TELLING THE TIME WITH AUDIOVISUAL SPEECH AND NON-SPEECH: DOES THE BRAIN USE MULTIPLE CLOCKS?

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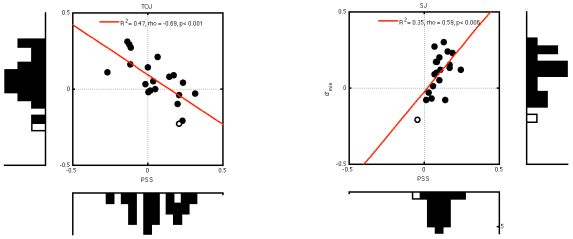
Aim & Introduction

- *'Unity assumption'*: mutual dependence between perceived cross-modal synchrony and integration Vroomen & Keetels, 2010; Welsh & Warren, 1980).
- Subjective audiovisual synchrony (Point of Subjective Synchrony, **PSS**) can vary widely between subjects (Stone, 2001) and paradigms (van Eijk, 2008). But unclear whether AV integration depends on PSS.
- We concurrently measured PSS *and* optimal timing for AV integration (**tAVI**) in a dual task paradigm.

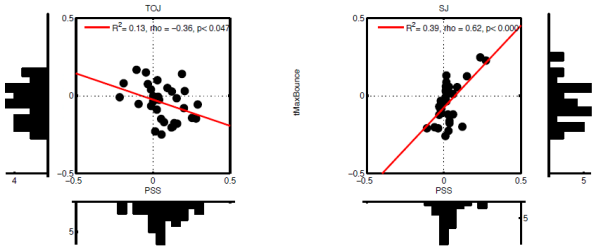
→ *Unity assumption predicts: PSS should correlate positively with tAVI*

Expt. 1 Results: McGurk



- Asynchrony for maximum illusion significant and positively correlated with PSS derived from SJ, following the unity assumption.
- The analogous correlation with PSS derived from TOJ was significantly negative.

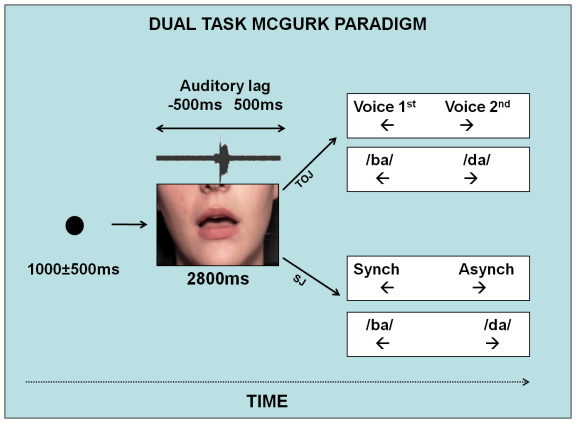
Expt. 2 Results: Stream-Bounce



- Relationship is not restricted to speech stimuli.
- Relationship apparent when visual information alters auditory perception as well as in instances where auditory information alters visual perception.

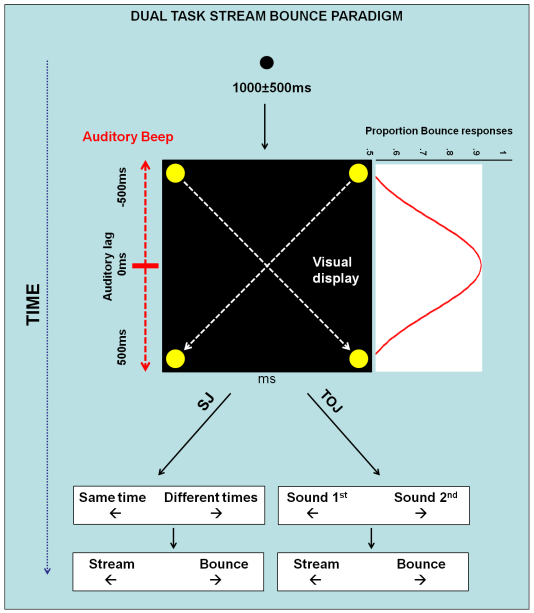
Expt. 1 Method: McGurk

- Subjects: ## experienced but naïve adults, age ##
- Stimuli: typical McGurk AV stimuli (McGurk & MacDonald, 1976):
- Congruent and incongruent combinations: movie of lip-movements [ba], [ga] paired with audio /ba/, /da/.
- Variable auditory lag: 9 levels, range ±500ms, randomised.
- Dual task: Timing judgement and phoneme identification
- Timing judgements, two types: Temporal Order Judgement (TOJ) or Simultaneity Judgement (SJ). Blocked and counterbalanced



Expt. 2: Stream-Bounce

- Non-speech stimuli, stream-bounce paradigm (Sekuler, Sekuler, & Lau, 1997).
- Other methods details unchanged



Discussion

The temporal mechanisms for the TOJ pairing seem neither unitary nor fully independent, but apparently antagonistic.

A tentative temporal renormalisation mechanism explains these paradoxical results as follows:

1) subjective timing in our different tasks can depend on independent mechanisms subject to their own neural delays;

2) inter-modal synchronization is achieved by first discounting the mean neural delay within each modality;

3) apparent antagonism between estimates of subjective timing emerges as the mean for each modality is attracted towards deviants in the unimodal temporal distribution.

References

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