ASSOCIATIVE LEARNING ACHIEVED WITHOUT CONSCIOUS PERCEPTION

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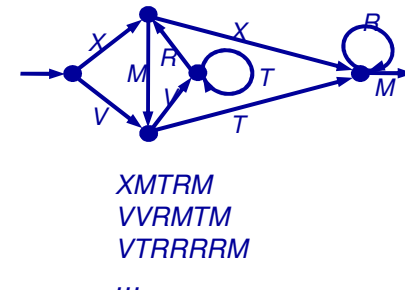[2]Sackler Centre for Consciousness Science
[3]San Francisco State University, USA

University of Sussex
Sackler Centre for Consciousness Science

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Implicit Learning vs. Unconscious Perception

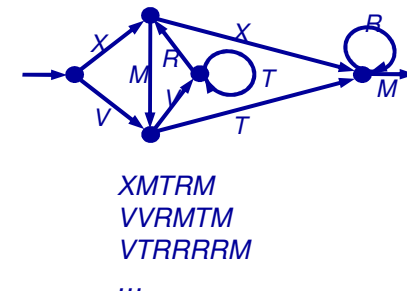# Implicit Learning vs. Unconscious Perception

Implicit learning

- That mechanism that results in the acquisition of knowledge we are not aware of possessing

- E.g. in AGL we might acquire knowledge of associations between letters without awareness

- We may then express that knowledge in grammaticality judgements without awareness

XMTRM
VVRMTM
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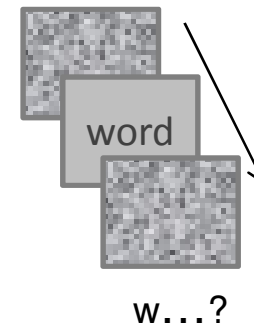# Implicit Learning vs. Unconscious Perception

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Unconscious Perception

- Perception without awareness of having perceived
- For example, subliminally presented words which influence subsequent stem completion
- Does not demonstrate associative learning but simply the priming of existing representations

word

w…?

Important Test of Unconscious Learning

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Can implicit learning occur without conscious perception?

- The essence of implicit learning is building associations

- So we are asking if associations can be acquired not simply without awareness that we are doing so

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Some evidence that this can be achieved

- Henke et al., 2003 – Subliminal Face-Profession Pairs
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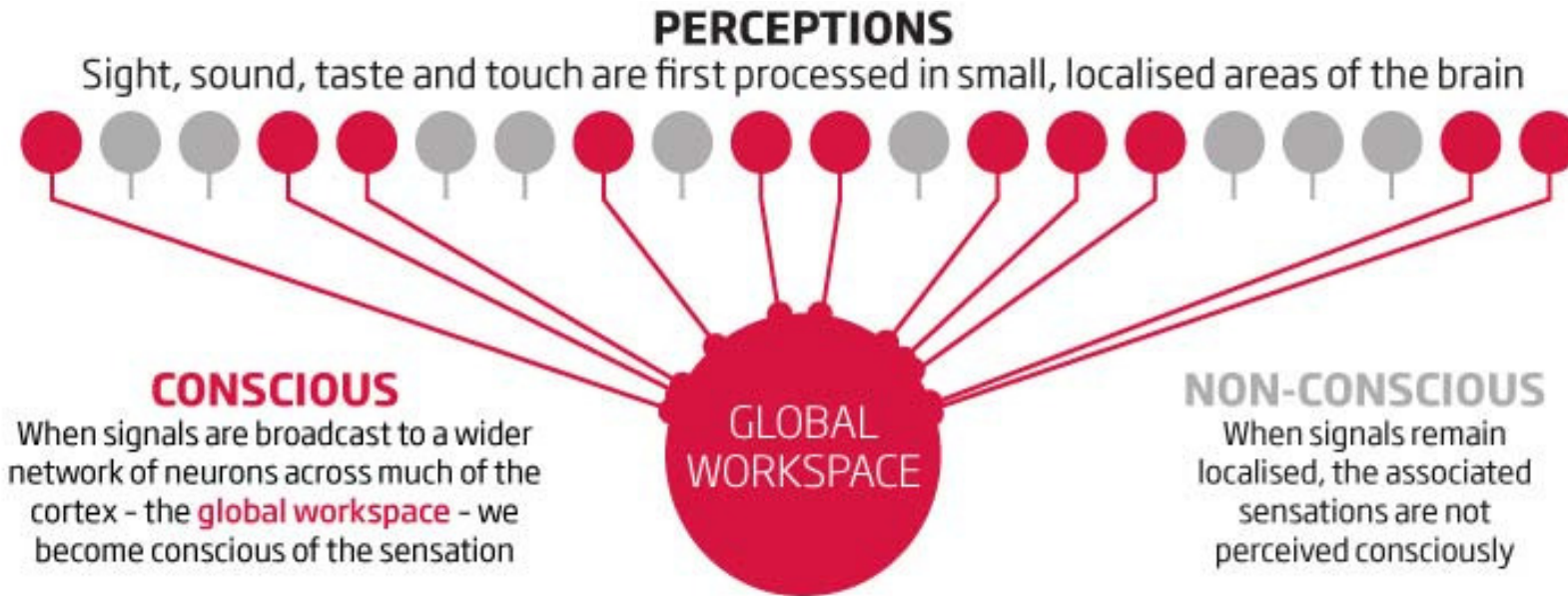- But also without awareness of perceiving the stimuli

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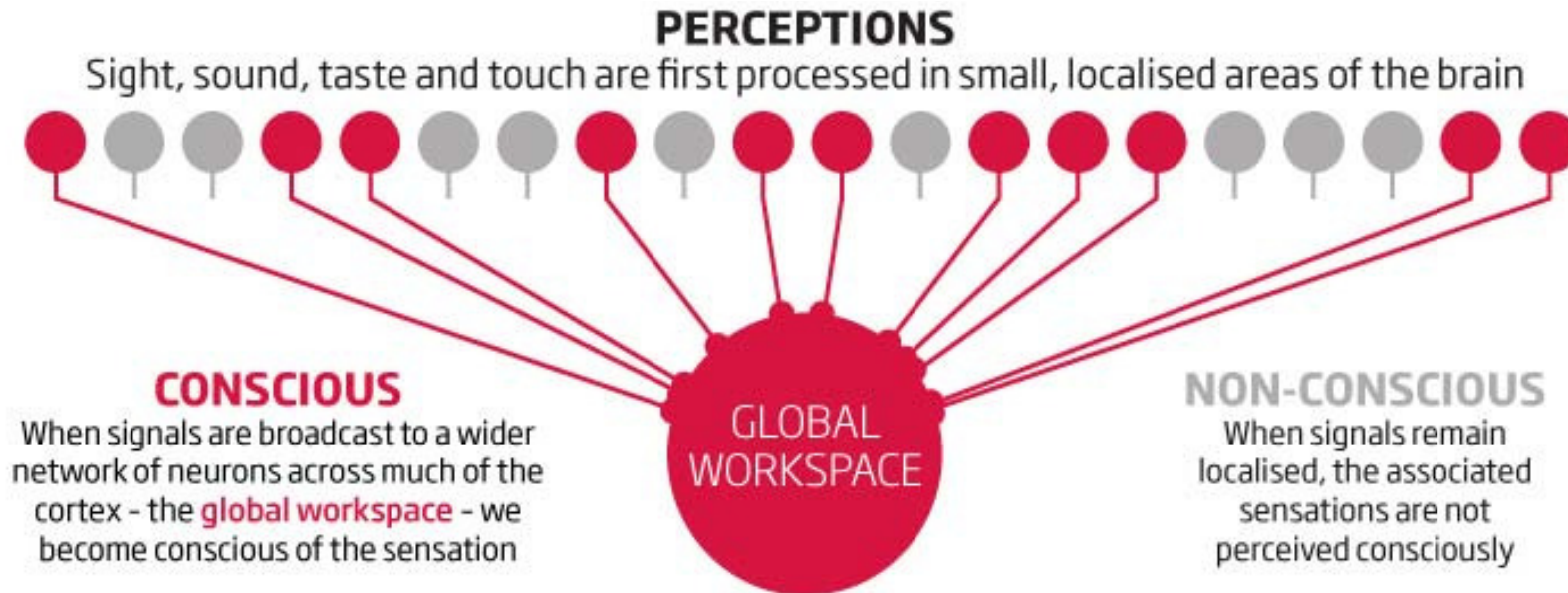
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So why bother?

Seeking a Test of Global Workspace Theory
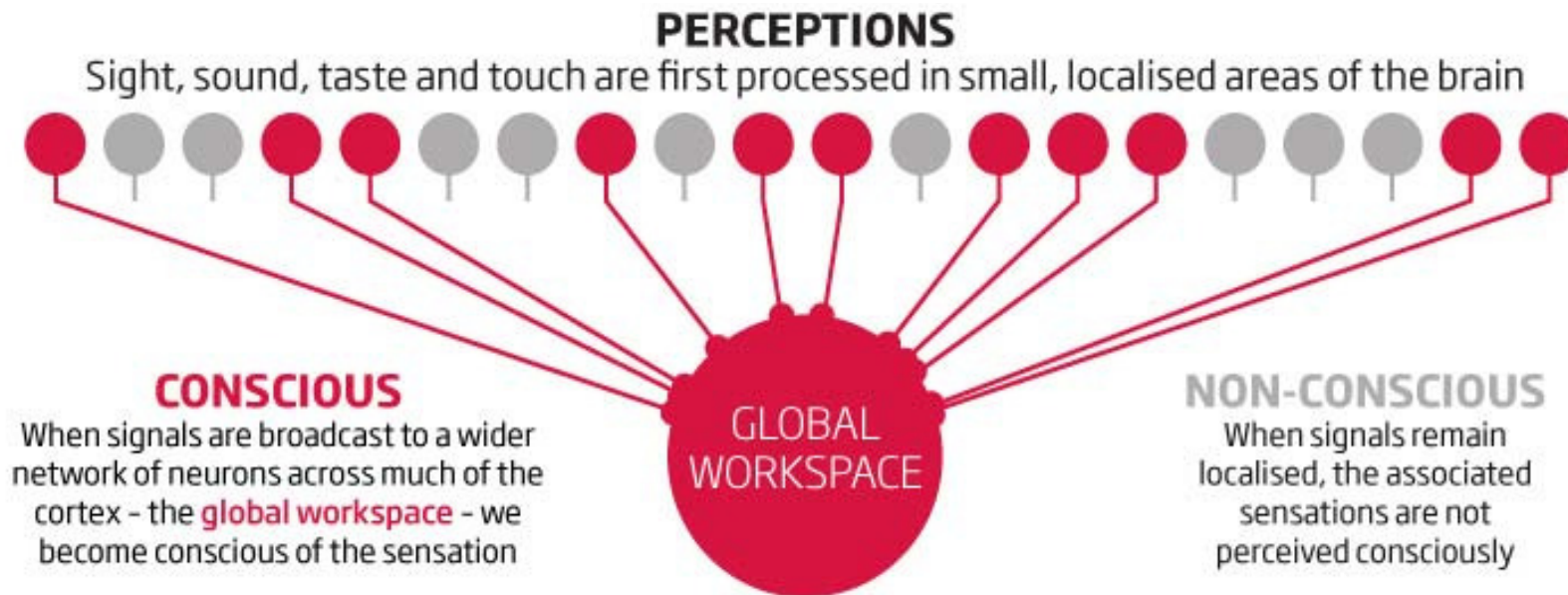
Seeking a Test of Global Workspace Theory

PERCEPTIONS
Sight, sound, taste and touch are first processed in small, localised areas of the brain

CONSCIOUS
When signals are broadcast to a wider network of neurons across much of the cortex - the global workspace - we become conscious of the sensation

GLOBAL WORKSPACE

NON-CONSCIOUS
When signals remain localised, the associated sensations are not perceived consciously

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- For example, we should not form unconscious associations between stimuli in different perceptual modalities
- Unconscious 'cross-modal binding' should not be possible

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This is the goal but we're not quite there yet!

Experiment 1: Auditory Associations
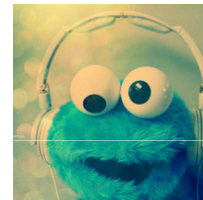
Experiment 1: Auditory Associations

Rationale
- Auditory paradigm as auditory buffer should facilitate associative learning
- Wanted an indirect test using RT as this had proved more sensitive
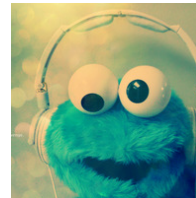- Wanted an ongoing test of awareness

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- Find auditory threshold in right ear
  (Report the non-number word)

1, 4, 26…green, 13…

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- Introduce attentional task in left ear
  (Press left for 1, and right for 2)

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- Train the classification of professions
  (Press left for uncreative, right creative)
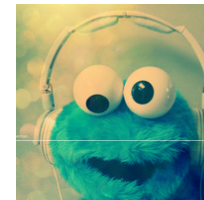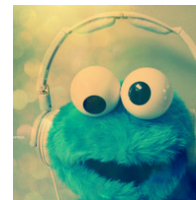
Pianist
Composer
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…
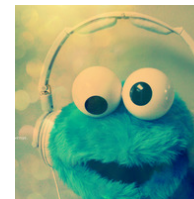
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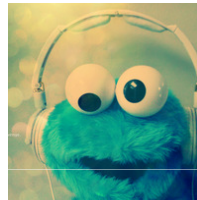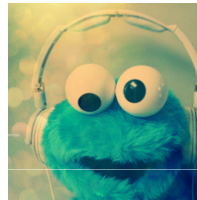**Test Trials – three stages to each trial, 32 trials in all**

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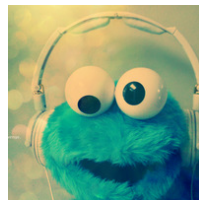
10, 4, mike pianist, 21…

5, 2, paul banker, 7 …
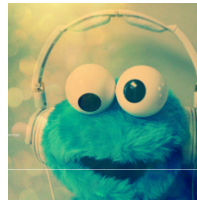
1, 1, 2, 1, 2, 2 …

2, 2, 2, 1, 2, 1 …

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2) Report any non-number words that were heard

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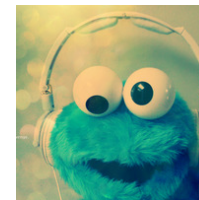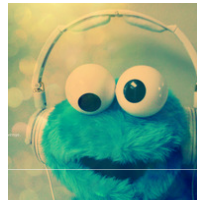
3) Timed classification of profession – primed by a name

mike   **mike**   **mike**   **mike**

Pianist   **Pianist**   *OR*   **Banker**   **Banker**

Same as subliminal   **Different to subliminal**

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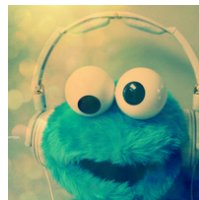
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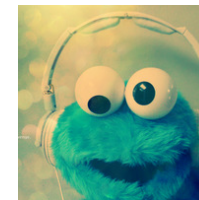*mike*   *mike*   *mike*   *mike*

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Delay (~200 ms) after prime predicts *inhibitory* priming (Eimer, 2006)

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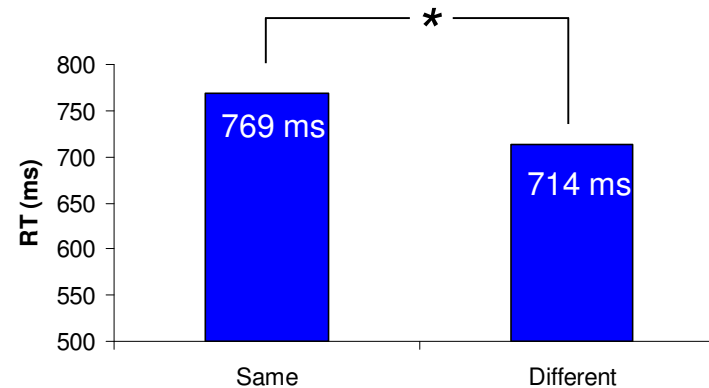
N = 60

Exclusions and pre-processing
- *All trials where word heard (M=.15)*
- Any participant making more errors than 2SD above the mean (N = 1)
- Non-normal distribution corrected with reciprocal transformation

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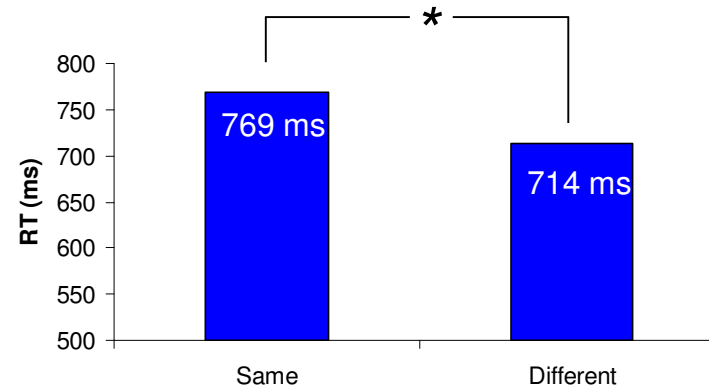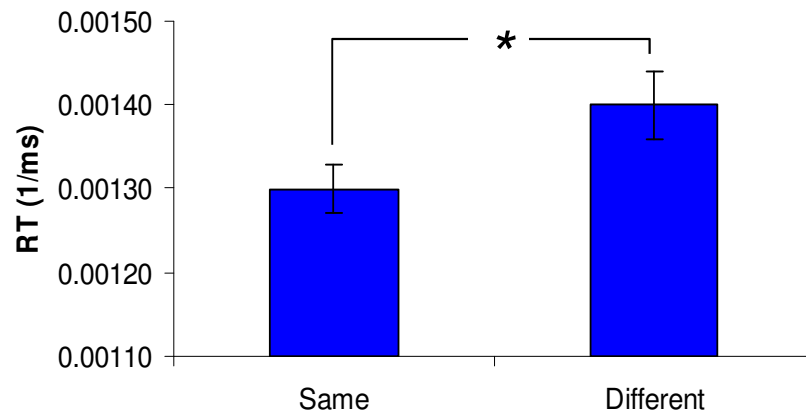- Non-normal distribution corrected with reciprocal transformation

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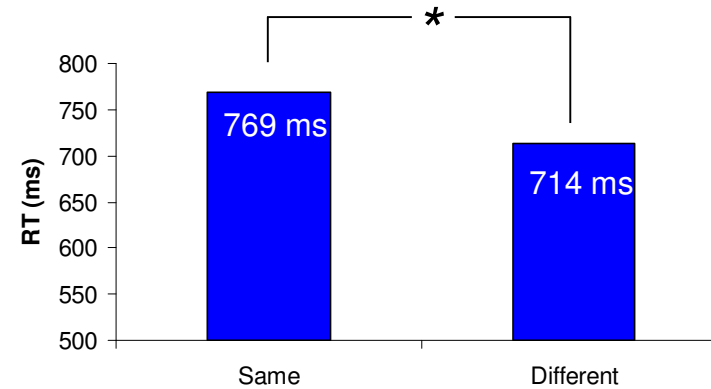- Non-normal distribution corrected with reciprocal transformation

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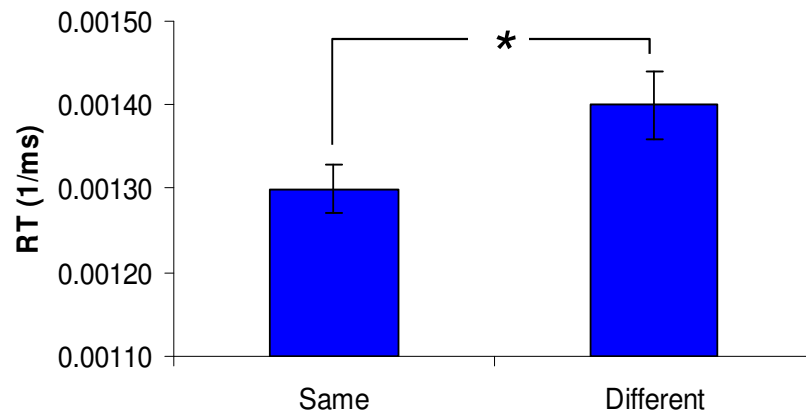- Non-normal distribution corrected with reciprocal transformation

After so many attempts replication was essential!

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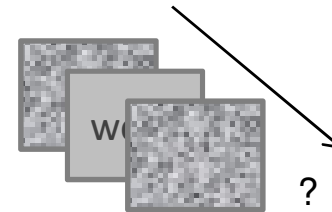- Find visual threshold
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  (Press left arrow or right arrow as seen)

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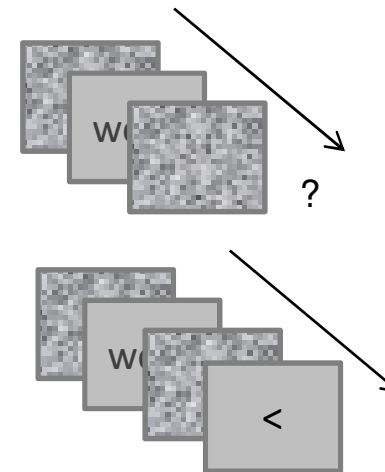**Paradigm Outline**
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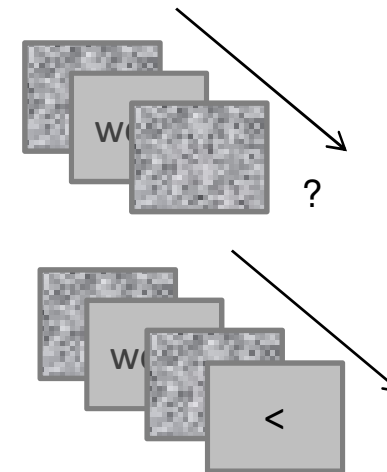 (Press left arrow or right arrow as seen)

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<div align="center">

Mike   *Mike*

(150 ms delay)   **OR**   *(150 ms delay)*

Pianist   *Banker*

Same as subliminal   **Different to subliminal**

</div>

The delay and gradual fade up of target designed to create *inhibitory* priming

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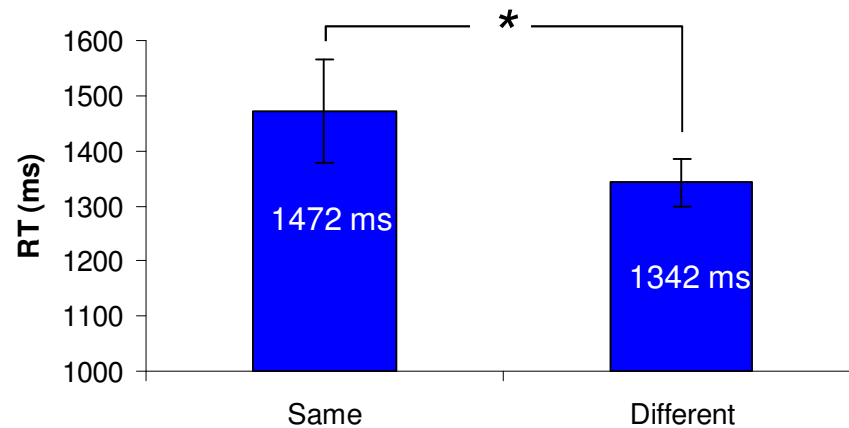
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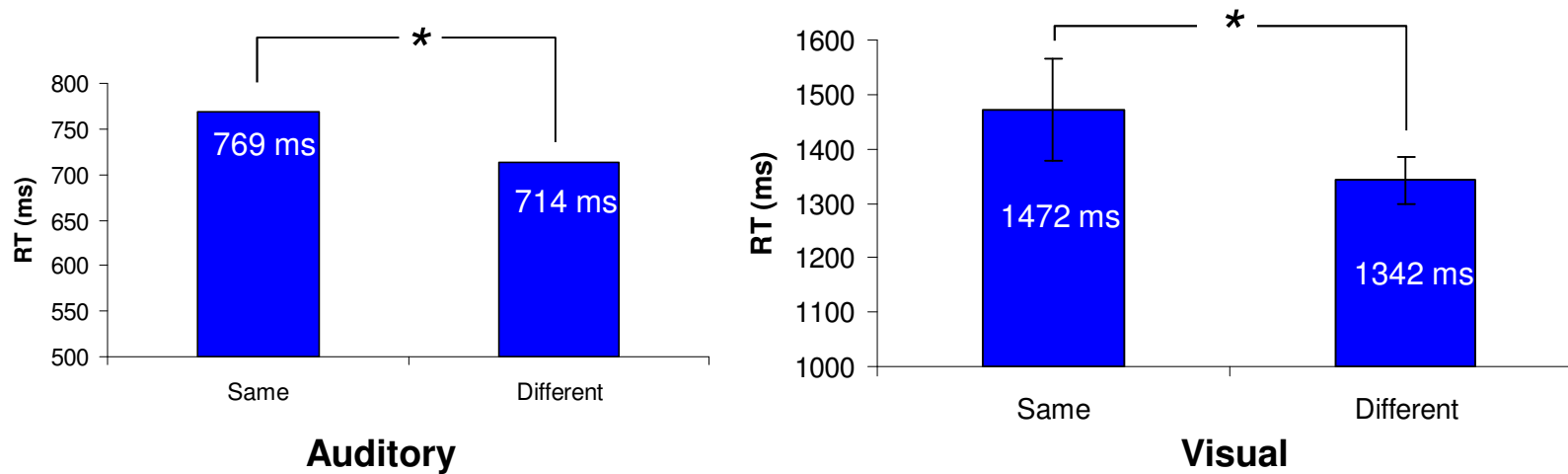- No transformation required

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- We can now move to test whether unconscious cross-modal binding is achievable – a potential test of GWT

- **Potential limitation of the current paradigm is that visual presentation (reading) automatically activates phonetic representations … so arguably it will not be the strongest test of cross modal capability.**

Thank you

Collaborators

Zoltan Dienes

Jason Samaha

Funding and Support