

The Less-Is-More principle in realistic visual statistical learning

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Introduction

Statistical learning:

- Number of studies have found that human infants and adults are able to extract the visual statistical relationships between elements during passive observation of a large number of similar scenes (Fiser & Aslin 2001, 2002a,b).
- The process of learning the co-occurrences between objects has been linked to higher order representations in the visual cortex (Logothetis & Sheinberg 1996).
- Learning the statistical structures enables humans to recognize complex objects and scenes.
- To date, visual statistical learning has been investigated with simple 2D stimuli rather than realistic scenes.

Less-Is-More principle:

- Classical view of learning and amount of information presented is in a monotonic relationship where learning increases while the amount of information increases.
- Originally found in the paradoxical learning of language in infants (prior to nativity), where infants are able to learn information faster than adults, even though this learning is based on restricted amount of information compared to that used by adults (Newport 1990, 1999).
- The principle has been found to be multi-modal for auditory, visual, and tactile senses (Conway & Christiansen 2005).
- Less-Is-More principle suggests that more information presented does not necessarily improve learning.

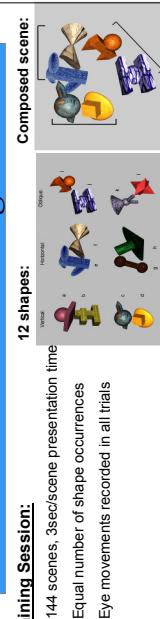
Eye Movement:

- Consciousness, goal-directed behavior and saccadic eye movements are tightly correlated and predict subjects' actions and cognitive processes (Hayhoe et al. 1992).
- However, the relationship between perceptual processing and eye movements during scene perception or object recognition remain poorly understood (Marrman et al. 1996, Mechner & Kowler 2001).
- Experts are better able to process the global statistics of a scene using representations in their long term memory than non-experts (Chase & Simon 1973).
- Few studies have investigated eye movements during a highly controlled purely learning situation.

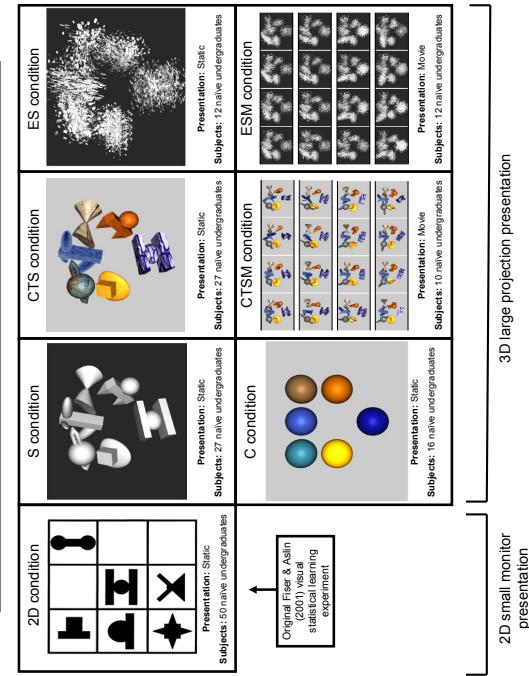
Goals:

- 1 •Investigate effect of the type of stimuli on statistical learning through categorical and non-categorical stimuli.
- 2 •Investigate effect of the amount of information presented on learning through the Less-Is-More principle
- 3 •Investigate the changing pattern of eye movements through the learning process.

Methods: Paradigm



Methods: Stimuli

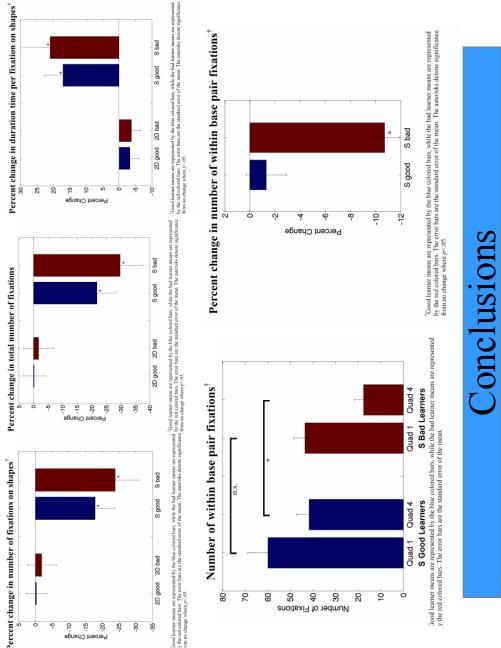


Results

3 Eye movements shift to a global viewing strategy during learning.

- During the late training session (late stage of learning) number of fixations on shapes decrease, total number of fixations decreases, and duration of fixations on shapes increases.
- The number of fixations within base pairs in the first quadrant is not significantly different between good and bad learners, however in the fourth quadrant fixations bad learners are significantly decreased.

- The percentage of within base pair fixations decreases in bad learners in the 3D S condition.



Conclusions

- Statistical learning is able to process categorical and non-categorical information.

- The Less-Is-More principle is upheld in a naturalistic 3D environment.

- There is no direct evidence of visual statistical learning on eye movement changes.

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