How lifelong perceptual learning shapes perception

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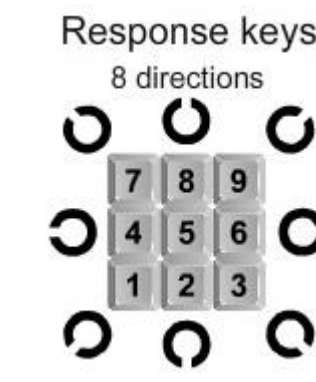[3]Faculté des sciences sociales et politiques, Institut de Psychologie, Bâtiment Anthropole, Lausanne, Switzerland

Introduction

We asked the question whether lifelong learning leads to general visual skills making some observers consistently superior to others. To this end, we tested 40 healthy students in 6 basic vision paradigms. If lifelong visual learning leads to generalized visual skills, we expect strong correlations between performance in the paradigms.
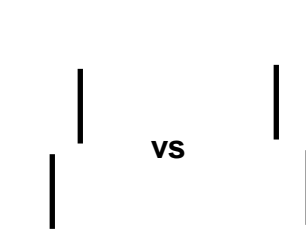
Battery of tests

Freiburg visual acuity test
Participants indicated the gap of the Landolt rings.
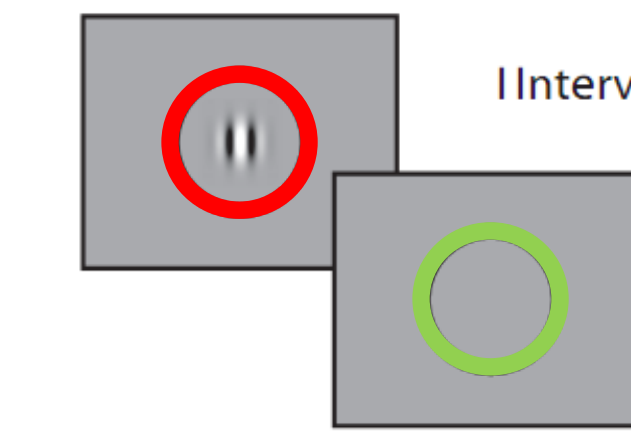
Vernier offset discrimination
Participants indicated the offset direction of the lower bar compared to the upper bar.
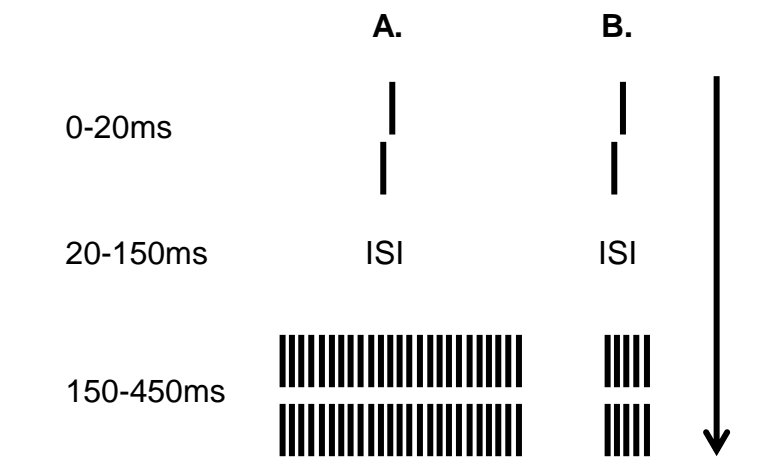
Bisection detection
Observers indicated whether the central line of outer line was offset either to the right or to the left
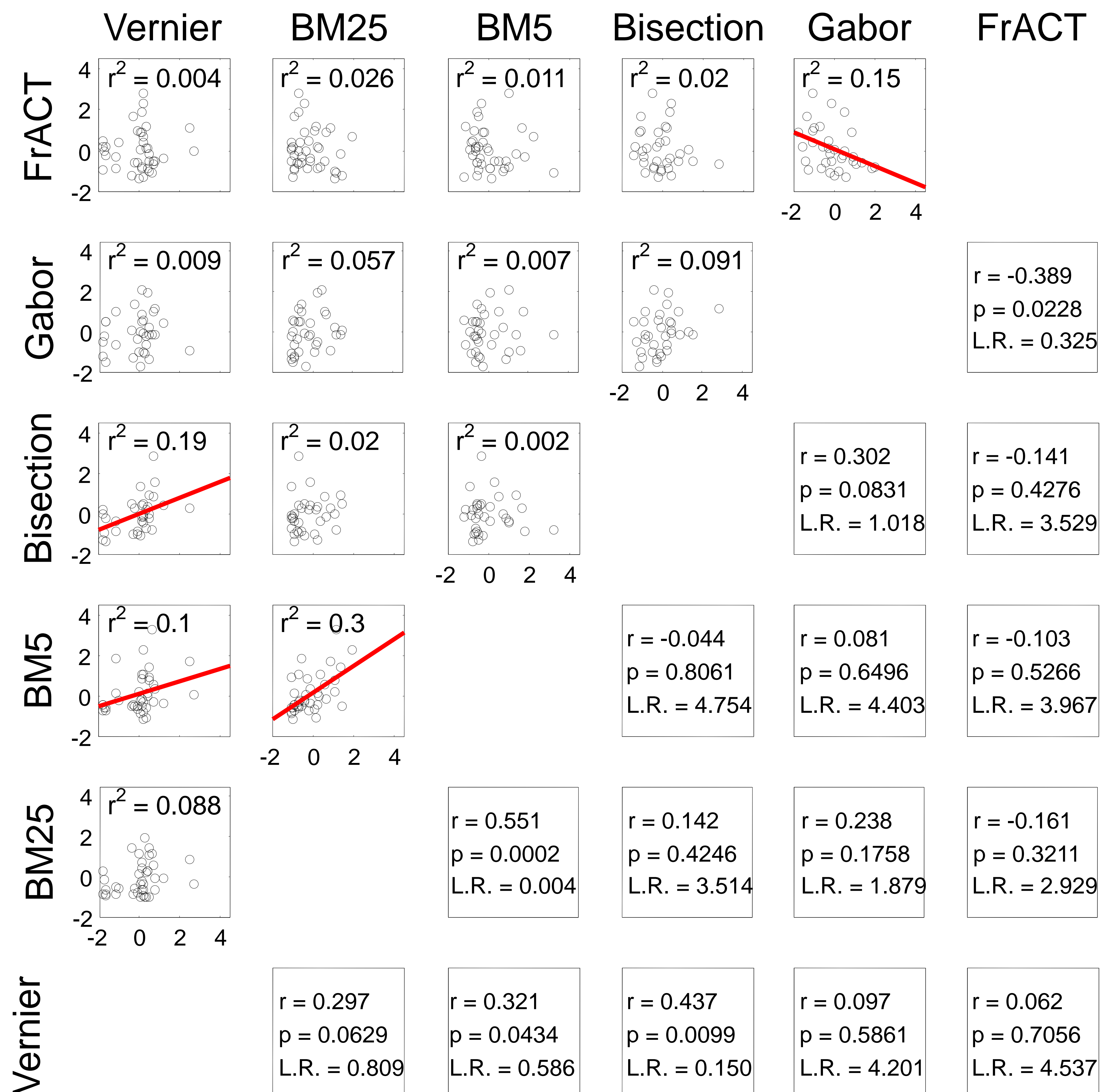
Gabor detection
A vertical Gabor appeared either in a first interval or in a second interval. Observers indicated the interval.

Visual backward masking
The vernier was followed by a grating comprising 5 (BM5) or 25 (BM25) lines. We determined the SOA between vernier and grating onset.

Correlations between visual tasks
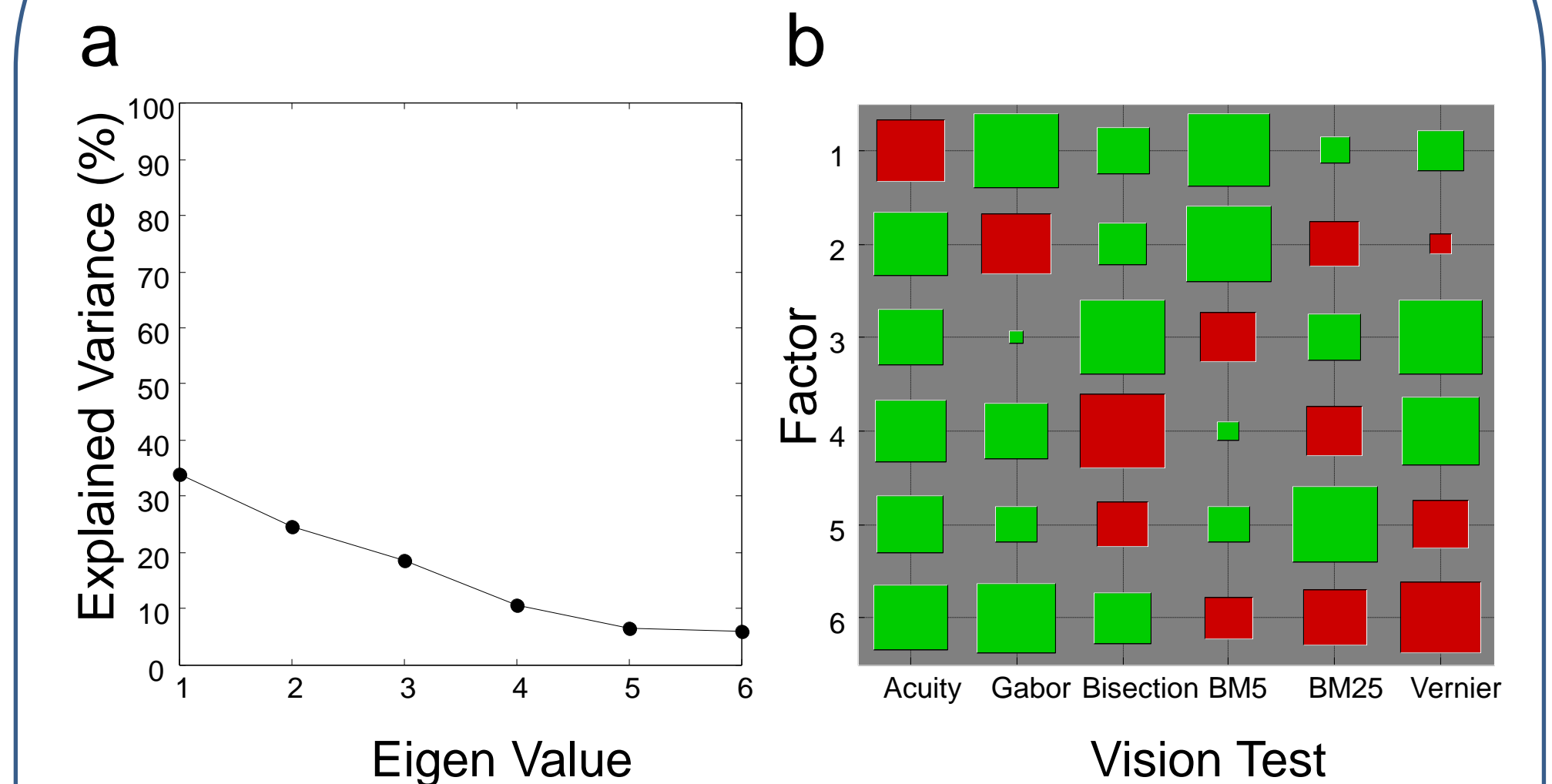

Regression lines (red) are plotted only for significant correlations (p<0.05). To compare values across the various paradigms, we normalized the data by taking z-scores. r and $r2$ refer to the Pearson correlations, and p is the probability of the null hypothesis that the slope of the regression line is zero. L.R. denotes the likelihood ratio of the null to the alternative hypothesis (L.R.>1 imply support for the null hypothesis).

Good test-restest reliability between the two repeated measures for each of the four visual tasks

	BM25	BM5	Gabor	Bisection
r	0.680284	0.824576	0.699544	0.645619
p	0.000001	<.0000001	0.000002	0.000021

Principal components analysis

a. A PCA combines correlated variables into a single common factor. A common factor usually has an eigenvalue of 80% or more. Clearly, there is no indication for a common factor behind our six tests.

b. Hinton plot showing the loadings for each visual test on each factor. Green squares denote positive loadings while red squares denote negative loadings. Square size indicates loading magnitude.

Conclusion

• All "interesting" pairwise correlations were non-significant, except for a positive correlation between Gabor contrast detection and visual acuity.
•These results cannot be explained by intra-observer variability because performance between BM5 and BM25 is high.

•Our study suggests that everyday experience shapes perception in a very specific manner.