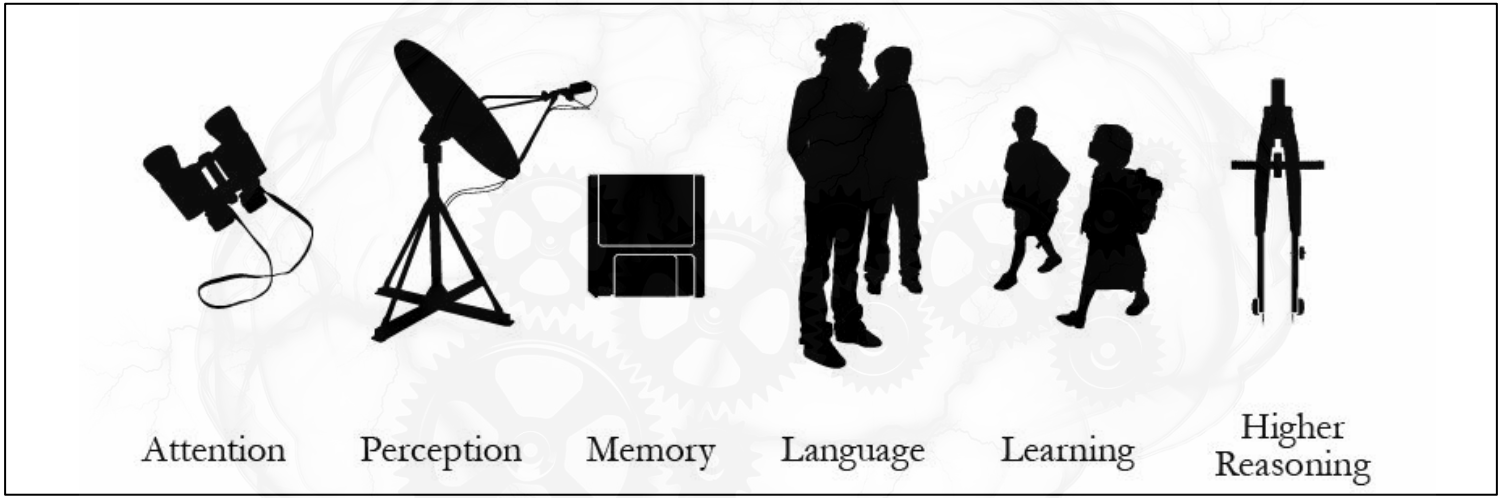
Asking **anonymously** Ask anonymously 46/300

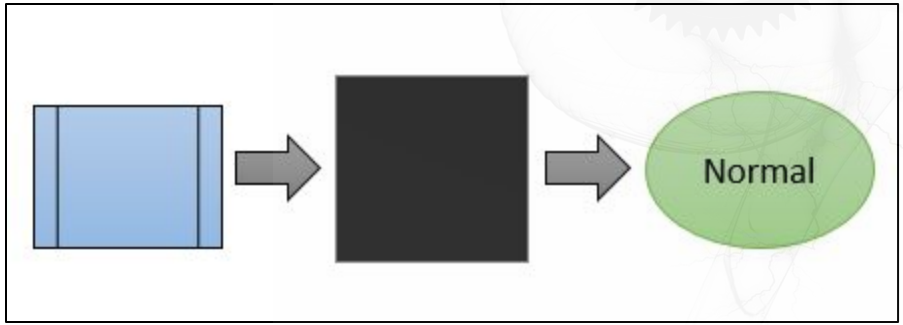
CANCEL SUBMIT

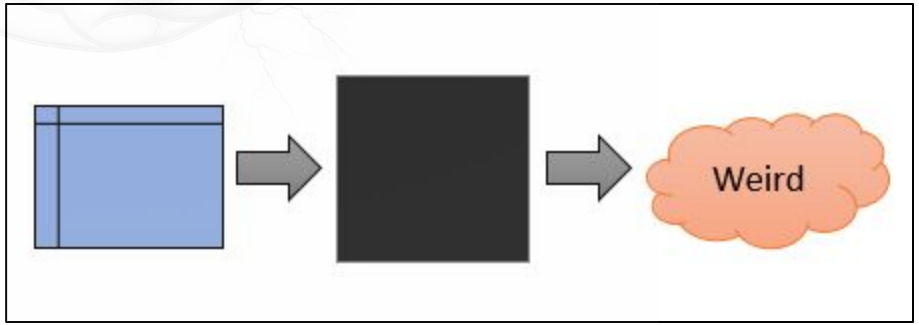
Change Blindness

Jenna Leland
Kristen Tang
Shawn Schwartz
Yasha Mouradi

***Theory* without <u>Experiment</u> is empty...**
<u>Experiment</u> without *Theory* is blind...







Change Blindness

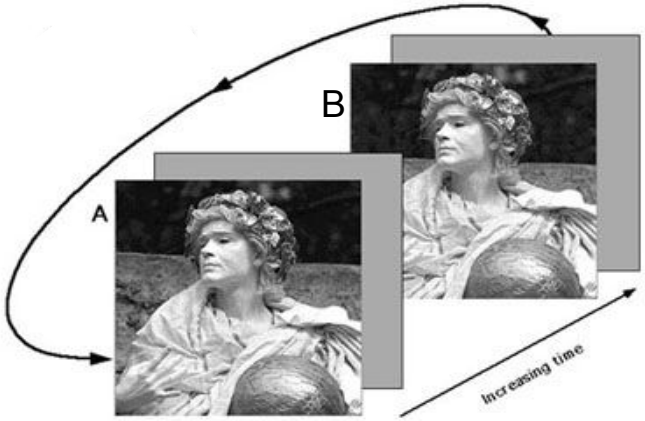
- Two identical images, except for one or more changes
- Images are shown in quick succession
- There is a mask shown between the images
    - A → Mask → B → Mask → A → Mask → B → Mask → A → Mask → B → Mask → ...

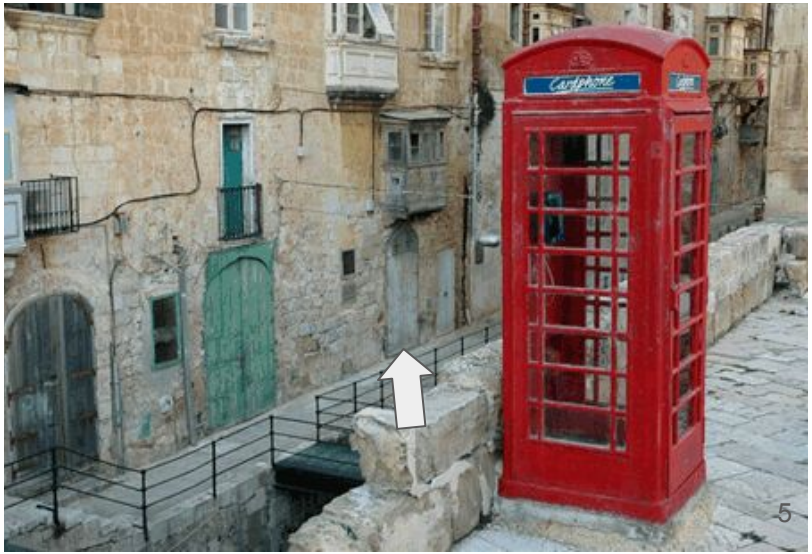
Change Blindness Task (CODE)

- **Show CBstim**

  For each trial, alternate between Image A and Image B with blank screen in between until

  1. Participant clicks within correct coordinates of change OR
  2. Trial times out



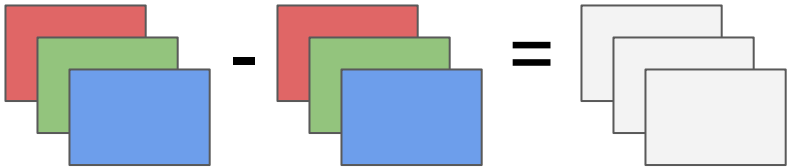


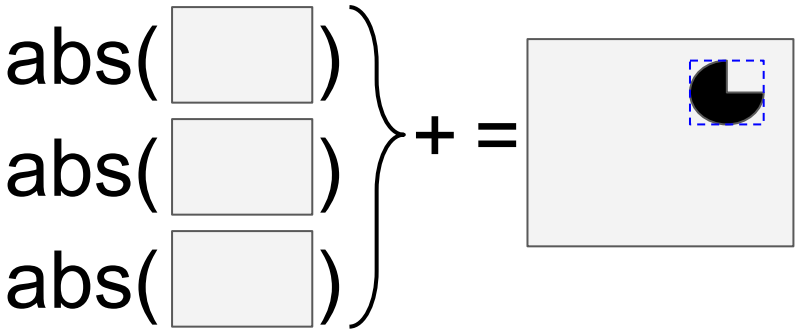
Outputs: Accuracy and Response Time

We generated a presentation vector for each frame of presentation. Either Image A, Image B, or a blank was shown (because subjects could click on any frame)

Change Region Identification

- Identification of changed region
  - Collapse three layers
  - Subtract pictures from each other
  - Find min and max to find the rectangle of change

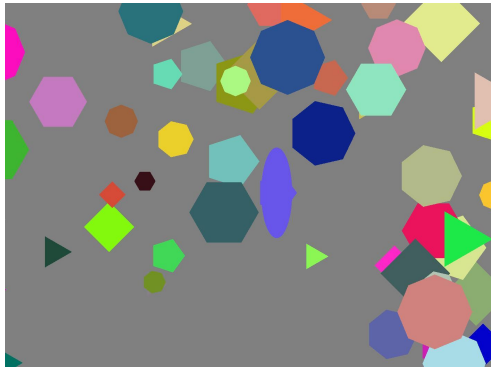
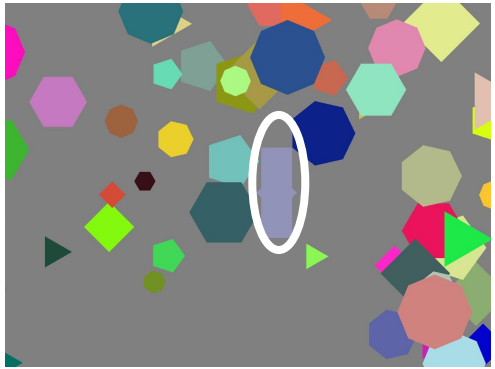




Shape Stimuli Production

- **Shape Stimuli Production Code** (before the experiment)

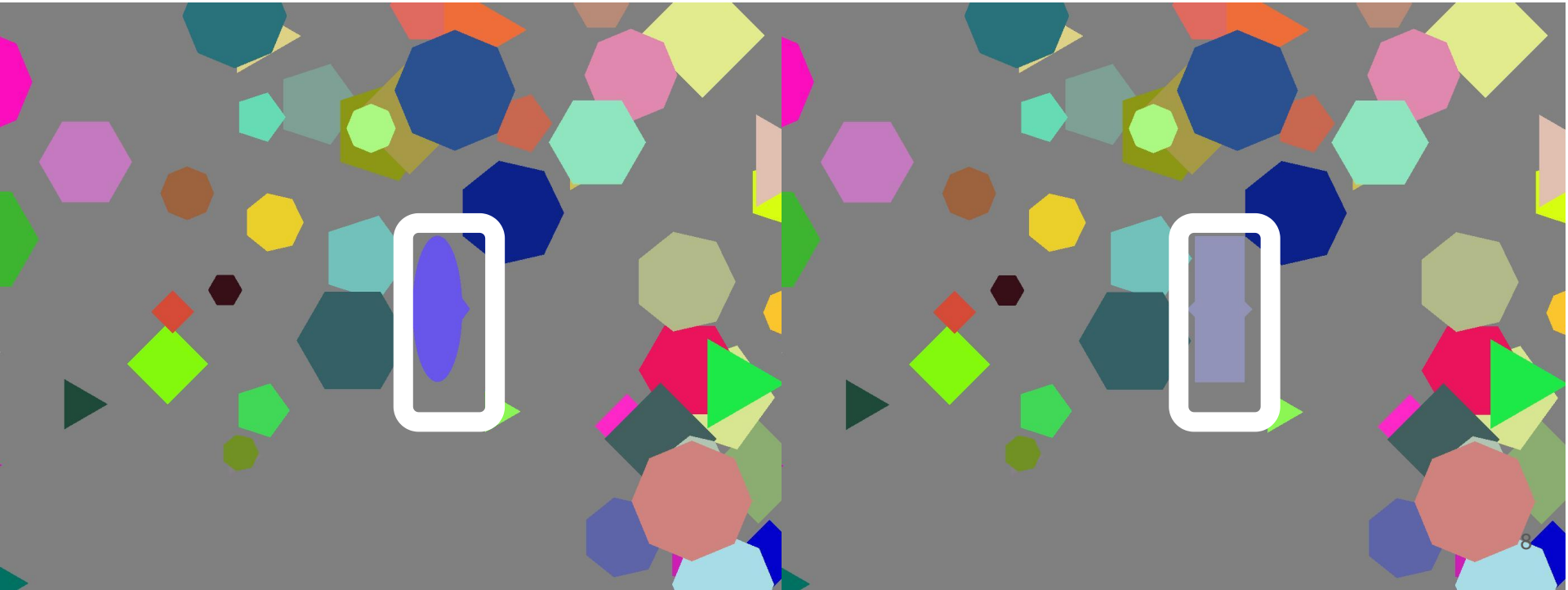


Change Blindness (CODE)

Create image A and image B for each trial

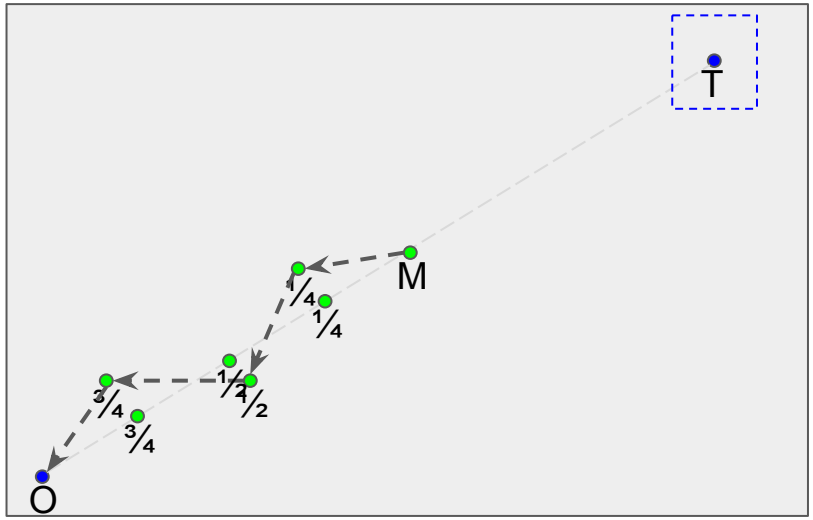
- Same set of random shapes
- One changed shape: same location, different shape and color

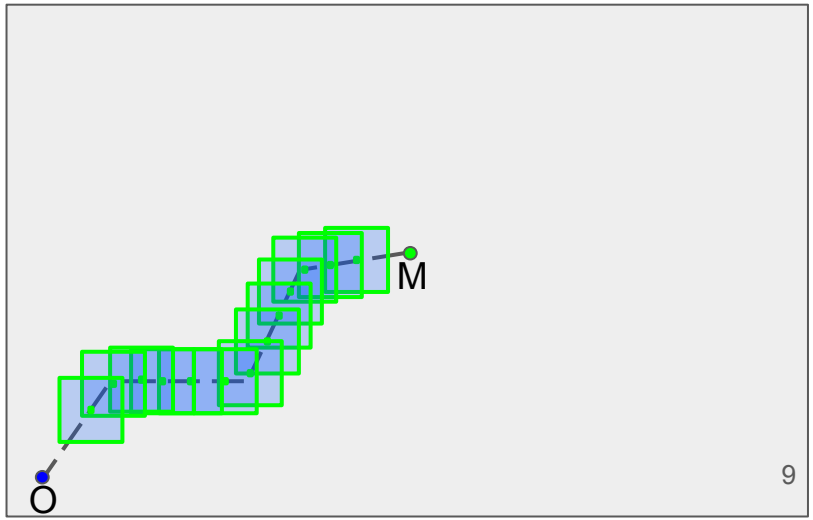


Mouse Trace Task (IV)

- Function: directs gaze to/away from change
- Input:
  - change rectangle
  - near vs. far
- Output:
  - Reaction time
  - X,Y location reached

- Find the center of change (point T)
- Find the farthest point by distance (point O)
- Find the midpoint between T & O (point M)
- Find the ¼, ½, ¾, points to T or O + noise
- Interpolate many points linearly: ***interp1()***
- Lock the mouse to a box along the path
- In case of cursor lock → click to end





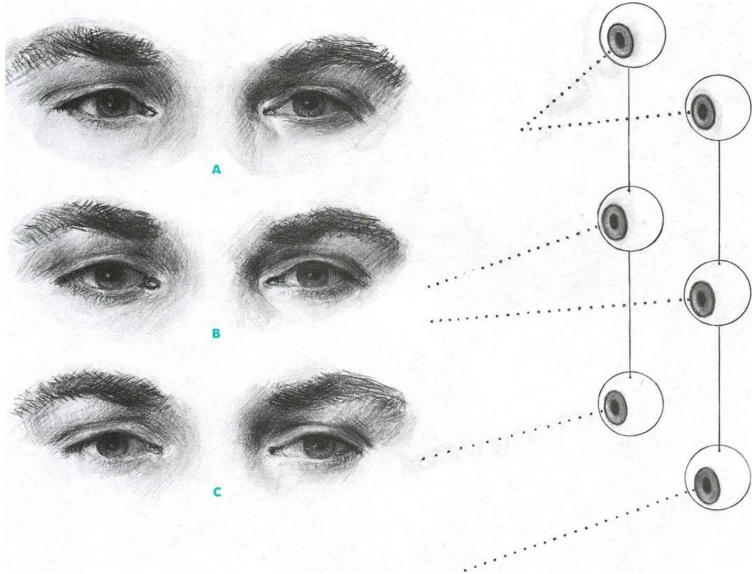
Design (2 IVs-2 DVs)

IVs — 1. Stimuli Type (image vs. shape)

2. Target-gaze proximity (near vs. far)

DVs — 1. Accuracy (% hits)

2. Response Time

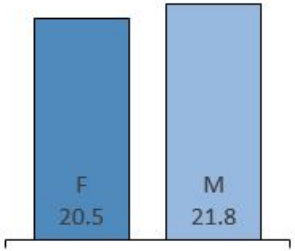


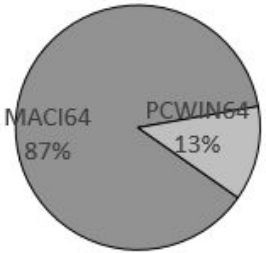
Hypotheses —

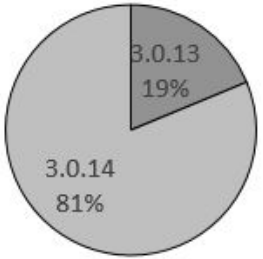
1. The smaller the target-gaze proximity, the faster and more accurately participants will be
2. Participants will find changes faster and more accurately in shapes than in images.
    a. Because if people are looking at realistic images, they tend to begin looking at what seems more salient to them right away once the mouse trace is done. Whereas if they are looking at random shapes, their gaze will be slower to shift to other areas, since all areas are of approximately equal salience.

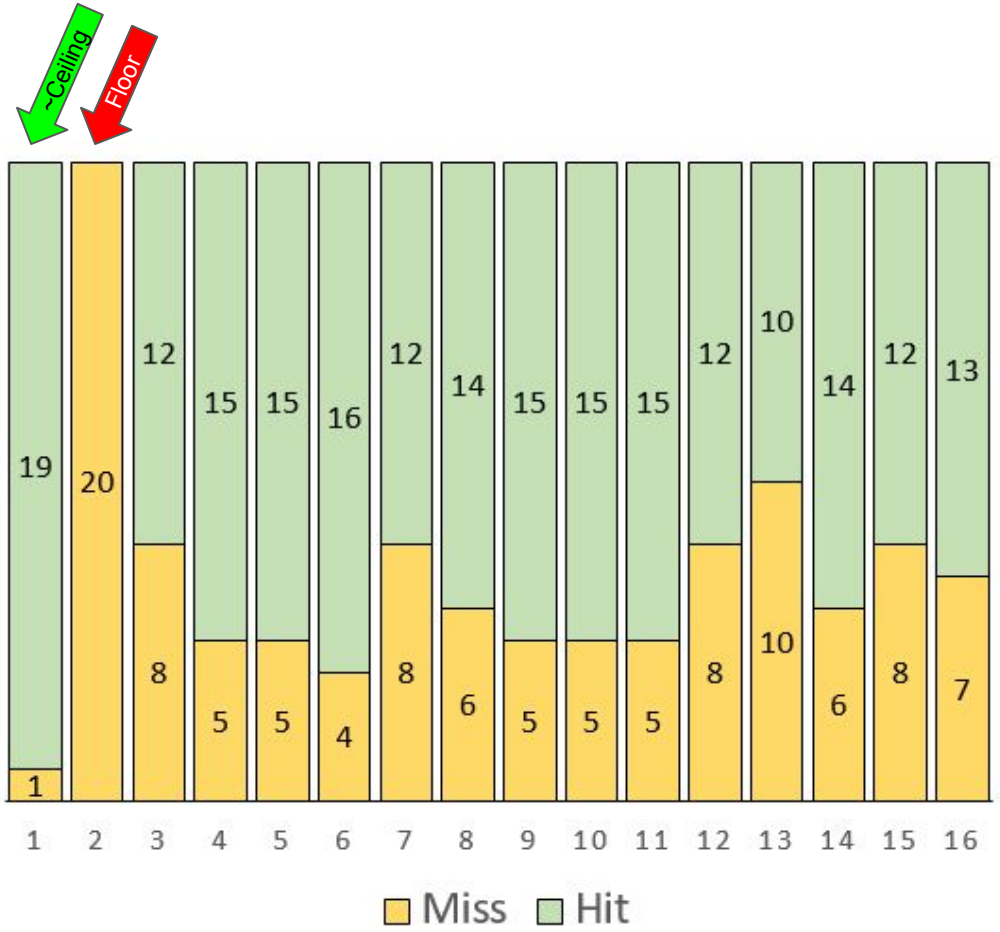
Participants

- 2 participants with overall near floor or near ceiling performance were removed from most analyses.



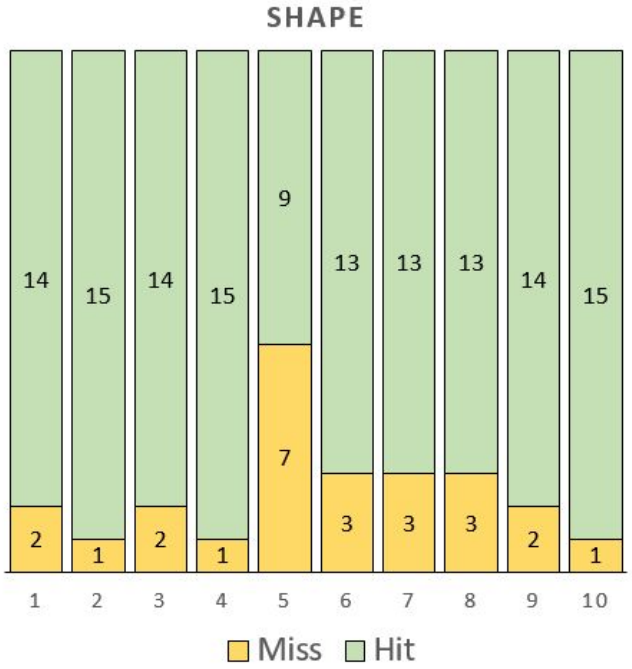






Task Difficulty by Stimuli

- Image 2 was missed by all participants
- Shape 5 was the most difficult

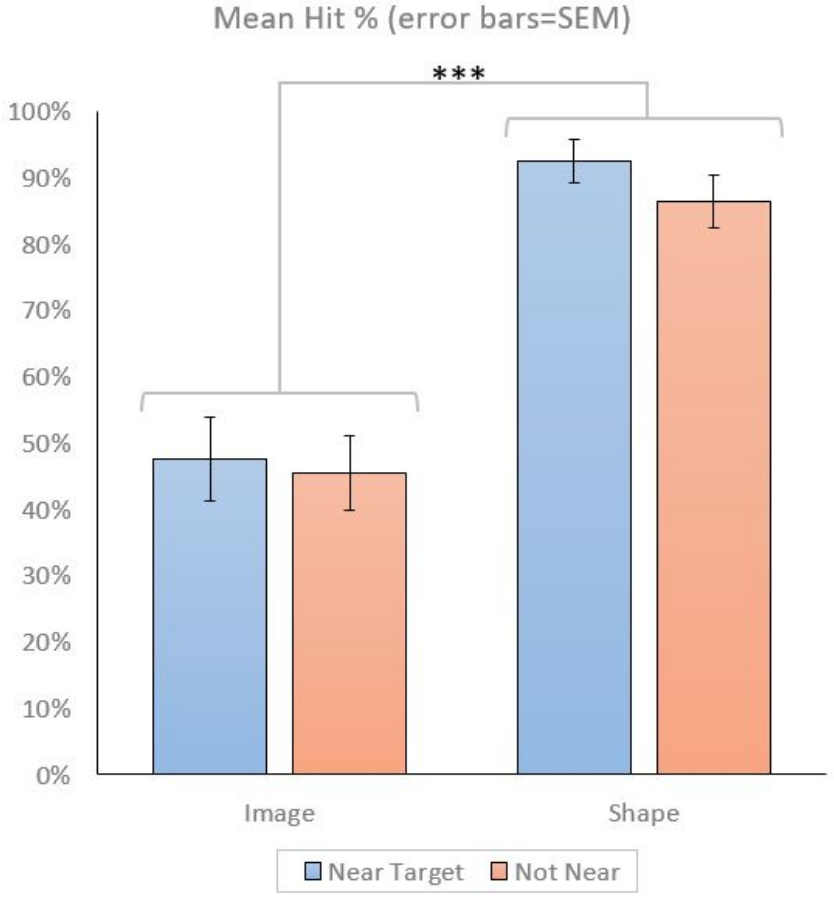


Missed by EVERY Participant!

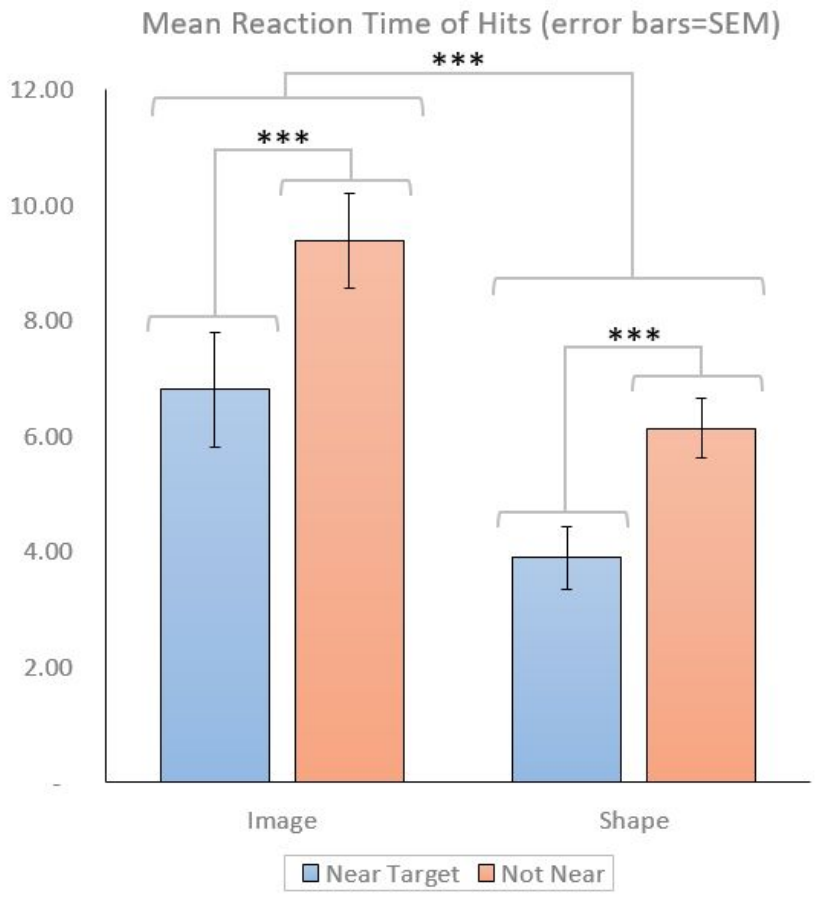
Data Analysis

Index	StimID	Cond_Shp	Cond_Trg	ScreenX	ScreenY	AspectRat	mouseX	mouseY	GazeX	GazeY	xtPtChang	ytPtChang	TargetX	TargetY	Dist	hits	hitRT
1	2	Image	Target	1440	900	1.6	501.0664	502.8047	0.55674	0.558672	496	507	0.551111	0.563333	0.007309	0	22.0219
1	10	Image	Opposite	1440	900	1.6	1431.934	889.0195	1.591037	0.987799	233	146	0.258889	0.162222	1.567226	1	20.6049
1	2	Shape	Target	1440	900	1.6	502	506	0.557778	0.562222	498	508	0.553333	0.564444	0.004969	1	3.86760
1	10	Shape	Opposite	1440	900	1.6	1431.977	892.6328	1.591085	0.991814	237	144	0.263333	0.16	1.566793	1	11.4194
1	8	Image	Target	1440	900	1.6	442.6641	471.082	0.491849	0.523424	439	469	0.487778	0.521111	0.004683	1	2.33389
1	8	Shape	Target	1440	900	1.6	439.5391	473.5703	0.488377	0.526189	436	474	0.484444	0.526667	0.003961	1	2.65064
1	9	Shape	Opposite	1440	900	1.6	10.45703	8.253906	0.011619	0.009171	1197	841	1.33	0.934444	1.610671	1	7.51848
1	9	Image	Target	1440	900	1.6	1191.234	845.9648	1.323594	0.939961	1194	844	1.326667	0.937778	0.003769	1	2.28388
1	1	Image	Opposite	1440	900	1.6	9.796875	8.933594	0.010885	0.009926	791	469	0.878889	0.521111	1.007343	1	13.2698
1	1	Shape	Target	1440	900	1.6	784.5117	466.25	0.87168	0.518056	792	474	0.88	0.526667	0.011974	1	1.60038
1	5	Shape	Opposite	1440	900	1.6	1434.793	7								1	6.41821
1	5	Image	Opposite	1440	900	1.6	1430.242	8								1	14.4034
1	7	Image	Opposite	1440	900	1.6	9.832031	5								1	11.436
1	6	Image	Opposite	1440	900	1.6	1439.996									1	12.3363
1	7	Shape	Target	1440	900	1.6	913.668									1	1.6670
1	6	Shape	Opposite	1440	900	1.6	1231	8								1	3.53418
1	3	Image	Target	1440	900	1.6	288.6875	7								1	14.3034
1	3	Shape	Target	1440	900	1.6	300.014	7								1	1.78376
1	4	Image	Target	1440	900	1.6	936.9809	2								1	1.70041
1	4	Shape	Opposite	1440	900	1.6	7.617188	8								1	3.98429

ID	Index	OS	OS2	Machine	PTBver	PTBrel	PTBrelDt	MATLABv	MATLABre	MATL
5851	1		Darwin 14	MACI64	3.0.14	30-Dec	2016	9.1	(R2016b)	#####
601	2		Darwin 16	MACI64	3.0.14	30-Dec	2016	9.2	(R2017a)	#####
5641	3		Darwin 14	MACI64	3.0.13	6-Jul	2016	9.1	(R2016b)	#####
1751	4		Darwin 14	MACI64	3.0.13	6-Jul	2016	9.1	(R2016b)	#####
7575	5		Darwin 16	MACI64	3.0.14	30-Dec	2016	9.2	(R2017a)	#####
4466	6	Windows	Microsoft	PCWIN64	3.0.14	30-Dec	2016	9.2	(R2017a)	#####
3963	7		Darwin 15	MACI64	3.0.14	30-Dec	2016	9.2	(R2017a)	#####
1234	8	Windows	Microsoft	PCWIN64	3.0.13	6-Jul	2016	9.1	(R2016b)	#####
143	9		Darwin 15	MACI64	3.0.14	30-Dec	2016	9.1	(R2016b)	#####
7774	10		Darwin 15	MACI64	3.0.14	30-Dec	2016	9.1	(R2016b)	#####
316	11		Darwin 15	MACI64	3.0.14	30-Dec	2016	9.1	(R2016b)	#####
4259	12		Darwin 15	MACI64	3.0.14	30-Dec	2016	9.1	(R2016b)	#####
8754	13		Darwin 16	MACI64	3.0.14	30-Dec	2016	9.2	(R2017a)	#####
1273	14		Darwin 15	MACI64	3.0.14	30-Dec	2016	9.1	(R2016b)	#####
5816	15		Darwin 16	MACI64	3.0.14	30-Dec	2016	9.2	(R2017a)	#####
723	16		Darwin 16	MACI64	3.0.14	30-Dec	2016	9.2	(R2017a)	#####

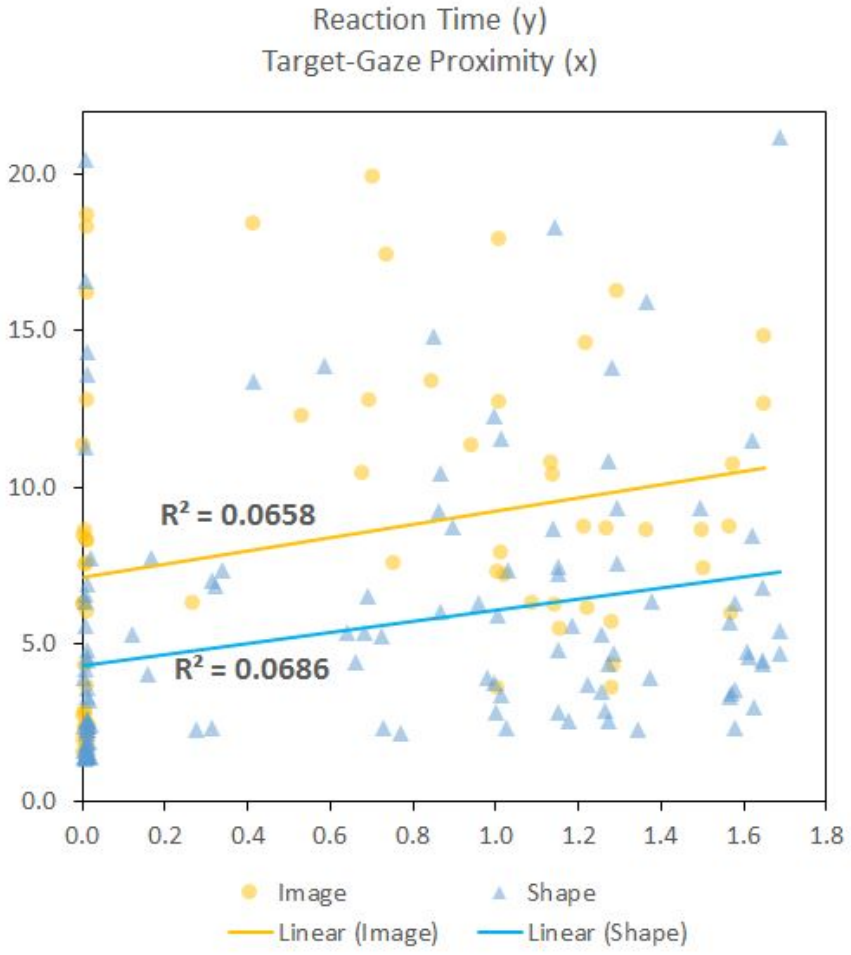


Source	Sum Sq.	d.f.	Mean Sq.	F	Prob>F
StimType	12.8084	1	12.8084	73.53	0
GazeTargProx	0.1141	1	0.1141	0.66	0.419
StimType*GazeTargProx	0.0247	1	0.0247	0.14	0.7065
Error	48.0751	276	0.1742		
Total	61.0714	279			

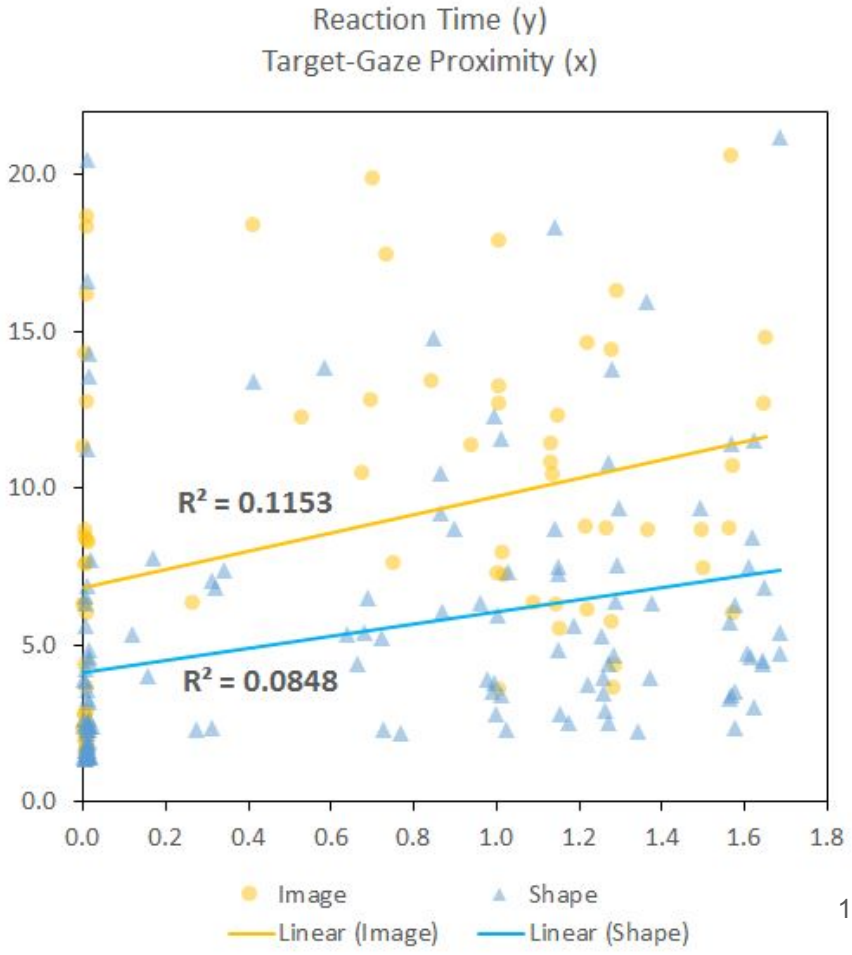


Source	Sum Sq.	d.f.	Mean Sq.	F	Prob>F
StimType	361.11	1	361.11	19.08	0
GazeTargProx	315.16	1	315.159	16.65	0.0001
StimType*GazeTargProx	6.79	1	6.787	0.36	0.5501
Error	3521.13	186	18.931		
Total	4232.5	189			

14 Participants (16-2)



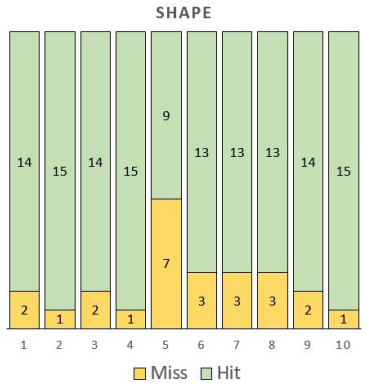
All Participants (16)

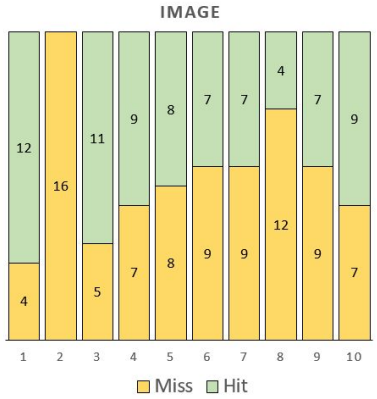


Potential Improvements...

- Rather than using rectangles, use pixel regions for changes, etc.
- Terminate trace prior to reaching the corner in the far from target condition

- Control for task difficulty between conditions by making the shapes more difficult or the images less difficult.





Potential Improvements...

- Explore different change types (object disappear, color change, position change, orientation change, etc…)
- Priming with words, priming with location
- Gaze-dependent paradigm with eye-tracking (we can see how many times people look right at the change, but miss it)
- Explore different mask types (colors, random shape, etc…)
- Multiples changes in the picture, see which they notice first:
  a. Background object vs foreground object / shape change vs color change
  b. Or like in the picture in slide 2, something disappearing and something just changing

Thank you!