

# CROSS-MODAL OR NOT CROSS-MODAL, THAT IS THE QUESTION: THE STUDY OF AFTEREFFECT IN VARIANCE PERCEPTION

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## AIM OF THIS STUDY

- We can grasp various features of the outside world by summary statistics efficiently. Subjective variance is not necessarily equal to the physical variance. For example, it might be affected by what we saw beforehand.
- In this study, we tested if adaptation to variance could transfer across different modalities.

## METHODS

### Experimental Conditions

Combination of **adaptation** and **test** modalities

- visual\_to\_visual (**VV condition**) Uni-modal condition
- auditory\_to\_auditory (**AA condition**) Uni-modal condition
- visual\_to\_auditory (**VA condition**) Cross-modal condition
- auditory\_to\_visual (**AV condition**) Cross-modal condition

### Procedure

#### Pre-adaptation Test

Participants first saw/listened a sequence of visual/auditory stimuli in which the elements' size/pitch was perturbed with one of the six magnitudes of variance, and were required to classify the variance in each stimulus as relatively small or large.

#### Adaptation session

Participants observed a sequence of visual/auditory stimuli perturbed in size/pitch with certain (large or small) variance. The sequences were repeated 100 times.

#### Pre-adaptation Test

The variance discrimination task was the same as the pre-adaptation test, except that adaptation trials were interleaved for top-up.

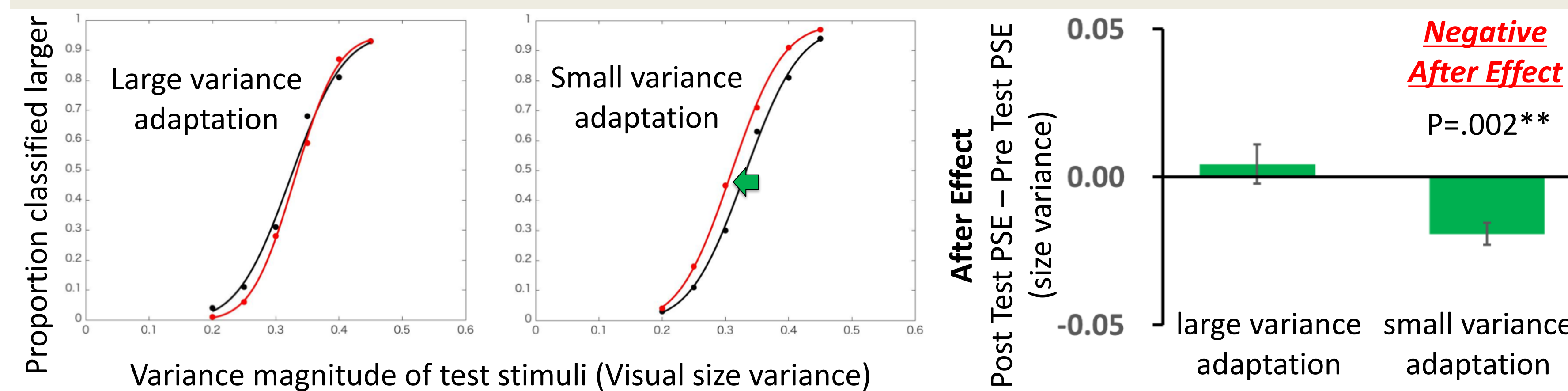
### Stimuli

In each trial, eight white disks or pure tones were presented, one-by-one, in sequence. The frequencies of each tone and diameters of each disk were randomly chosen from the lognormal distribution,  $\ln N(\ln F, \sigma^2)$ ,  $\ln N(\ln D, \sigma^2)$ .  $F$  means frequency,  $D$  means diameter of disk. The baseline frequency and diameter were changed for each sequence.

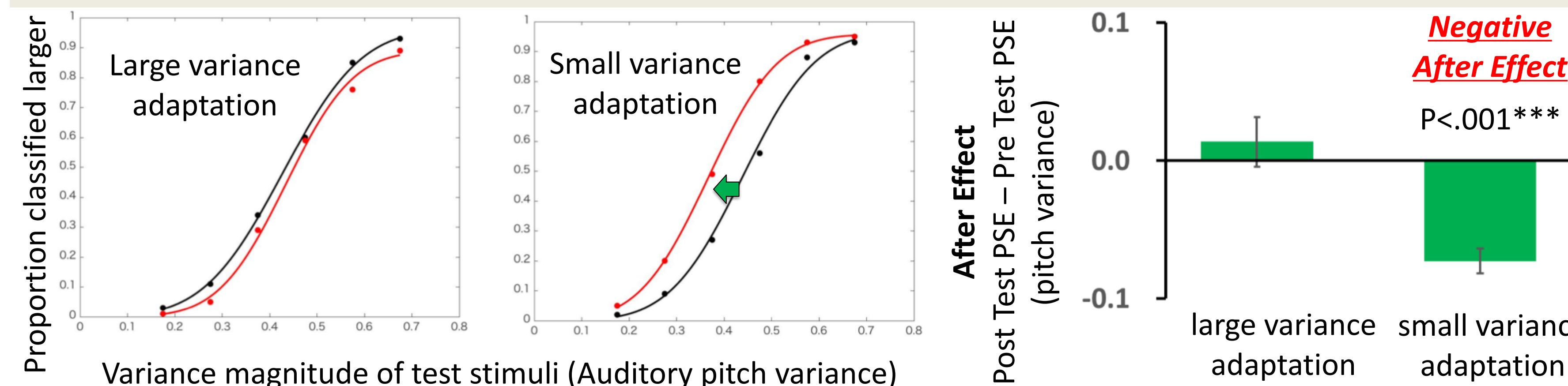
## RESULTS

The PSE was calculated for the pre-and post-adaptation test trials by fitting a cumulative normal function and finding the 50% point. (The calculation was conducted for each participant, but we fitted the psychometric function to the data combined across all 7 participants in the figure below to simply the poster.) The aftereffect was quantified as the difference (POST test – PRE Test) in PSE.

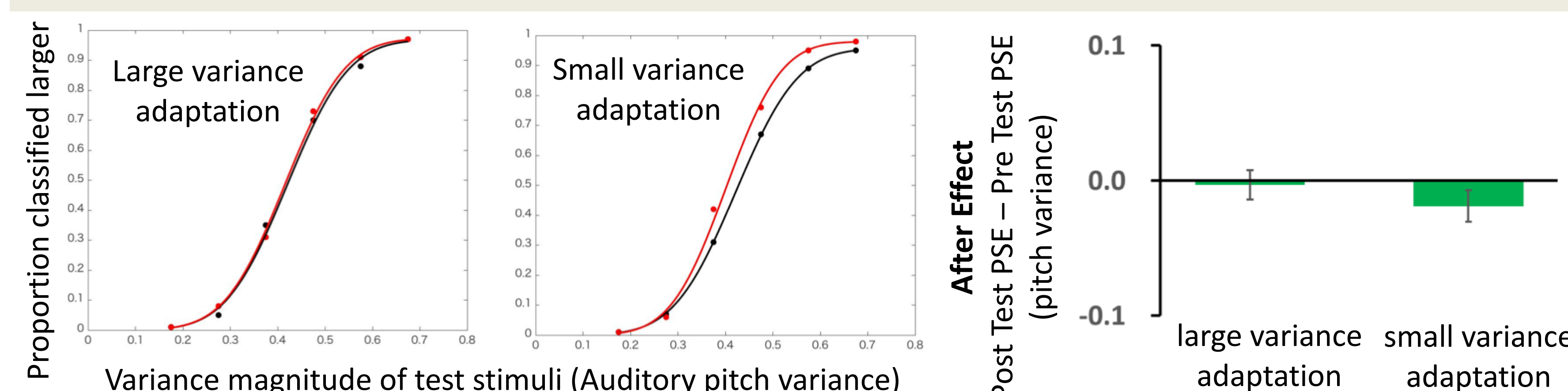
### VV condition (adaptation: visual size, Test: visual size)



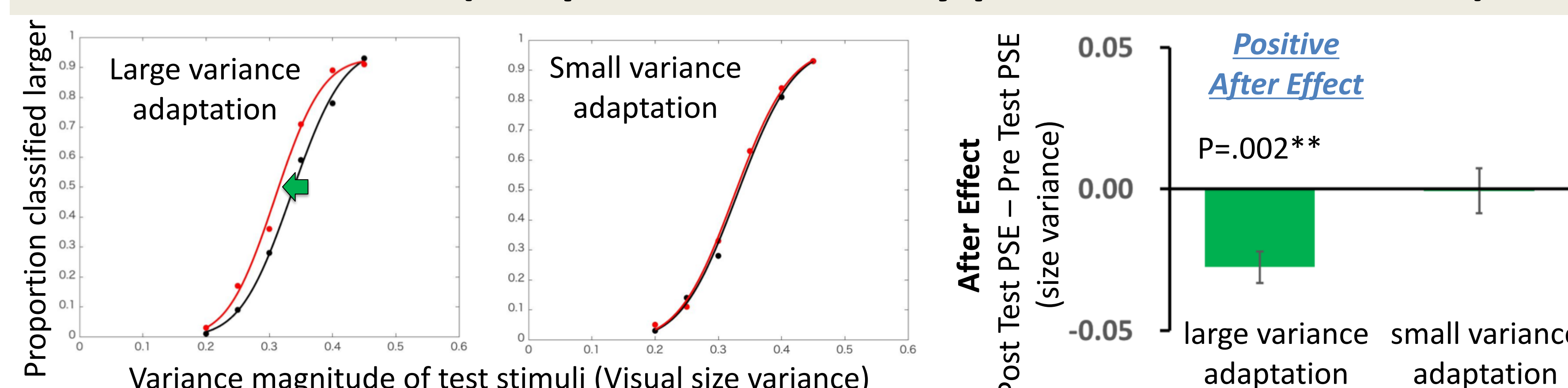
### AA condition (adaptation: auditory pitch, Test: auditory pitch)



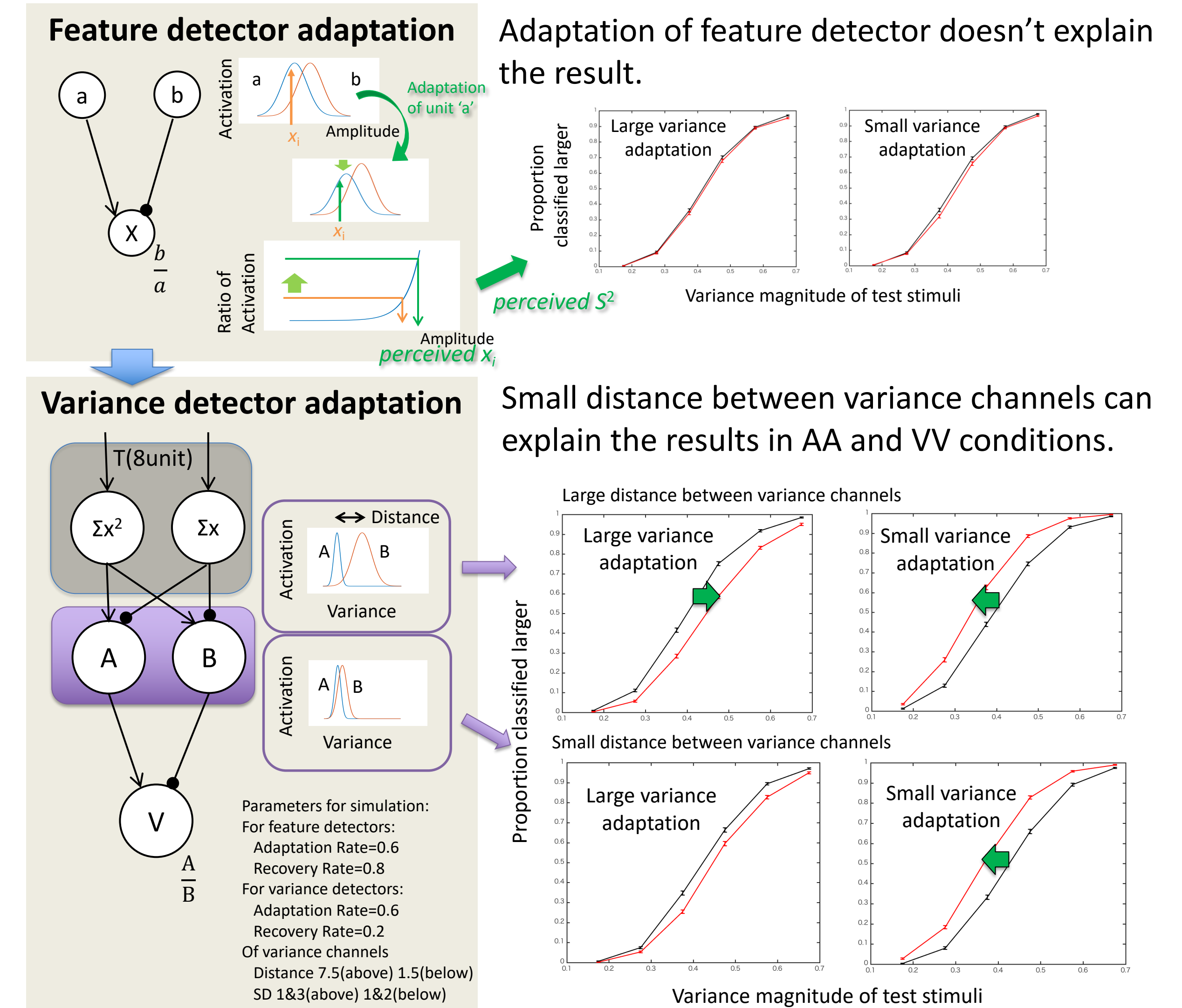
### VA condition (adaptation: visual size, Test: auditory pitch)



### AV condition (adaptation: auditory pitch, Test: visual size)



## MODEL



## CONCLUSION

- We found that perceived variance got significantly larger after prolonged exposure to small variance adaptors when the adaptor and test stimuli were presented in the same modality.
- In contrast, when they were presented in different modalities, not the adaptation aftereffect but some priming effect occurred. Our results indicated that the mechanisms of human variance perception are segregated between sensory modalities.
- The model simulation suggests that a mechanism sensitive to the difference in small variance, so to speak homogeneity detector, might have worked in the unimodal condition(VV, AA), but not in the cross-modal condition(VA, AV).

### Acknowledgement

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