Ensemble Coding Abilities are Governed by a (Mostly) Domain General Mechanism

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Domain Generality In Ensemble Coding

Relationships **between** different ensemble judgements

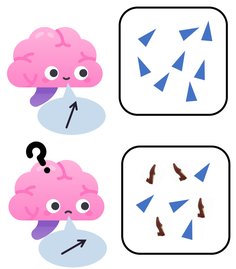
average direction of motion

average colour of trees

average expression

What about the items **within** an ensemble?

Can people make ensemble judgements when ensembles are composed of different stimulus types?

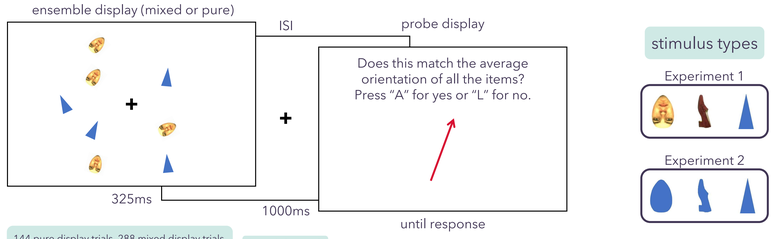


Are participants better at generating summary statistics from pure ensemble displays compared to mixed?

In mixed displays, will participants use information from both stimulus types to determine the average orientation?

If they can't, will their estimate be based on one stimulus subset?

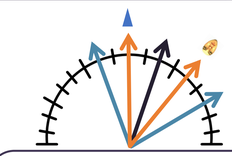
Experiments 1 & 2 Methods



144 pure display trials, 288 mixed display trials
correct probe shown on 50% of trials

Exp1 & 2 N = 40

Ensemble & Probe Info



Possible Probes

true average probe
- average of all items

subset probe
- average of one of the subsets

within range probe
- within the range of one of the subsets

within range probes were used to rule out a strategic subsampling strategy

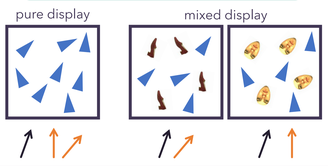
Exp 1 & 2 Analysis

hit = correctly saying "yes" to the **true average probes**
false alarm = incorrectly saying "yes" to the **subset probes**

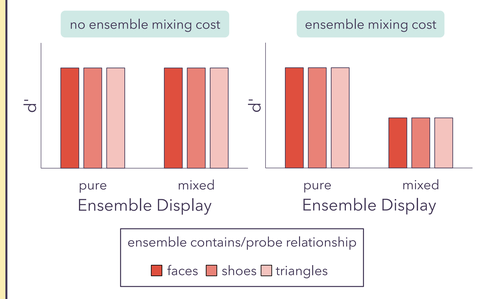
calculations take into account what stimulus type the **display contains** and what stimulus type the **probe was related to**

sensitivity (d') = Z(hits) – Z(false alarms)

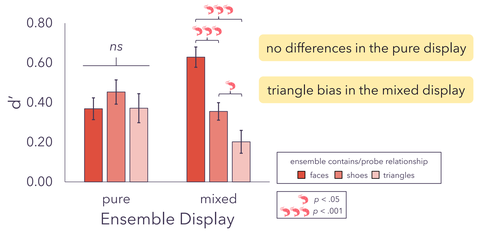
calculating hits and false alarms example
display contains/probe related to triangles



Exp 1 & 2 Predictions



Exp 1 Results: stimulus dependencies in the mixed display

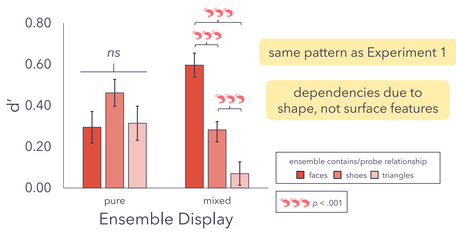


no differences in the pure display

triangle bias in the mixed display

Are these sensitivities due to shape or surface complexity of the stimuli?

Exp 2 Results: stimulus dependencies due to shape

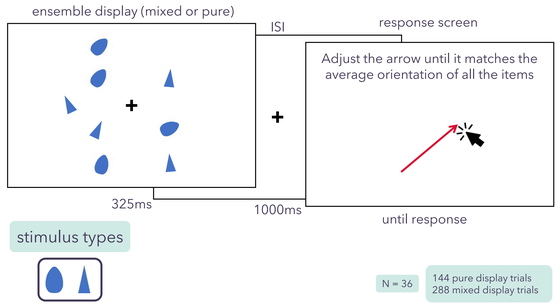


same pattern as Experiment 1

dependencies due to shape, not surface features

How much "triangle bias" is there in the mixed display?

Experiment 3 Methods: continuous report



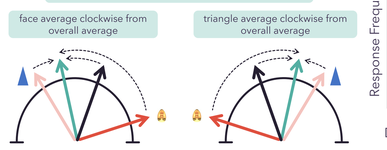
N = 36

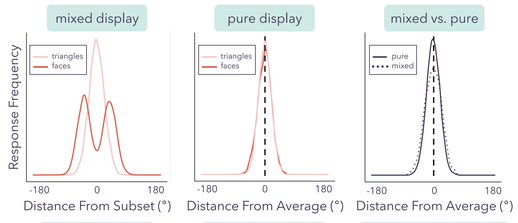
144 pure display trials
288 mixed display trials

Experiment 3 Analysis & Predictions

on each trial, calculate how far away the **participant's response** was from the **true average**, **triangle subset average**, and **face subset average**

example: two possible mixed display trials





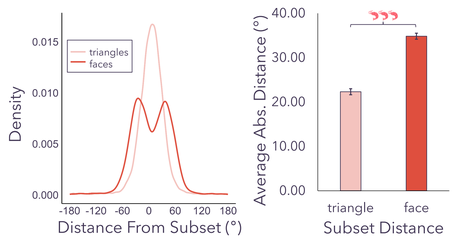
triangle bias/ face repulsion

no differences in the pure condition

slightly more error in the mixed condition

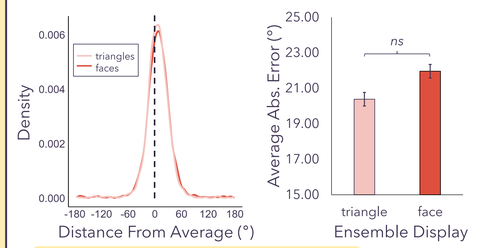
if there is triangle bias, participant responses will end up in **between the triangle subset average and the true average**

Exp 3 Results: triangle bias in the mixed condition



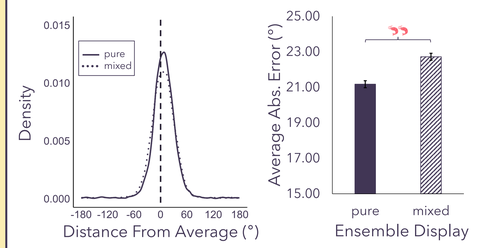
responses are closer to the triangle subset average than the face subset average

Exp 3 Results: no differences in the pure condition



errors are the same when the stimuli all belong to the same category, as in Experiments 1 and 2

Exp 3 Results: small difference between mixed and pure



slightly more error in the mixed display

Conclusion: domain general (sort of)

- When every item within an ensemble is the same, ability to extract summary statistics is similar across ensembles composed of different stimuli
- Having more than one type of stimulus present in an ensemble interferes with the extraction/report of summary statistics
- There are stimulus-specific dependencies in mixed ensembles

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