

# Lab Meeting

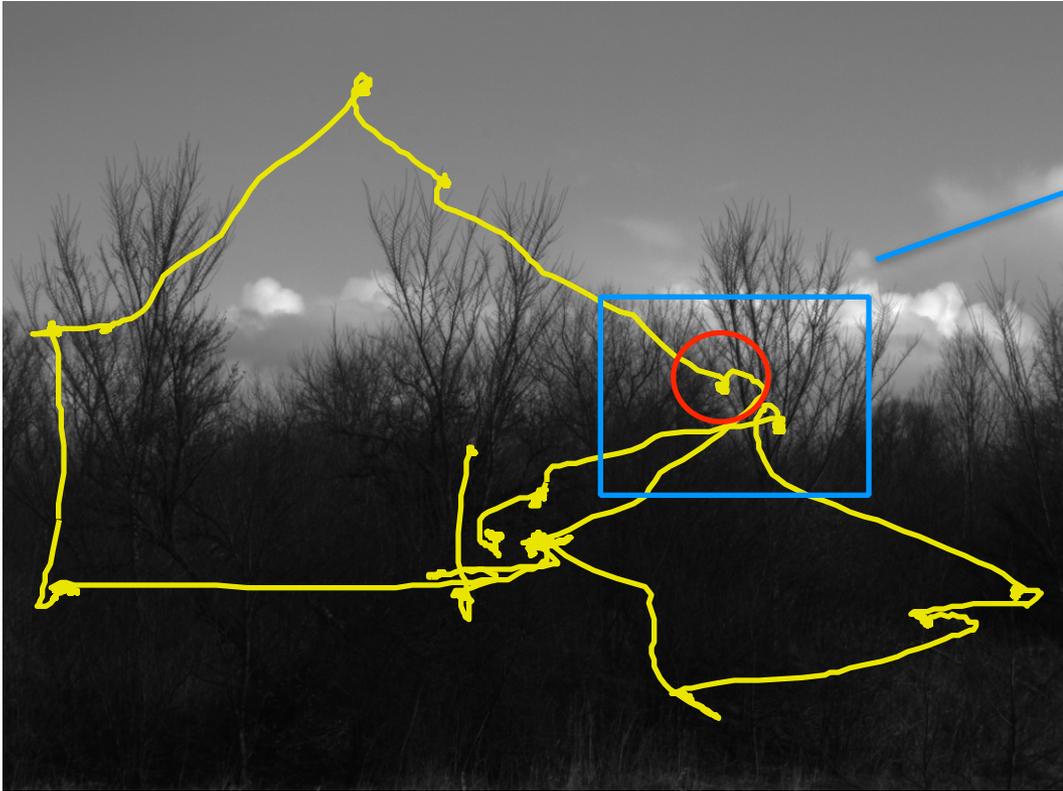
4/14/2015

# Eye Movement and Fixational Patches

- Data from 11 subjects from three different tasks:
  - Free Viewing
  - Visual Search with Low frequency target
  - Visual Search with High frequency target
- Objective:
  - Any differences between tasks
  - Any relation between characteristics of drifts and the visited patch

# Analysis

1024\*768



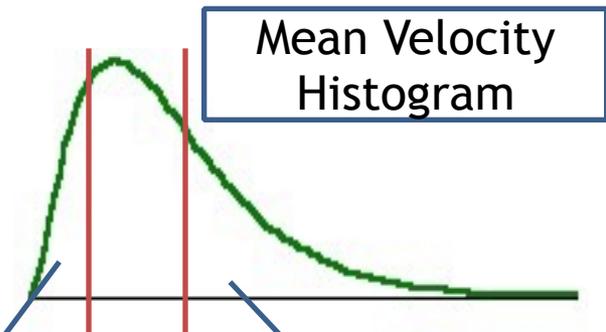
1 degree

1. Filtered with Sgolay (3,41)
2. 50 Samples removed from both beginning and end
3. A minimum length of 100

**Within Task**

# 1) Eye movement characteristics as the basis:

mean velocity, span, curvature



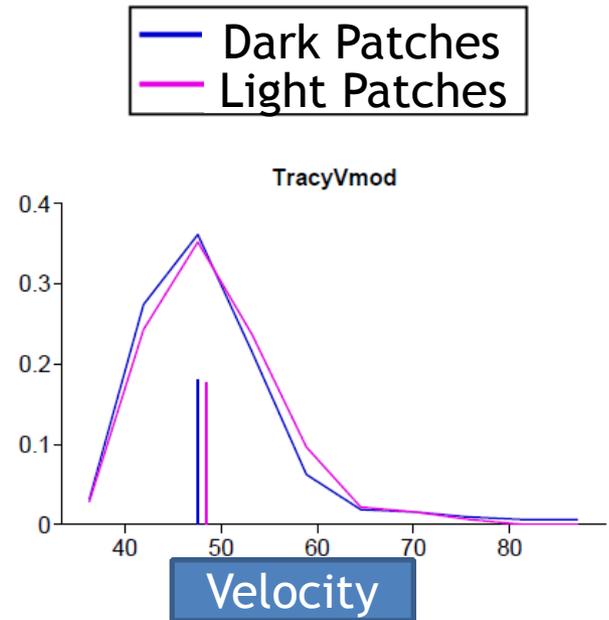
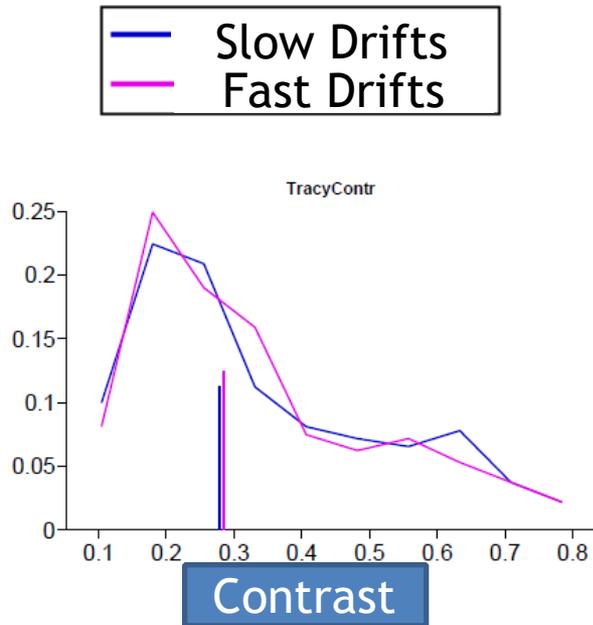
# 2) Characteristics of the patch as the basis:

Mean Luminance, Contrast

Slow Drifts:  
characteristics of  
the patch?  
Mean Luminance,  
Contrast

Fast Drifts:  
characteristics of the  
patch?  
Mean Luminance,  
Contrast

- Histograms of (span, velocity) for lower and upper 25 percentiles of (luminance, contrast) and vice versa

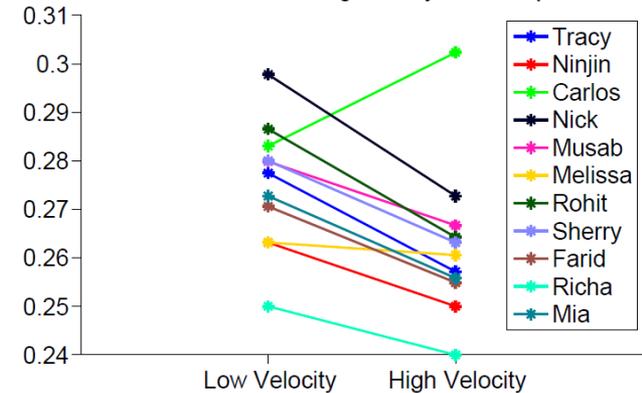


- Any consistent pattern among subjects for low vs. high?

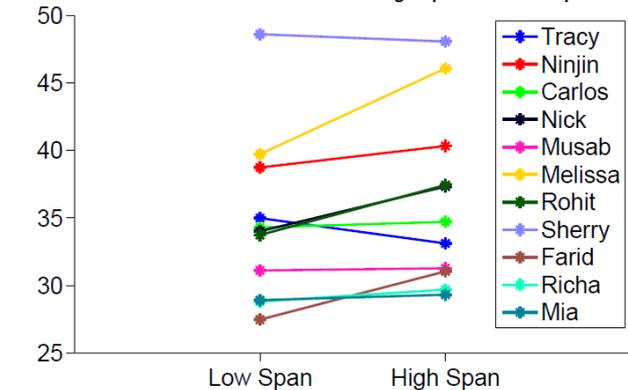
P value of Paired t-test Between characteristic associated with 'Slow' and 'Fast' drifts	Mean Luminance	Contrast
FV	0.970	0.098
VS <sub>Low</sub>	0.525	0.579
VS <sub>High</sub>	0.451	0.007 *

P value of Paired t-test Between characteristic associated with 'Low Span' and 'High Span' drifts	Mean Luminance	Contrast
FV	0.045 *	0.188
VS <sub>Low</sub>	0.110	0.160
VS <sub>High</sub>	0.187	0.293

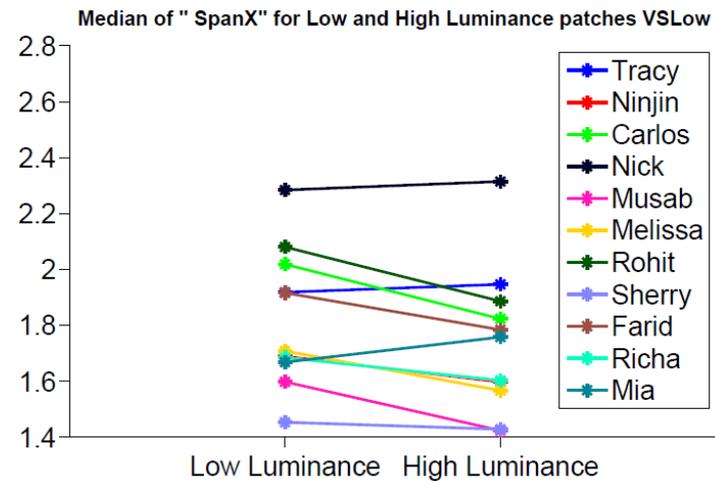
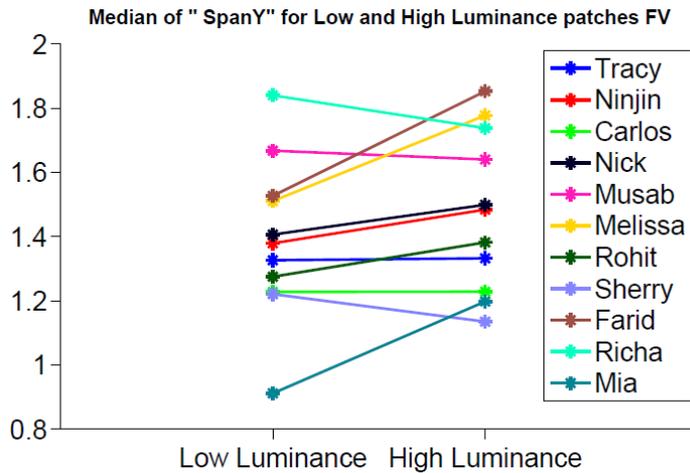
Median of " Contrast" for Low and High Velocity associated patches for VS<sub>High</sub>



Median of " MeanLuminance" for Low and High Span associated patches for FV

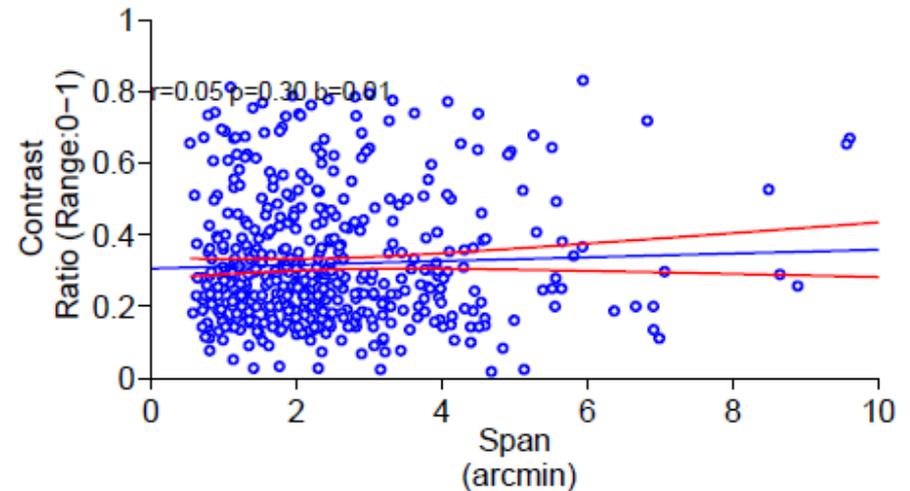
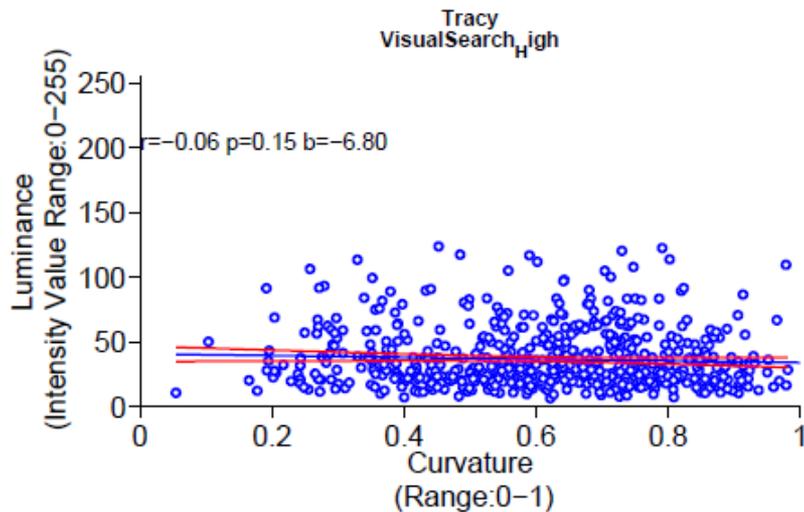


P value of Paired t-test Between characteristic associated with 'Low Luminance' and 'High Luminance' patches	Vx	Vy	Vmod	Span	SpanX	SpanY
FV	0.24	0.34	0.25	0.13	0.13	0.02 *
VSLow	0.67	0.54	0.65	0.13	0.02 *	0.69
VSHigh	0.68	0.52	0.15	0.87	0.18	0.38



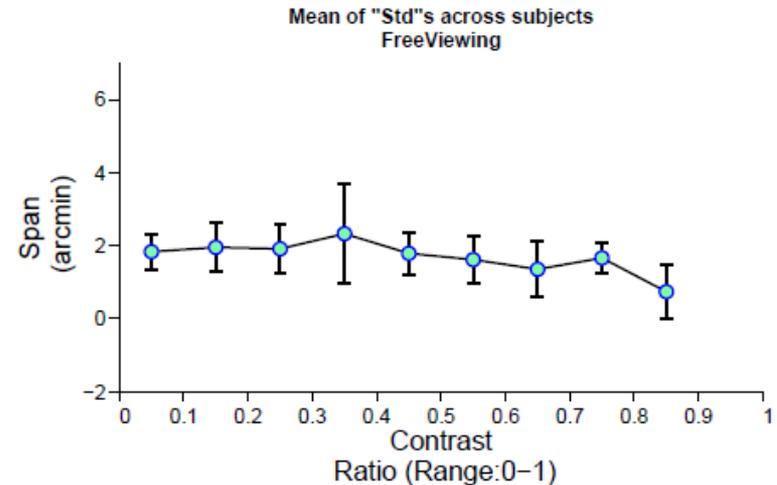
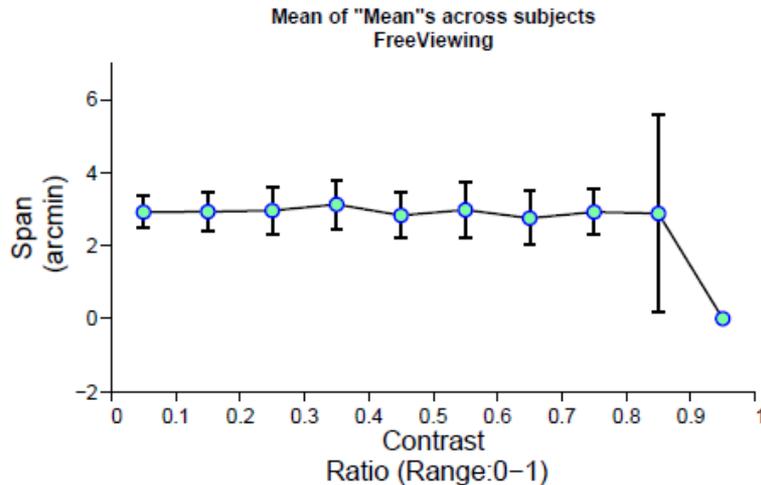
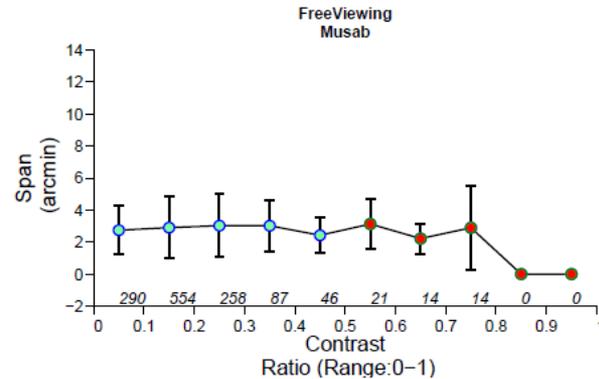
P value of Paired t-test Between characteristic associated with 'Low Contrast' and 'High Contrast' patches	Vx	Vy	Vmod	Span	SpanX	SpanY
FV	0.24	0.34	0.25	0.13	0.13	0.08
VSLow	0.67	0.54	0.65	0.13	0.07	0.31
VSHigh	0.68	0.52	0.15	0.87	0.59	0.69

- Regressing Characteristics of Drifts on Characteristics of Image:
  - (Duration, curvature, span, velocity)  
on  
(Luminance , Contrast)

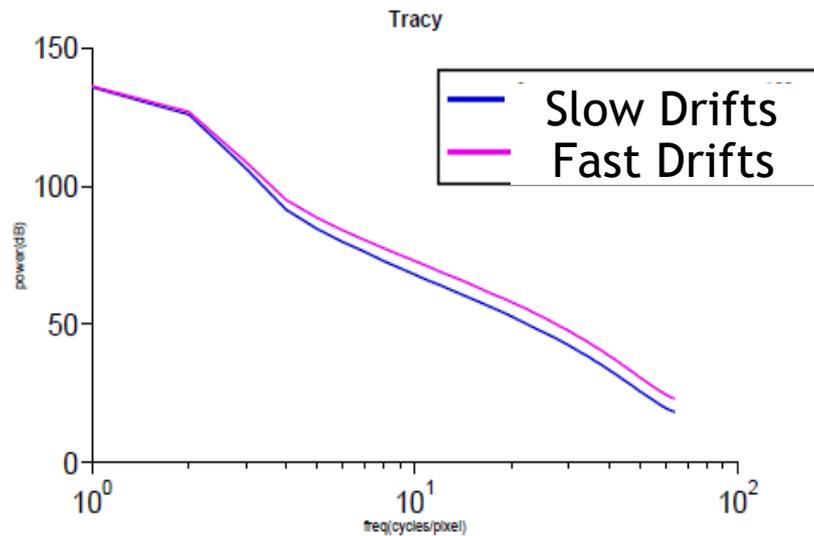


➤ Maybe the relation is not linear (std is changing)

- Binning the contrast/luminance, looking at the mean and std of span, velocity,...in each bin



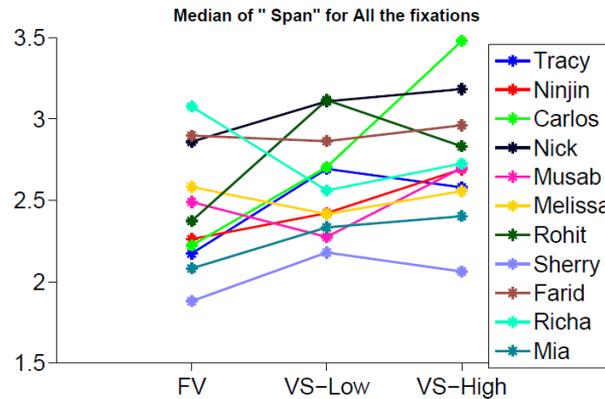
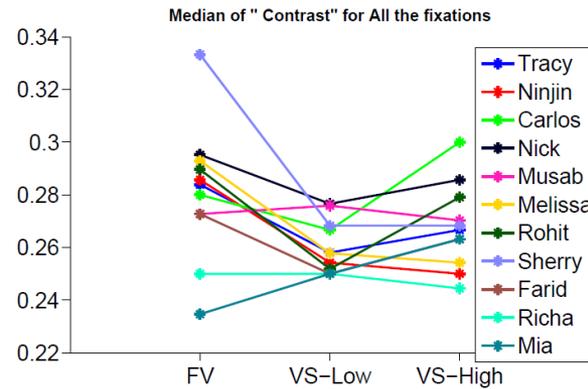
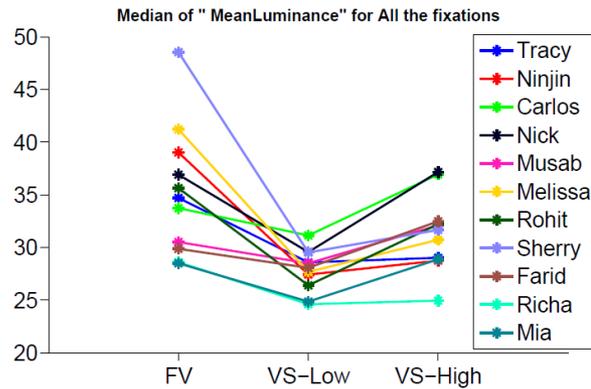
- Does the spectral characteristics of the patch make a difference?



Between Task

- Consistent pattern among subjects: Paired t-test

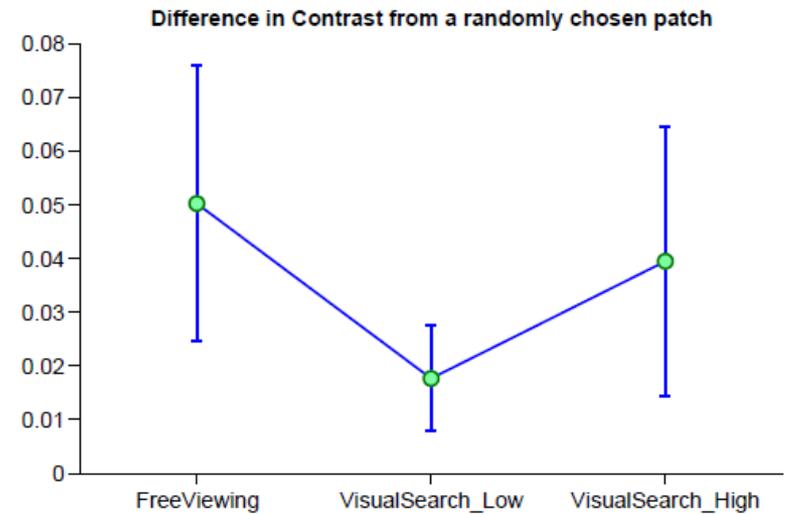
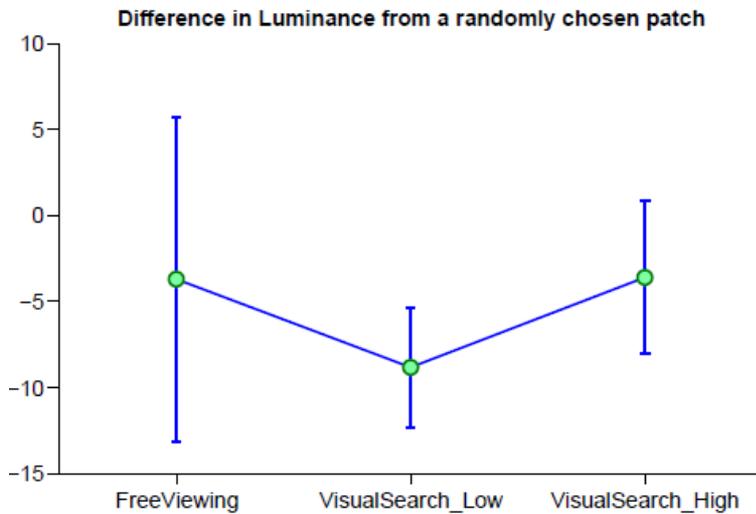
P value of Paired t-test	Mean Luminance	Lumi-nance	Contrast	Velocity	Span	Duration
FV- VSLow	0.0013*		0.0107*	0.1551	0.1765	0.089
FV-VSHigh	0.0753		0.1254	0.4662	0.0322*	0.109
VSLow-VSHigh	0.0005*		0.0819	0.5375	0.1452	0.568



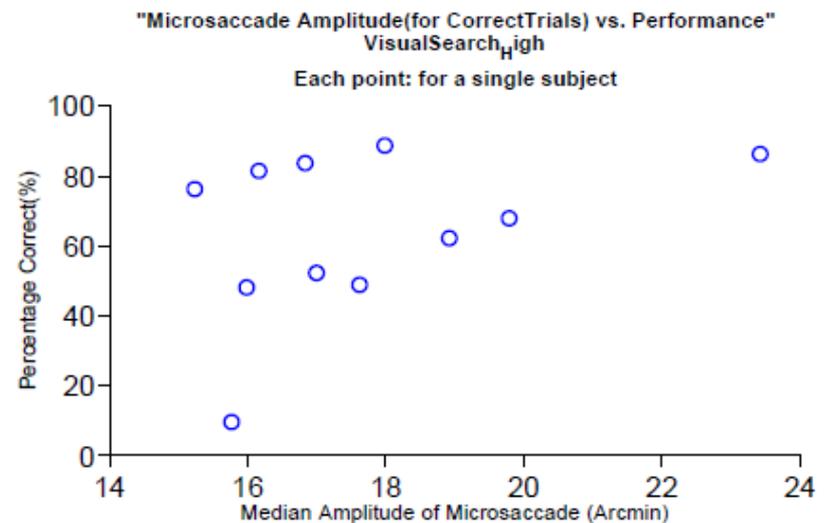
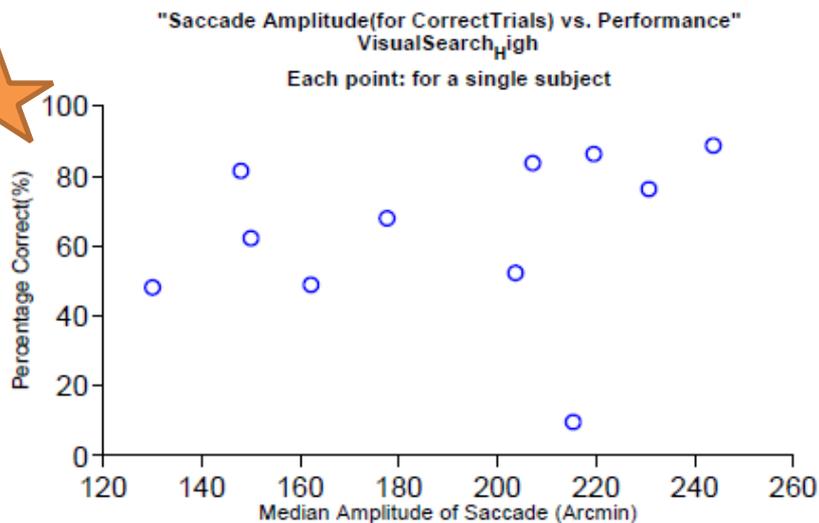
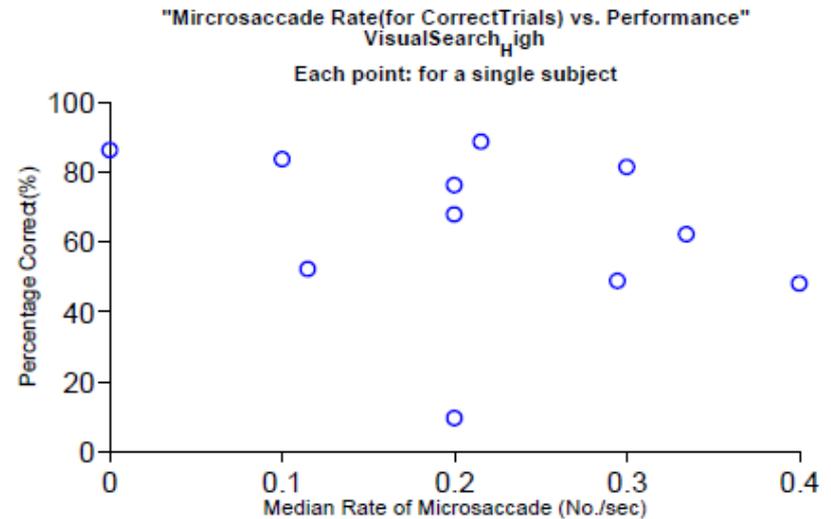
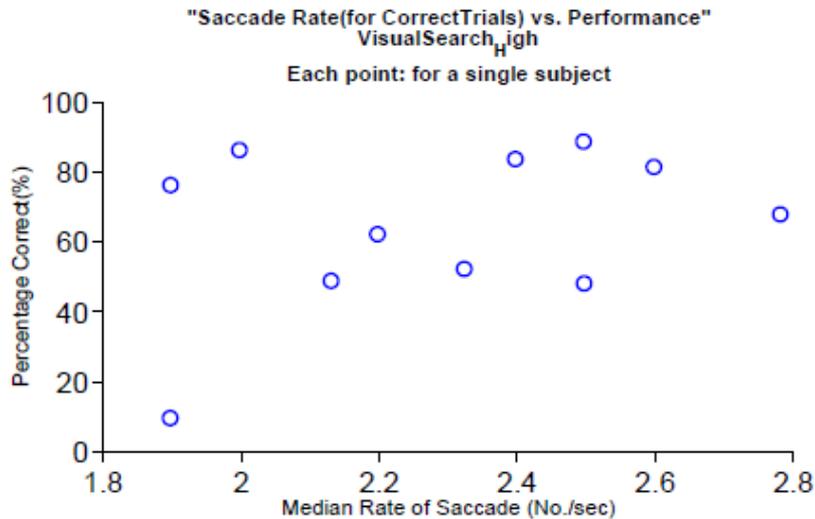
- Consistent pattern among subjects: Paired t-test
  - Diffusion Coefficient

Paired ttest p-value	FV-VSLow	FV-VSHigh	VSLow-VSHigh
Diffusion Coefficient	0.89	0.50	0.39
Rate of increase in the Area Under 2D Histogram-EigenValue Method	0.52	0.16	0.33

- How different is the selected patch from a random patch?



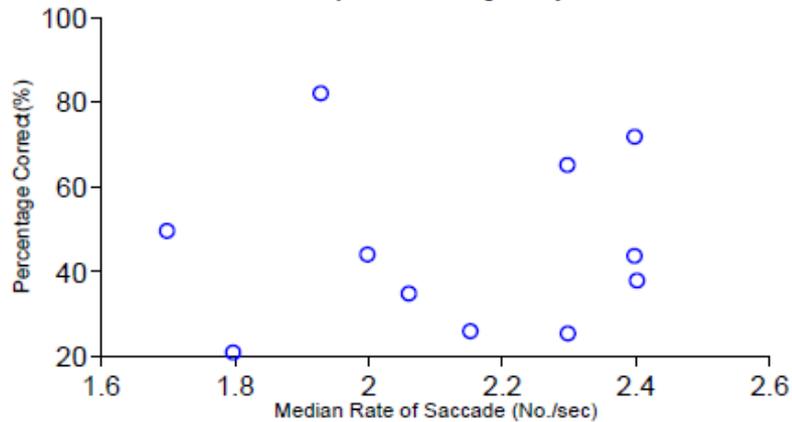
- Performance and saccade ? Any relation?  
– VS-High



# - VS-Low

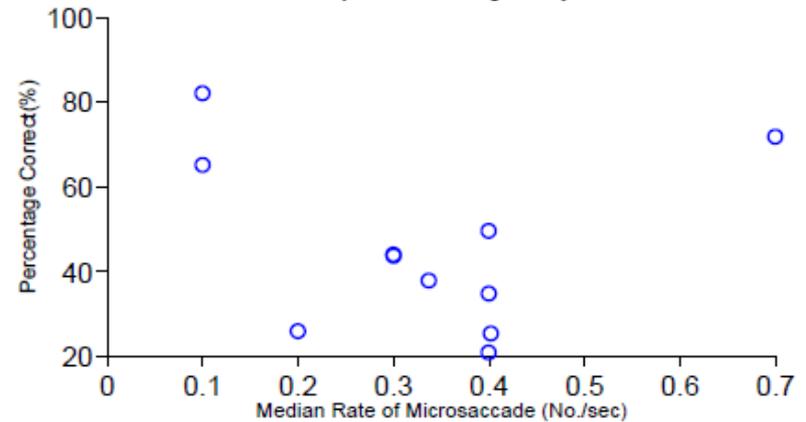
"Saccade Rate(for CorrectTrials) vs. Performance"  
VisualSearch<sub>Low</sub>

Each point: for a single subject



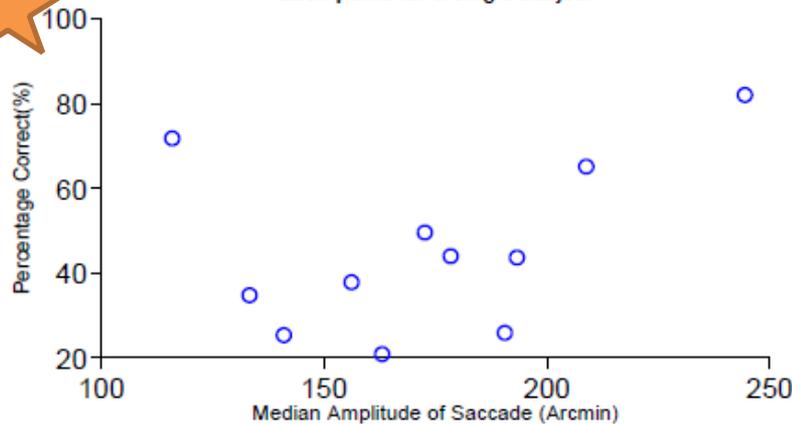
"Microsaccade Rate(for CorrectTrials) vs. Performance"  
VisualSearch<sub>Low</sub>

Each point: for a single subject



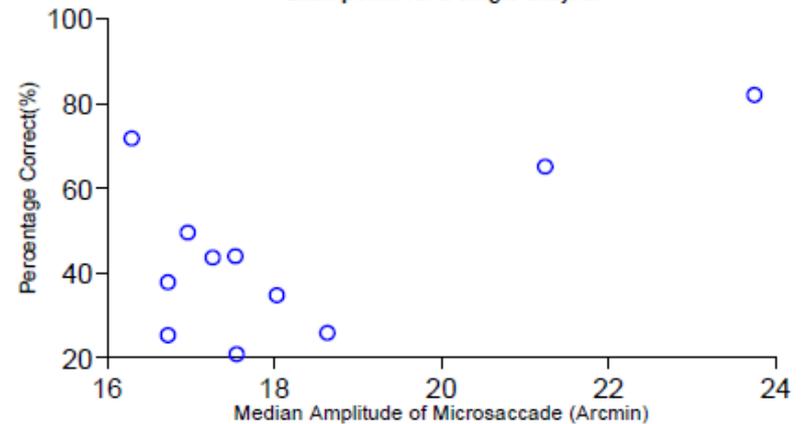
"Saccade Amplitude(for CorrectTrials) vs. Performance"  
VisualSearch<sub>Low</sub>

Each point: for a single subject



"Microsaccade Amplitude(for CorrectTrials) vs. Performance"  
VisualSearch<sub>Low</sub>

Each point: for a single subject



# Summary

- Within task → not a solid conclusion
  - Try diffusion coefficient for lower vs. upper percentile
  - Try frequency content
- Between task →
  - Seemingly the patches are not chosen randomly.
  - Higher luminance and contrast in FV compared with VS-Low
  - Higher contrast in VS-High compared with VS-Low
  - Higher saccade amplitude, higher performance

**The End**