

Hazard Recognition by Novice and Experienced Drivers



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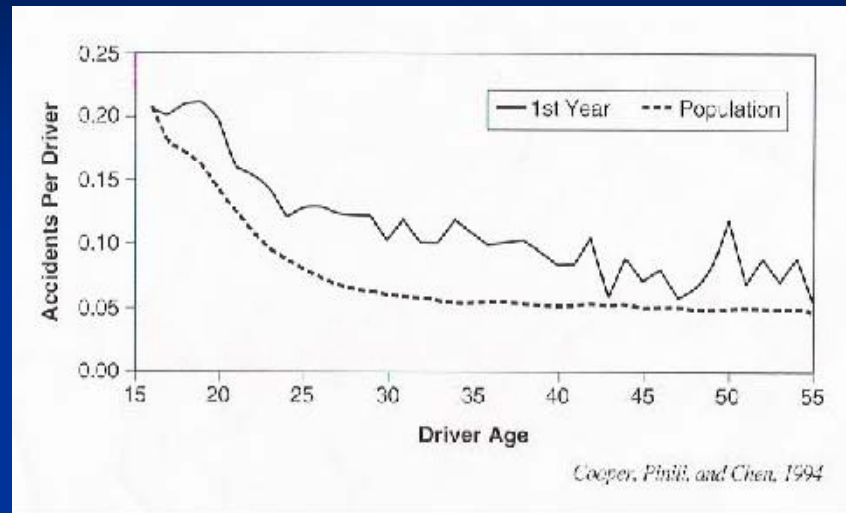
Which scene is riskier?



Again -- Which is riskier?



Accident Rates of Novice vs. Experienced Drivers

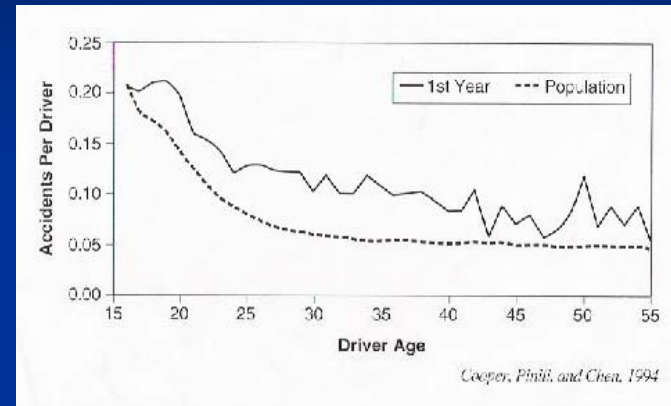


Crash data show greater risk of causing an accident during the first year of driving.

The elevated risk is evident in all age groups.

Cooper, Pinili, & Chen (1995). An examination of crash involvement rates of novice drivers aged 16 to 55. *Accident Analysis and Prevention*, 27, 89-104.

The difference between Experienced & Novice drivers?



Hypothesis --

Over time, drivers learn where to look

- ✓ The experts anticipate, fixate, and recognize potential hazards more readily than novices.

The 2nd Biggest Visual Illusion in the Universe

In order to experience this illusion, you must follow these instructions very carefully. It is really simple. First, read this whole paragraph, then do exactly what it says. But understand, this demonstration takes a great deal of self control. Really. So here's what you must do. After reading the paragraph, select a line near the center of the text. Then you should select a word near the center of the line. And then you should select a letter that sits in the center of the word that sits in the center of the line that sits in the center of the text. OK. Now fixate your eyes on that letter, maybe the red one. Do not move your eyes, not at all. Hold fixation on that single red letter!

OK? Got it?

Now, without moving your eyes,
try to read the text 3 lines above your fixation point

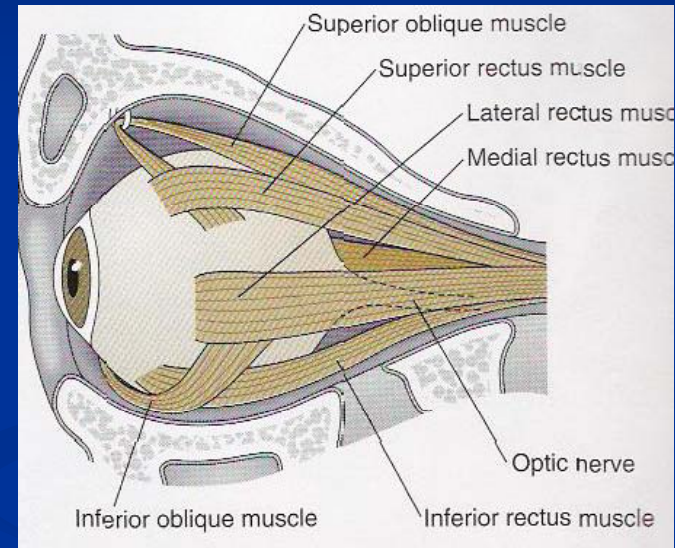
What's the point?

You *can't* see everything at once.
The 2nd biggest illusion in the Universe is the false impression that we can see every thing at once.
But that's not possible. The fovea is too small.

We *SEE* with our Foveae, and Eye Movements Feed the Foveae

Of all the movements a body makes,
eye movements are

1. The **fastest**
 - ✓ More than 700° per second.
2. The **most accurate**
 - ✓ Microscopic precision
3. The **most frequent**
 - ✓ 2-3 times per second
 - ✓ >150,000 in 16 hours
 - ✓ Not counting REM sleep



(side view)

Research has shown that seeing requires scanning --
fixating every bit -- of whatever we want to see.

A Classic Example

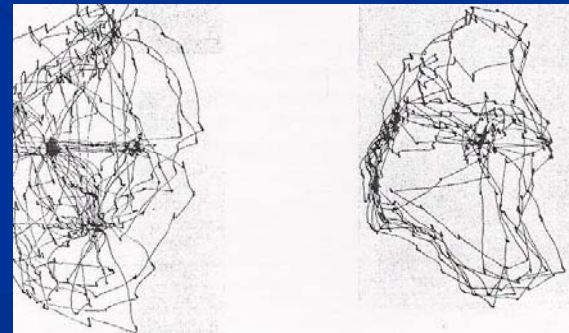
Seeing a face requires 100's of eye movements

Alfred Yarbus (1967) showed how we scan images very quickly & systematically.

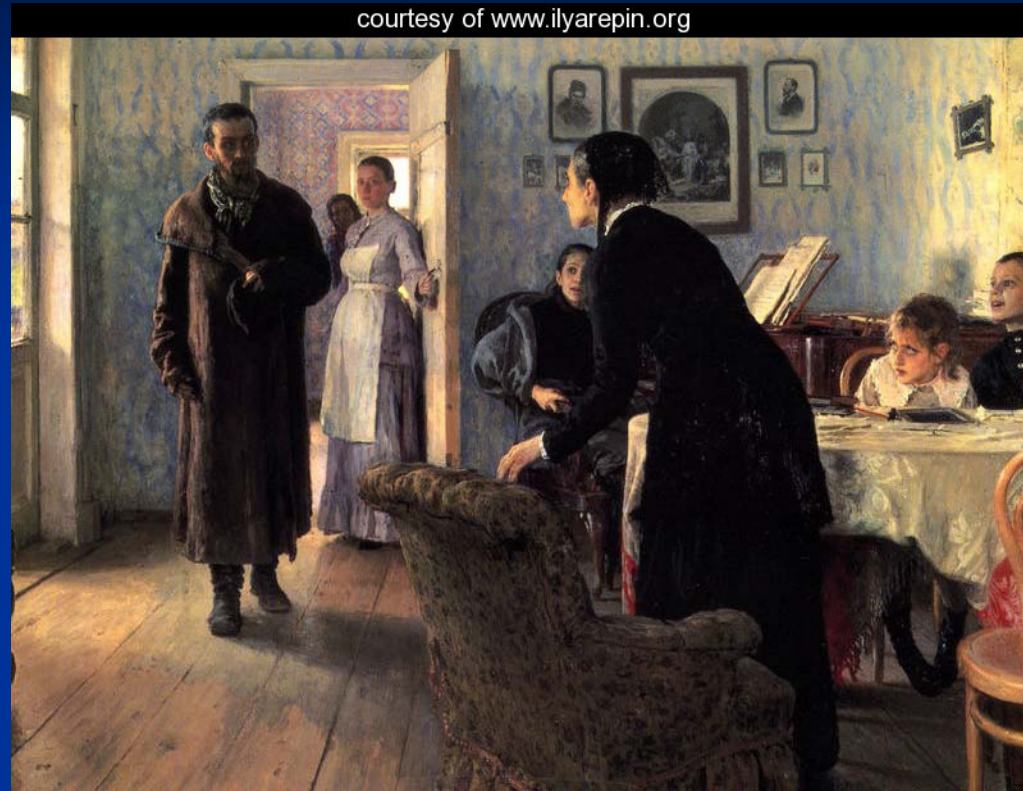
Two of the **stimuli**
his subjects viewed:

- ✓ *Girl from the Volga*, 3 min
(~360 eye movements)
- ✓ *Queen Nefertiti*, 2 min
(~240 eye movements)

Typical *scanpaths* —>>

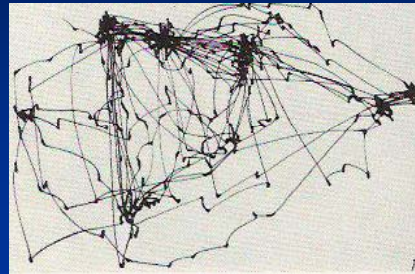


Yarbus also investigated more complex scenes

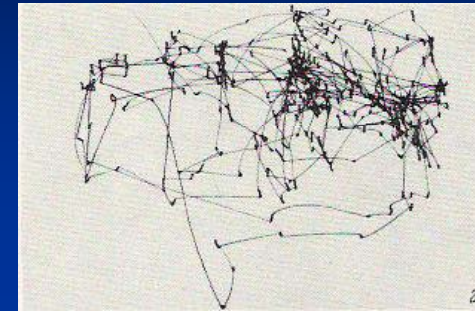


An Unexpected Visitor
Ilya Efimovick Repin (1884)

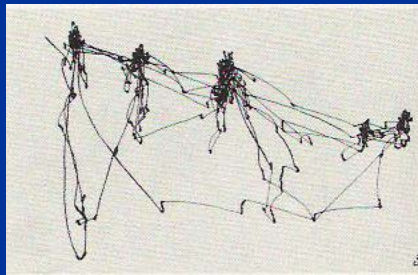
Different instructions —> different scanning



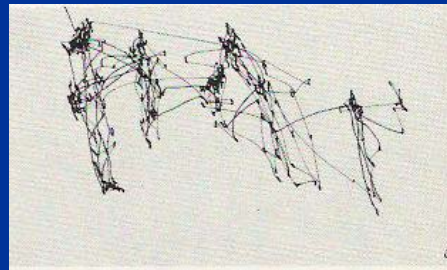
Free Scanning



Material circumstances?



Ages?



Remember their clothes



Remember positions of persons and objects

This is how the brain selects what we see:

- ✓ Scan Paths determine what we *SEE* & mirror visual attention
- ✓ Where we look depends on the task and expectations.

Our Experiment --

Participants --

19 Experienced (> 1 year)

Younger: 19-48 yr (n=10)

Older: 52-60 yr (n=9)

12 novices (< 1 year)

Ages 15-62 (mdn=17)

Scenes --

52 scees rated for Risk (1 - 10)

26 pairs -

"Easy" Δ Risk = 6 - 7 points

"Difficult" Δ Risk = 1 point



Jennifer Stevenson
& Andrew Osborn



Task --

Which scene has greater risk?

Measures --

Response Time

Eye movements

Recall Stimuli --

Easy Comparison



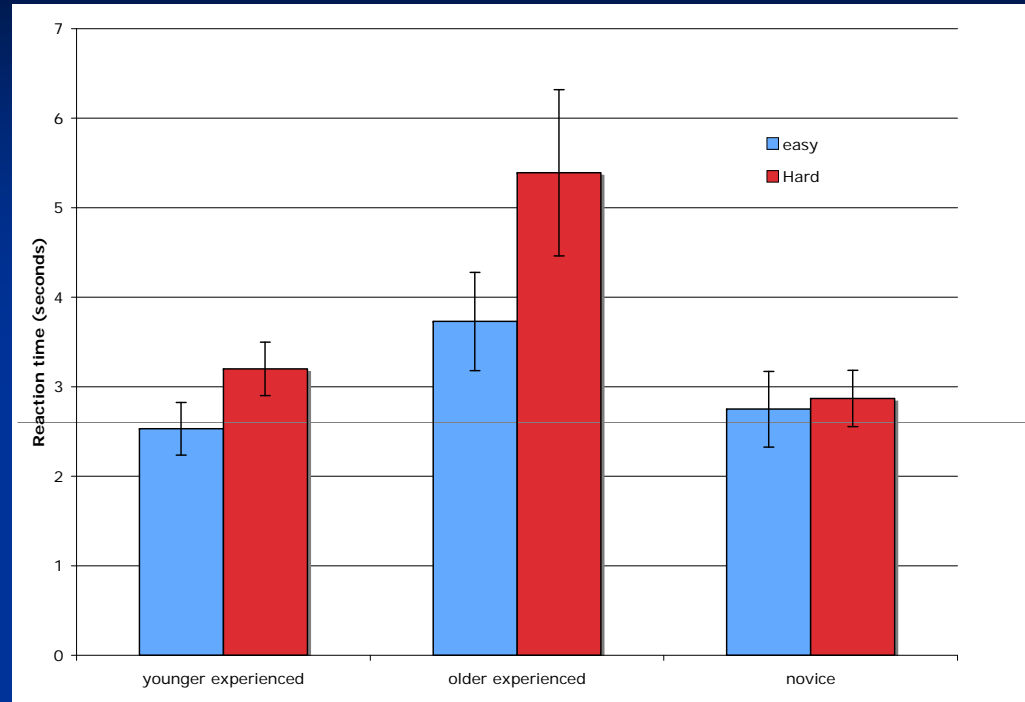
Difficult Comparison



Hypotheses --

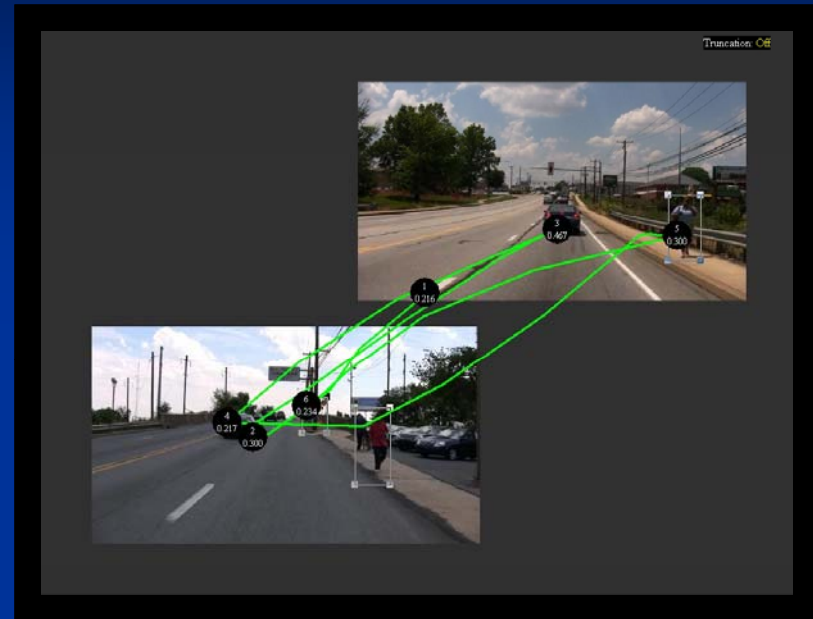
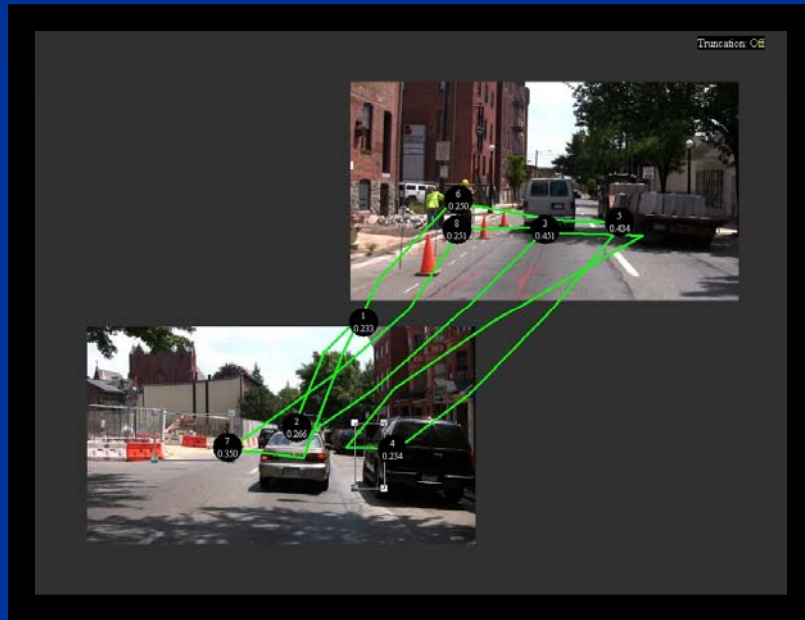
1. Experienced drivers would respond more quickly for "Easy" than for "Difficult" comparisons.
2. Novice drivers would respond with similar speed to both "Easy" and "Difficult" comparisons (because they don't recognize the risky elements).
3. Compared to Novices, Experienced drivers would fixate more on the risky elements of a complex road scene.

Results -- Response Times

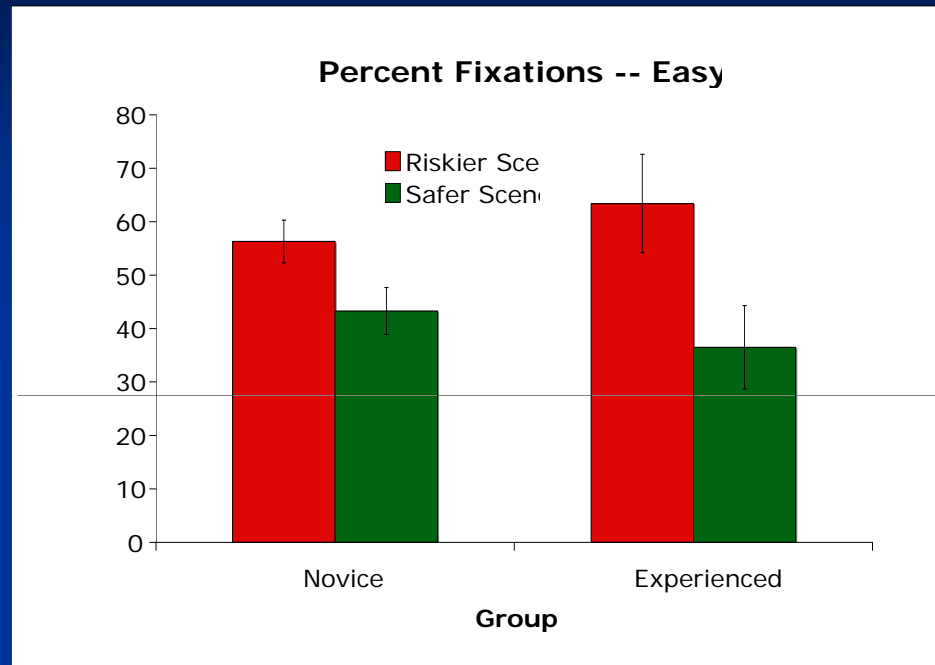


Differences between Response Times for Difficult-Easy Comparisons were significantly greater for Experienced Drivers.

Sample Scan Paths



Results -- Eye Movements



1. For Easy comparisons, both groups tended to fixate the Riskier scene longer than the Safer scene.
2. The bias toward longer fixation of the Riskier scene was significantly greater for the Experienced drivers.

Summary & Conclusions

No one can see everything at once.

- ✓ What you see depends on where you look.
- ✓ Where you look depends on the task and expectations.
- ✓ Scan path= objective record of attention & "situation awareness"

When evaluating the risk of two road scenes,

- ✓ Experienced drivers look longer at the riskier scene, and they take longer to evaluate Difficult comparisons.
- ⇒ Compared to Novices, Experienced drivers recognize and attend more more thoroughly to risky elements in realistic road scenes.
- ⇒ Such differences in Visual Scanning may help to account for the fact that, for at least a year after licensure, new drivers are at greater risk of causing a collision.

The End.



Thank you.