



# Spatial frequencies for rapid and accurate race categorisation in Caucasian participants

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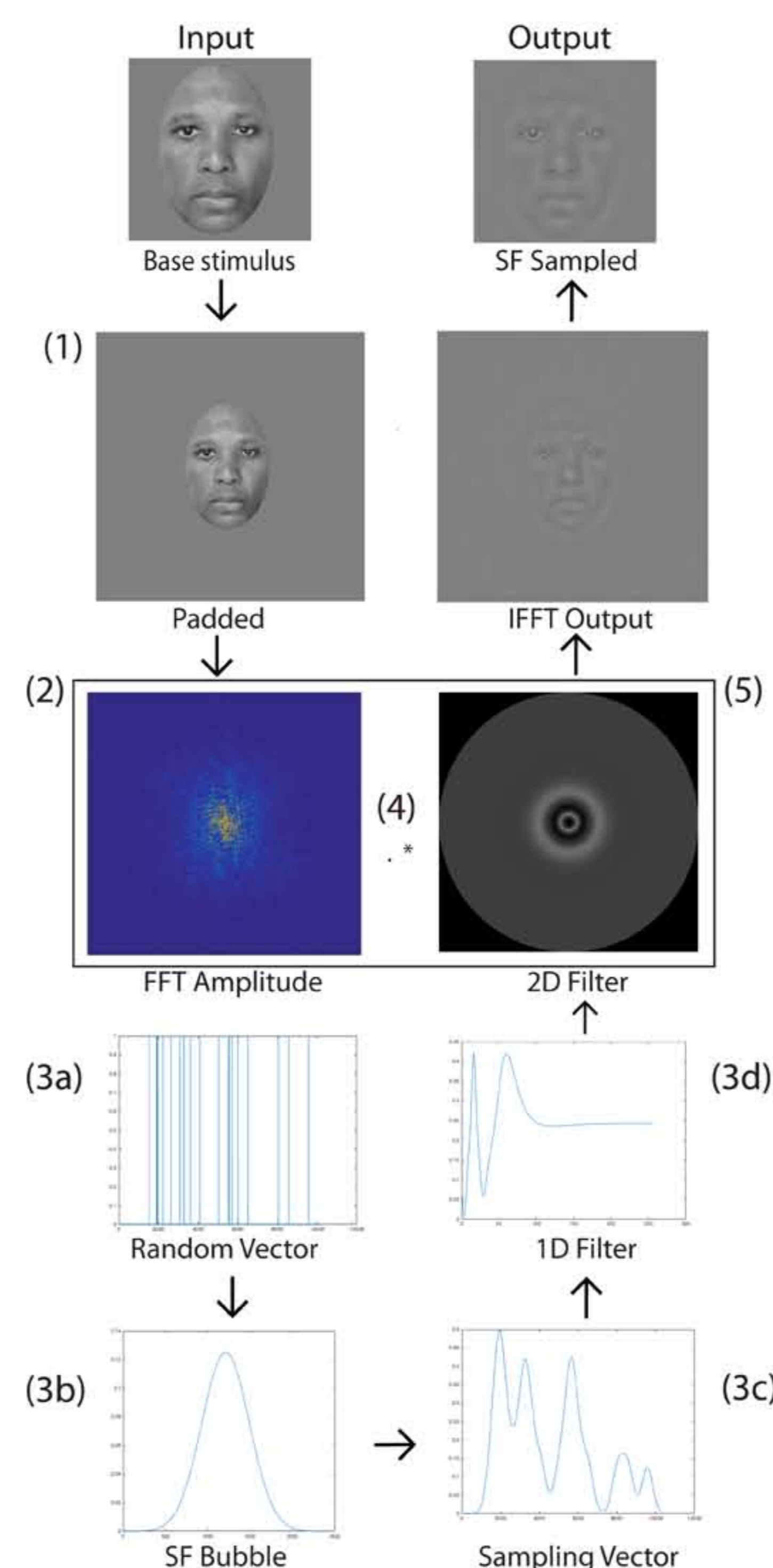
## Theoretical context

Medium spatial frequencies (peaking at  $\sim 10$  cycles per faces) are particularly important for accurate face recognition (Willenbockel, 2010). However, to the best of our knowledge, spatial frequencies useful for ethnic categorisation have not yet been investigated. We know that race categorisation is faster for other race (OR) than same race (SR) faces (e.g. Caldara et al., 2004). Some researchers propose that face identification prevails for SR (but not for OR faces), thus decreasing race categorisation proficiency for their own-race (Hugenberg et al., 2010). To gain a better understanding of this phenomenon, we investigated the perceptual basis of race categorisation.

## Method

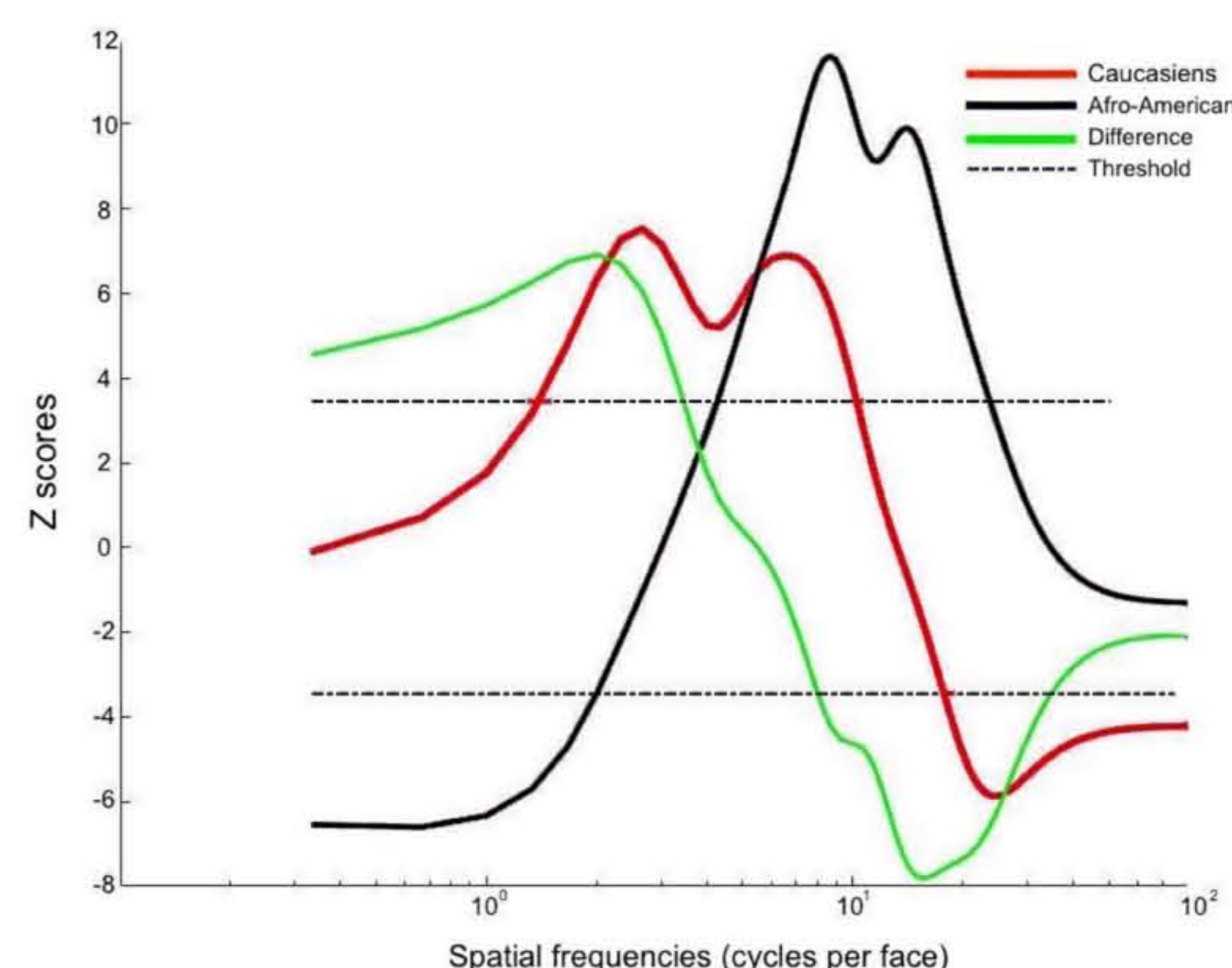
Sixteen Caucasians were asked to categorize rapidly and correctly the race of 50 Caucasian and 50 Afro-american faces (400 trials per race). On each trial, the spatial frequencies (SF) of the stimuli were randomly sampled using SF Bubbles (Willenbockel et al., 2010). Small amounts of white noise were added to each stimulus to keep accuracy at  $\sim 90\%$ .

**Figure 1.** Procedure for creating a stimulus with the frequency bubbles method



## Analysis and results

Multiple regression analyses were conducted on the sampled SFs and the participant's speed (using a median split) to create group SF classification images (CI) for Caucasian and Afro-american faces separately. Subtracting one CI from the other showed that rapid categorisation with Caucasian faces was significantly more correlated with the availability of low SF ( $< 3.3$  cpf);  $Z_{crit}=3.45$ ,  $p < 0.025$ ) whereas medium/high SF availability lead to fast categorisation with afro-american faces (between 8.3 and 34.7 cpf);  $Z_{crit}=3.45$ ,  $p < 0.025$ ).



**Figure 2.** Spatial frequencies correlated with response speed

SFs between 1.7 and 9.3 cpf (peaking at 3.4 cpf; peaks were calculated using a 50% area spatial frequency measure) were significantly correlated with response speed for Caucasian faces, whereas SFs between 4.3 and 23.7 cpf (peaking at 10.3 cpf) were significantly correlated with response speed for Afro-american faces.

## Conclusion

These results demonstrate that participants categorized SR faces rapidly if the SFs important for face identification (i.e. medium SFs) were removed from the stimulus, whereas rapid OR face categorisation can be based on medium SFs. A conceivable interpretation could be that removing identity information facilitates ethnic categorisation for SR faces whereas this information does not pose problems for OR faces.

## References

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- Hugenberg, K., Young, S. G., Bernstein, M. J., & Sacco, D. F. (2010). *Psychological review*, 117(4), 1168.
- Willenbockel, V., Fiset, D., Chauvin, A., Blais, C., Arguin, M., Tanaka, J. W., ... & Gosselin, F. (2010). *Journal of Experimental Psychology: Human Perception and Performance*, 36(1), 122.

