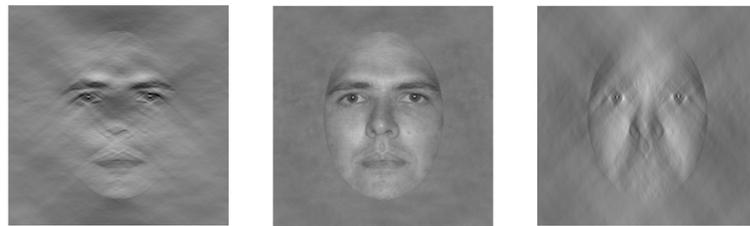


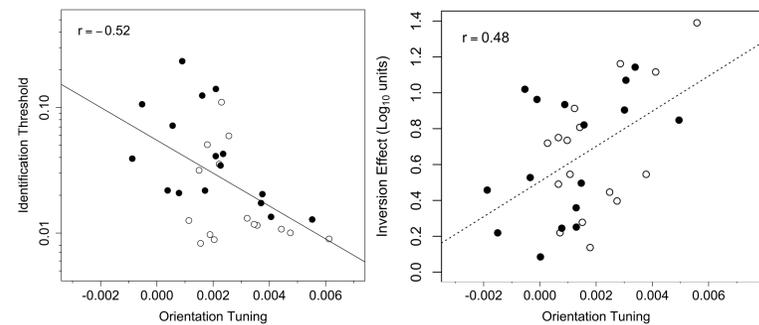
Background

The information conveyed by horizontally oriented frequency components is a highly diagnostic cue for face identification.^{1,2}



A target face filtered to retain horizontal (left) or vertical (right) structure (bandwidth = 90°)

More selective use of horizontal structure is correlated with identification performance.³



Data from Pachai et al.³ demonstrating the relationship between horizontal selectivity and individual differences in upright face identification (left) and the face inversion effect (right).

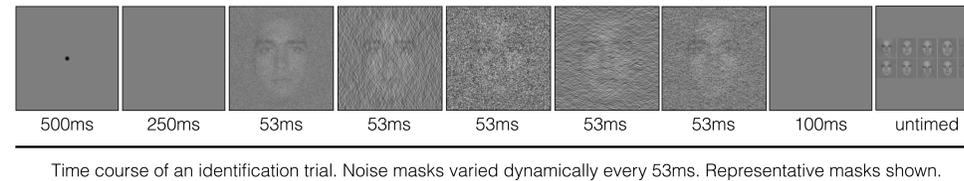
Face-selective ERP responses appear as early as 130ms after stimulus presentation.⁴

Present Research

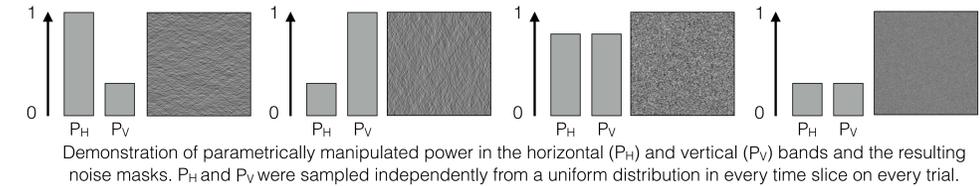
Given the rapid emergence of face-selective processing and the importance of horizontal structure for overall face identification, we expect horizontal selectivity to emerge in the earliest windows of face identity processing.

To explore this hypothesis, we employed a temporal classification image technique with dimensionality reduction (e.g. ^{5,6}).

Methods



Time course of an identification trial. Noise masks varied dynamically every 53ms. Representative masks shown.



Demonstration of parametrically manipulated power in the horizontal (P_H) and vertical (P_V) bands and the resulting noise masks. P_H and P_V were sampled independently from a uniform distribution in every time slice on every trial.

2000 trials/observer (N=14), 10AFC face identification

Faces masked with orientation-power-modulated dynamic noise (pre-filtering RMS contrast = 0.2)

Face contrast: 50% threshold in dynamic white noise

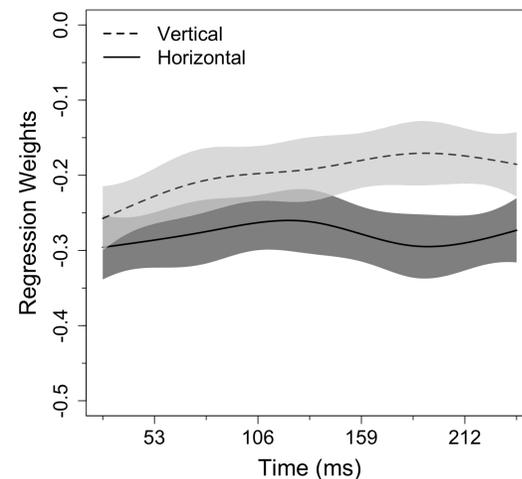
CI's measured using GAM and GLM approaches

$$\text{GAM: } \eta(E[Y]) = f_0(t)P_H + f_1(t)P_V$$

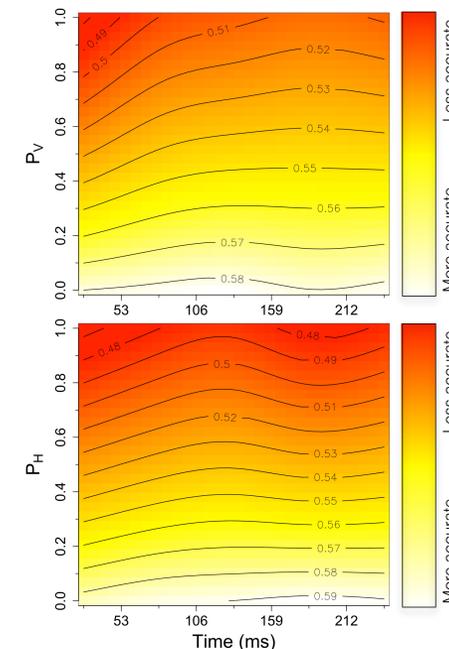
$$\text{GLM: } \eta(E[Y]) = \beta_{H1}P_{H1} + \beta_{V1}P_{V1} + \dots + \beta_{H5}P_{H5} + \beta_{V5}P_{V5}$$

GLM and GAM shown to converge on similar weights⁷

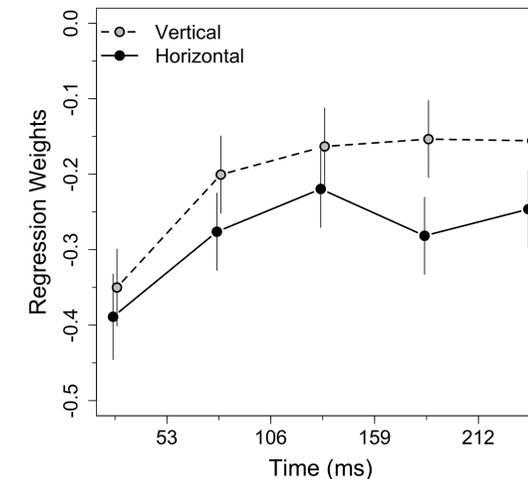
Results



Left: Regression weights revealed by the GAM as a smooth function of time. More negative weights indicate a *stronger* effect of masking power in that band. Shading indicates +/- 2 SEM.



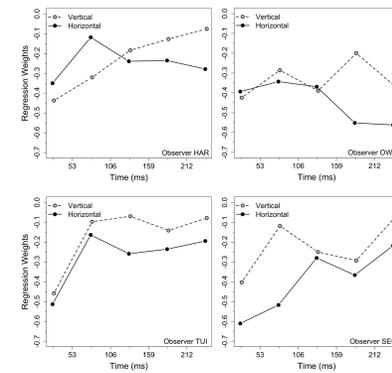
Right: Contour plots demonstrating the effect of masking power scaling factors in the vertical (P_V; top) and horizontal (P_H; bottom) bands on observer responses (colour coded) over time. Lines indicate trends of constant proportion correct in the 10AFC task.



Left: Regression weights revealed by the GLM for each independent time slice. More negative weights indicate a *stronger* effect of masking power in that band. Error bars indicate +/- 2 SEM.

Right, top: Individual-observer regression weights illustrating variability among temporal profiles.

Right, bottom: Results of a 2 (orient) X 5 (time) repeated-measures ANOVA conducted on the β weights revealed by the GLM



Orientation	F(1,13)=27.6, p=0.0002
Time	F(4,52)=10.3, p<0.0001
Orientation * Time	F(4,52)=1.3, p=0.26

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Conclusions

Sensitivity to horizontal structure is generally present early and throughout identity processing.

Initial sensitivity to vertical structure tends to decay rapidly during stimulus presentation.

Poster presented at the 14th annual meeting of the Vision Sciences Society, St Petersburg, Florida, May 18, 2014. For further information, please feel free to contact Matt Pachai at pachaim@mcmaster.ca