Extensive training of orientation filtered textures increases generalization of learning

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Background

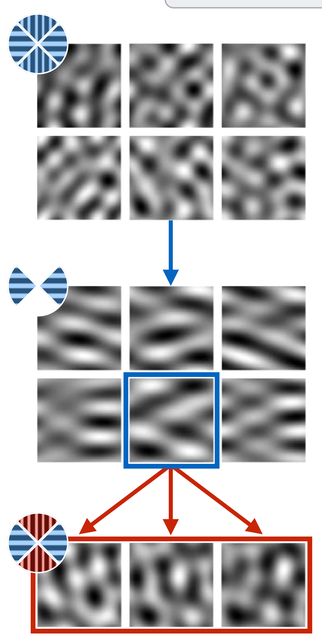
Perceptual learning reflects improved sensitivity to diagnostic stimulus components.[1]

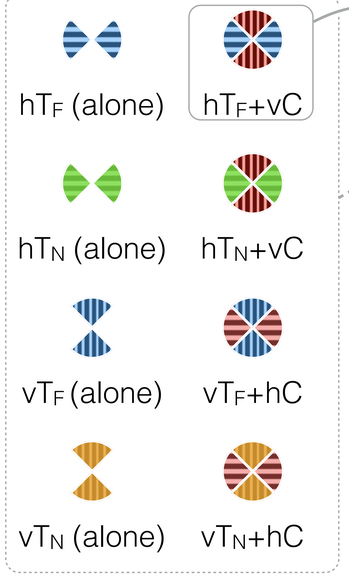
Discriminating particular orientation components in a texture identification task is difficult when orthogonal, uninformative orientation components (i.e., context) are present.[2]

Learning to discriminate particular orientation components of textures with a varying context on every trial (~1000 trials over 2 days) produces context-generalizable, but target-specific, learning.[3,4]

Will extended training lead to stronger learning and increased generalization?

Stimuli & Conditions





h = horizontal v = vertical
T = Target C = Context
F = Familiar N = Novel

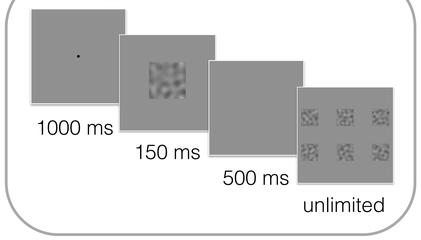
Training

- 1-of-6 texture identification task
- ~600 trials/session, 7-8 sessions.
- hT and vC each had 0.035 c_{RMS}.

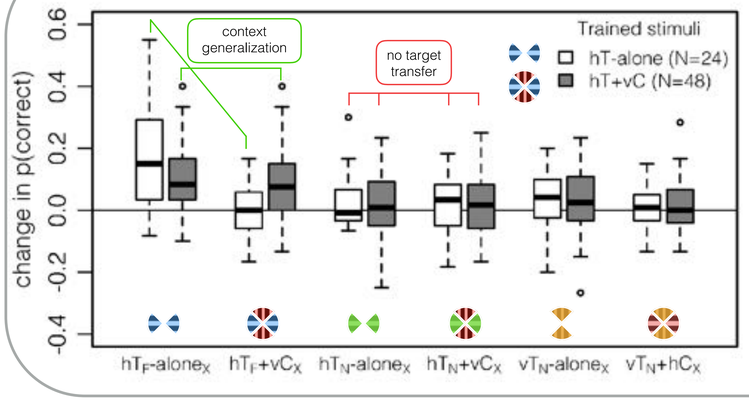
Testing

- Within subjects, n=12.
- Pre- and post-training sessions.
- 60 trials/condition/session.
- T-alone and T+C was blocked.
- Target orientation and familiarity intermixed within each block.

Trial Structure



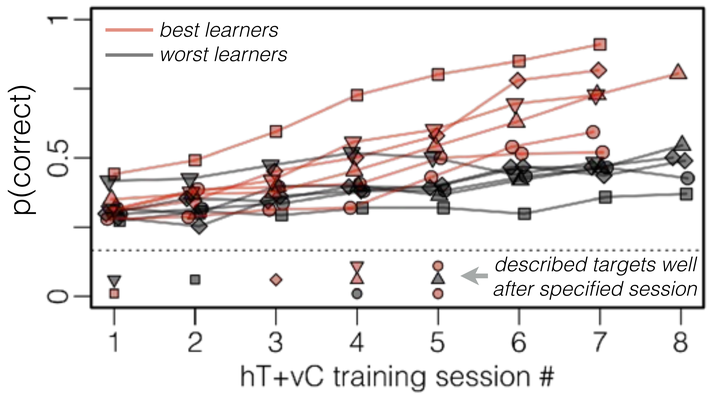
Summary of Previous Results



Learning to identify targets within in a context (hT+vC) generalized to the familiar targets presented alone (hT+alone), but *not* vice versa.

Context generalization:
(1) requires target+context training[3]
(2) requires familiar targets[3,4]
(3) can be promoted with a cue[3]
(4) is not a by-product of difficulty[4]
(see Poster #33.4049)

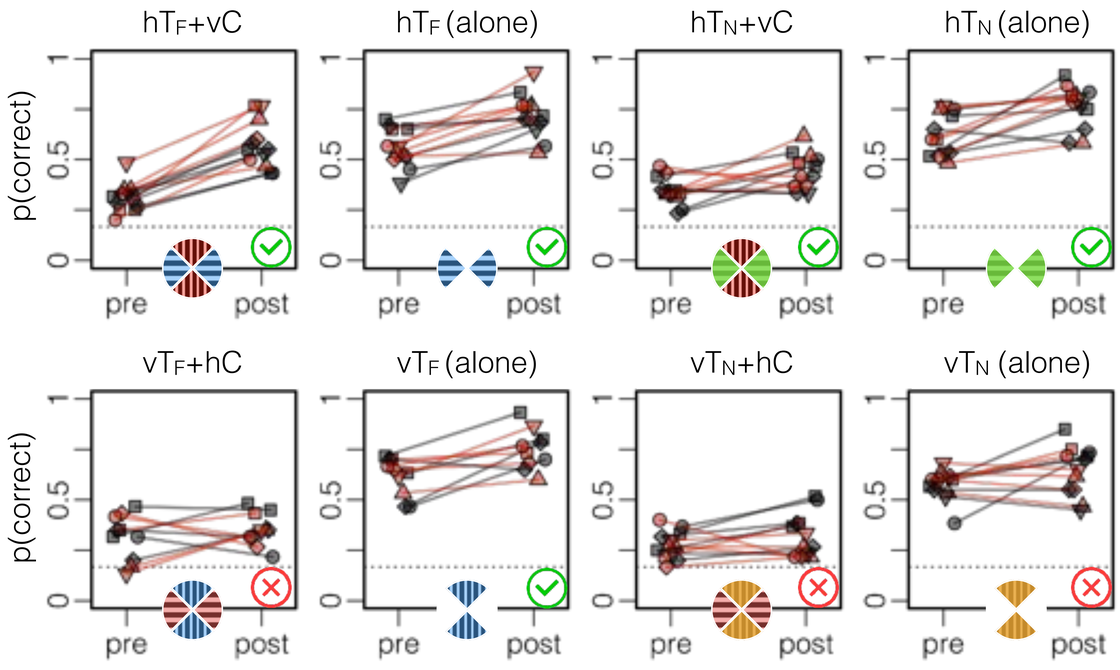
Training: Learning magnitude and rate varied drastically across individuals.



In post-session interviews, 10 out of 12 participants eventually described discovering and then seeking horizontal structure.

Time of reporting strategy did not systematically relate to changes in learning rate.

Testing: Learning generalized to a novel context and to novel targets.



Training produced significantly better accuracy for:

familiar targets in a
- familiar orientation & familiar context
- familiar orientation & novel (no)context
- novel orientation & novel (no)context

novel targets in a
- familiar orientation & familiar context
- familiar orientation & novel (no)context

Training improvement correlated only with context generalization.

Extended training on target+context textures allows observers to form effective strategies to identify structure in diagnostic orientation bands.

Variability in the context is essential to avoid context-specific learning,[3] and likely promotes the re-weighting of orientation channels.

References

1. Gold, Sekuler & Bennett, (2004), *Cog Sci.*
2. Olzak & Thomas, (1991), *Vis Res.*
3. Hashemi, Pachai, Sekuler & Bennett, (2016), *VSS*
4. Serrano, Hashemi, Sekuler & Bennett. *Poster #33.4049*

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