Neural representations of observed interpersonal and person-object motion synchrony in the social perception network

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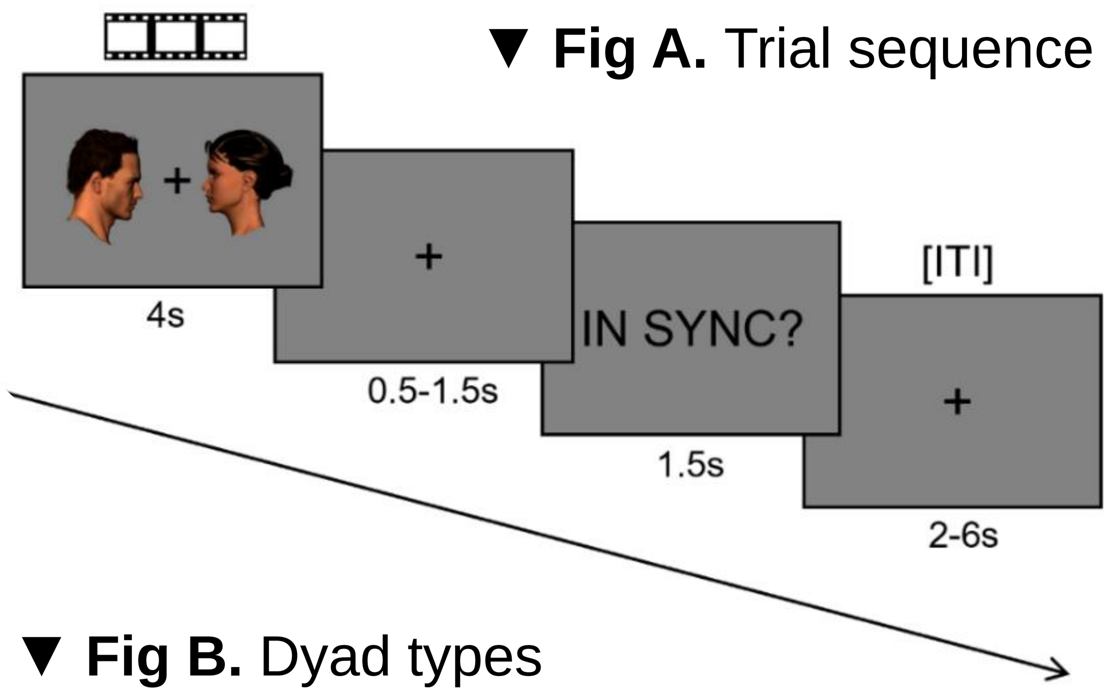
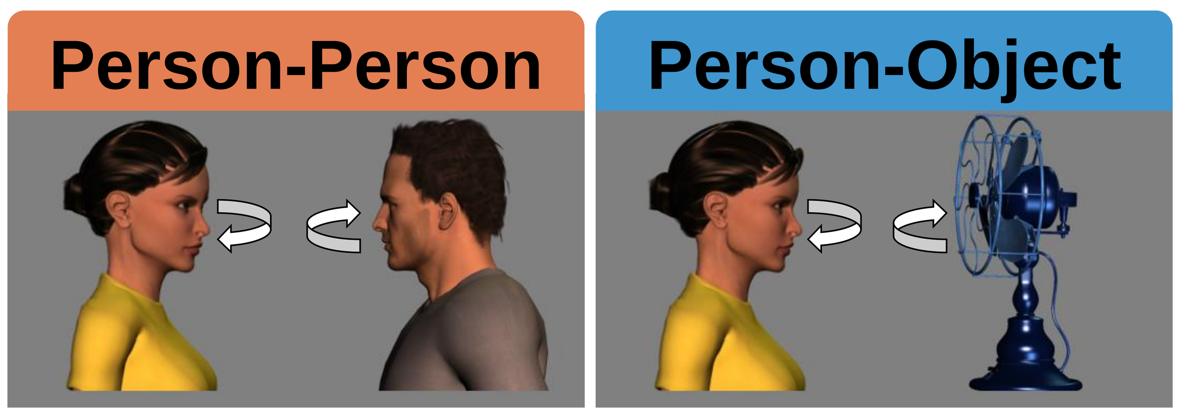
Background & Research Question

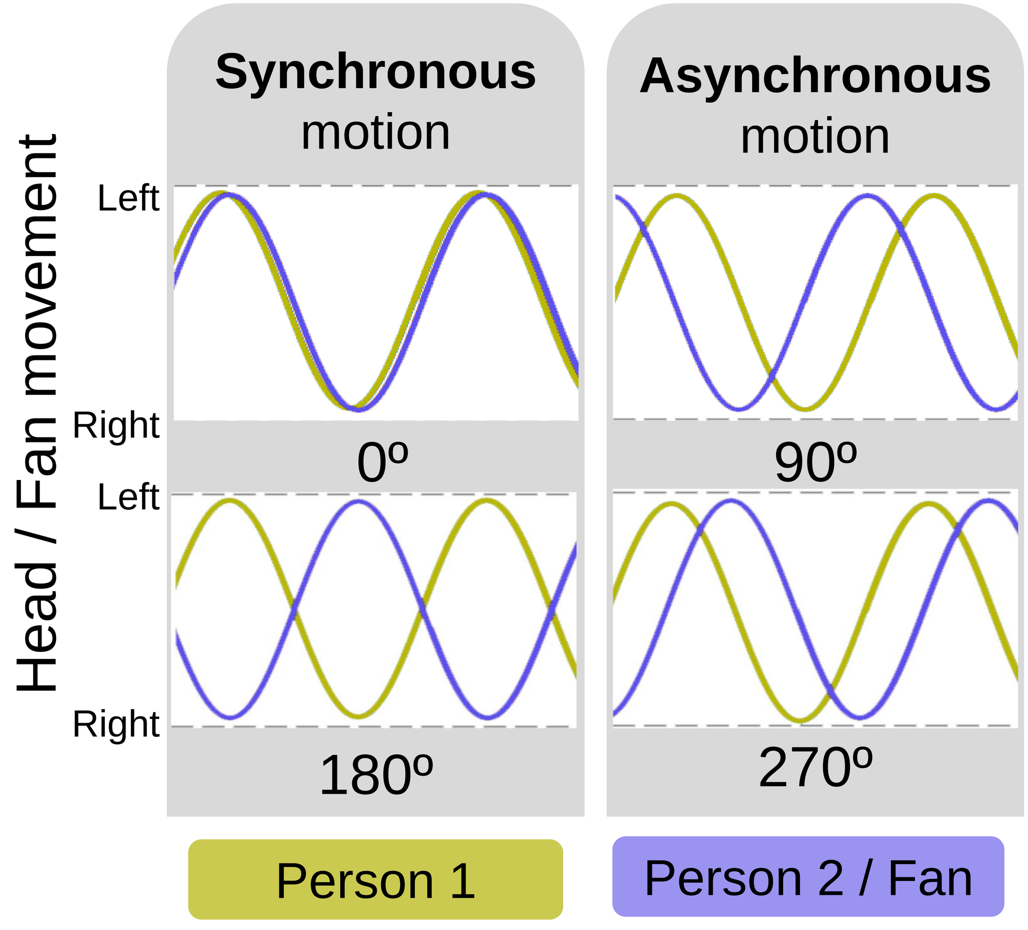
- Regions in occipitotemporal cortex are known to support the visual processing of faces, bodies, and actions[1-3]. However, little is known about the visual processing of interactions between people
- **Interpersonal synchrony** is a critical cue when observing social interactions from third-person perspectives. Person-Person dyads moving in temporospatial alignment are more likely to be perceived as a social unit and elicit higher appraisals of rapport[4-6]
- Initial findings suggest **posterior superior temporal sulcus** (pSTS) and **extrastriate body area** (EBA) encode representations of synchronous vs. asynchronous head shaking/nodding[7]. However, it remains unclear whether this reflects interpersonal synchrony *per se*, or domain-general visual processing of synchronous motion
- Can we find comparable levels of synchrony/asynchrony decoding accuracy in these regions for non-social Person-Object dyads that engage in equivalent motion?

▼ **Fig A.** Trial sequence



▼ **Fig B.** Dyad types





▲ **Fig C.** Relative-phase relationships between dyadic stimulus elements

Method

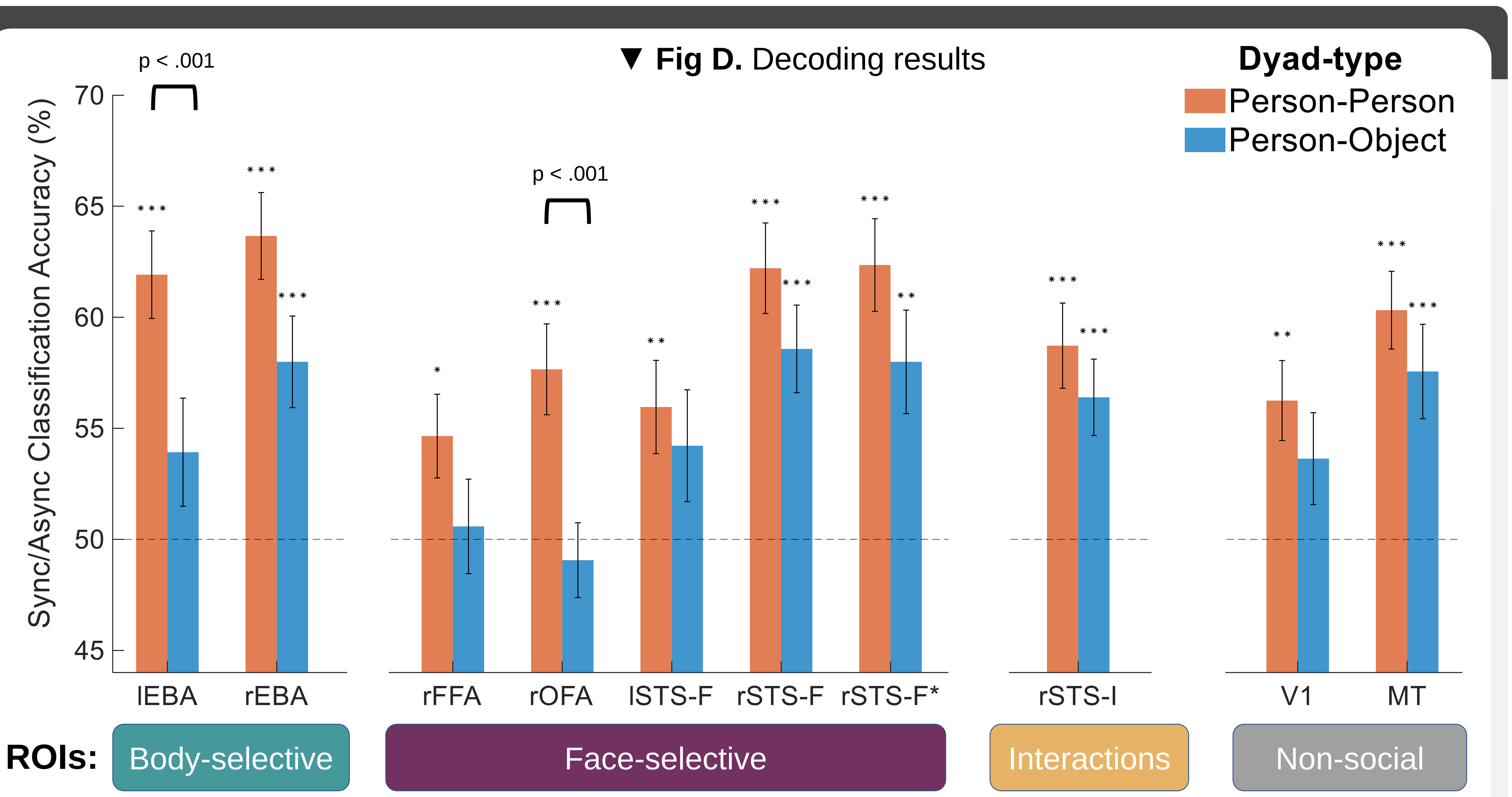
- **Sample:**
  N = 43 (28 female, 15 male; M_{age} = 29.16, SD_{age} = 6.22)
- **Task:**
  Participants judged whether stimulus elements (persons or fans) within dyads were moving in sync or out of sync (Fig. A)
- **Stimuli:**
  Video clips of Person-Person and Person-Object dyads (Fig. B) animated to head-shake/oscillate at four different levels of relative-phase offset (Fig C.)
- **Design:**
  Event-related. Main task: 32 trials x 8 runs. Functional localizers: Face and body[8]; Social interactions[9]
- **Functional data acquisition:**
  Siemens 3T MRI, TR = 2300ms. TE = 30ms. Voxel size = 3 mm isotropic
- **Regions of interest:**
  Body-selective: left and right EBA
  Face-selective: right fusiform face area (rFFA), right occipital face area (rOFA), left STS, right STS face region (rSTS-F), rSTS-F* (*excludes STS-I voxels)
  Interaction-sensitive: rSTS interaction region (rSTS-I)
  Non-social: primary visual cortex (V1), middle temporal area (MT)
- **Multi-voxel pattern analysis:**
  Leave-one-out cross-validation procedure using The Decoding Toolbox[10]. Classifiers trained on functional images from 7 runs and linear discriminate function tested on images from remaining run in 8 cross-validation folds. Average classification accuracies computed for each ROI at the individual subject level

Results

- **Behavioural:**
  No significant difference in task accuracy between Person-Person (M = 87.5%, SD = 10.5%) and Person-Object (M = 86.3%, SD = 10.5%) conditions [$t(42)$ = 1.000, p = .323]
- **Decoding of synchronous vs. asynchronous motion:**
  Above-chance (50%) accuracy of classifiers trained and tested on neural responses from various ROIs during both Person-Person and Person-Object trials (Fig. D; one-sample t tests)
- **Effect of dyad-type:**
  Contrasts reveal superior decoding for Person-Person > Person-Object condition in lEBA and rOFA (paired t tests)

* = $p \leq .05$; ** = $p \leq .01$, *** = $p \leq .001$.
FDR corrected for 10 comparisons (q = .05)

▼ **Fig D.** Decoding results



Conclusions

- We replicate prior findings of neural representation of interpersonal synchrony/asynchrony in face-, body-, and interaction-sensitive regions within the social perception network
- We further demonstrate that a subset of these same regions, including STS, support significant decoding for Person-Object dyads, challenging the view that synchronous motion processing in these regions is gated to observed social interactions
- Notably, we observe enhanced decoding in lEBA and rOFA for Person-Person > Person-Object dyads, strongly supporting their specialised role in processing social interaction-specific motion synchrony
- These outcomes cannot be attributed to mere additive processing of individual stimulus elements, as motion synchrony perception necessitates simultaneous extraction and integration of dynamic information from each element
- These findings contribute to the delineation of roles within occipitotemporal regions, and the degree to which they engage in domain-specific vs. domain-general processing

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