A snake wiggle of reaction time functions to indicate holistic perception

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46th Annual Meeting of the Society of Mathematical Psychology
August 5, 2013, Potsdam, Germany

The holistic hypothesis: Objects are perceived as whole entities and not as a sum of independent features

Analytic, or feature-based hypothesis: Objects are perceived as a simple sum of independent features

Signatures of Holistic perception

- Gestalt laws: proximity similarity by inducing perceptual effects (Sarris; Overvliet, Krampe & Wagemans)
- Pop-out effect (Pomerantz; Eidels)
- Part to whole paradigm (Donnelli; Tanaka & Farah; Bierman)
- Garner Task (Kimchi)
- Superiority effects (Pomerantz)
- Thatcher faces illusion: Grotesqueness (Wenger)
- Face inversion (Bartlett, Innes-Ker)
- Unitization (Goldstone, Blaha)
- Scrambled faces vs Normal
- Neural Responses (Peterson, Palmeri)
  - Lightfoot & Shiffrin
- Context effect (Palmer, Kimchi)
- **Super capacity index** (Townsend, Eidels, Blaha)
- **Coactivation signature** (Colonius, Little, Fific, Nosofsky, Townsend; Houpt)

Systems Factorial Technology

SFT

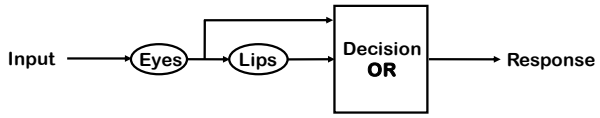
A catalog of mental architectures

Signatures

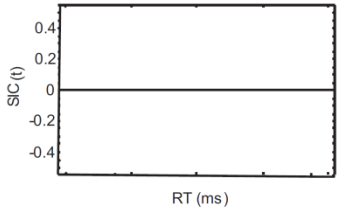
SIC

Architecture flow diagram

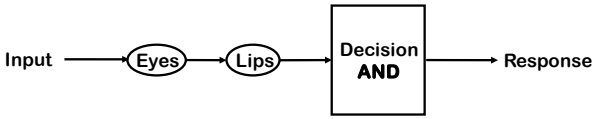
A
Serial
Self-terminating



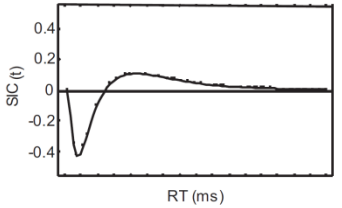
Analytic



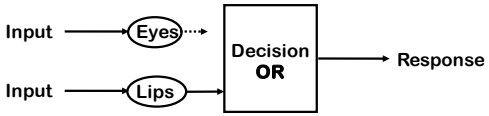
B
Serial
Exhaustive



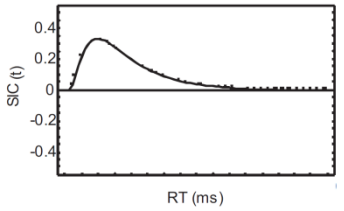
Analytic/ Holistic



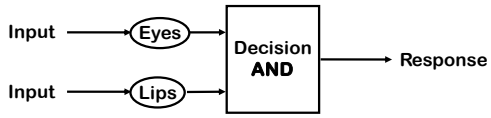
C
Parallel
Self-terminating



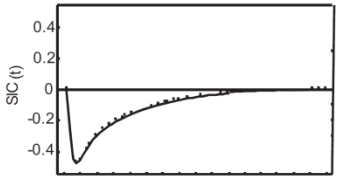
Analytic



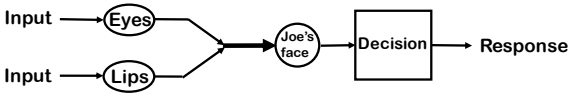
D
Parallel
Exhaustive



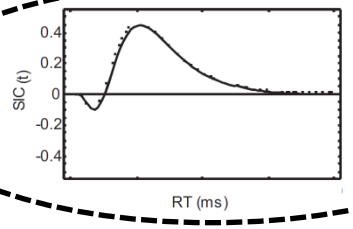
Analytic/ Holistic



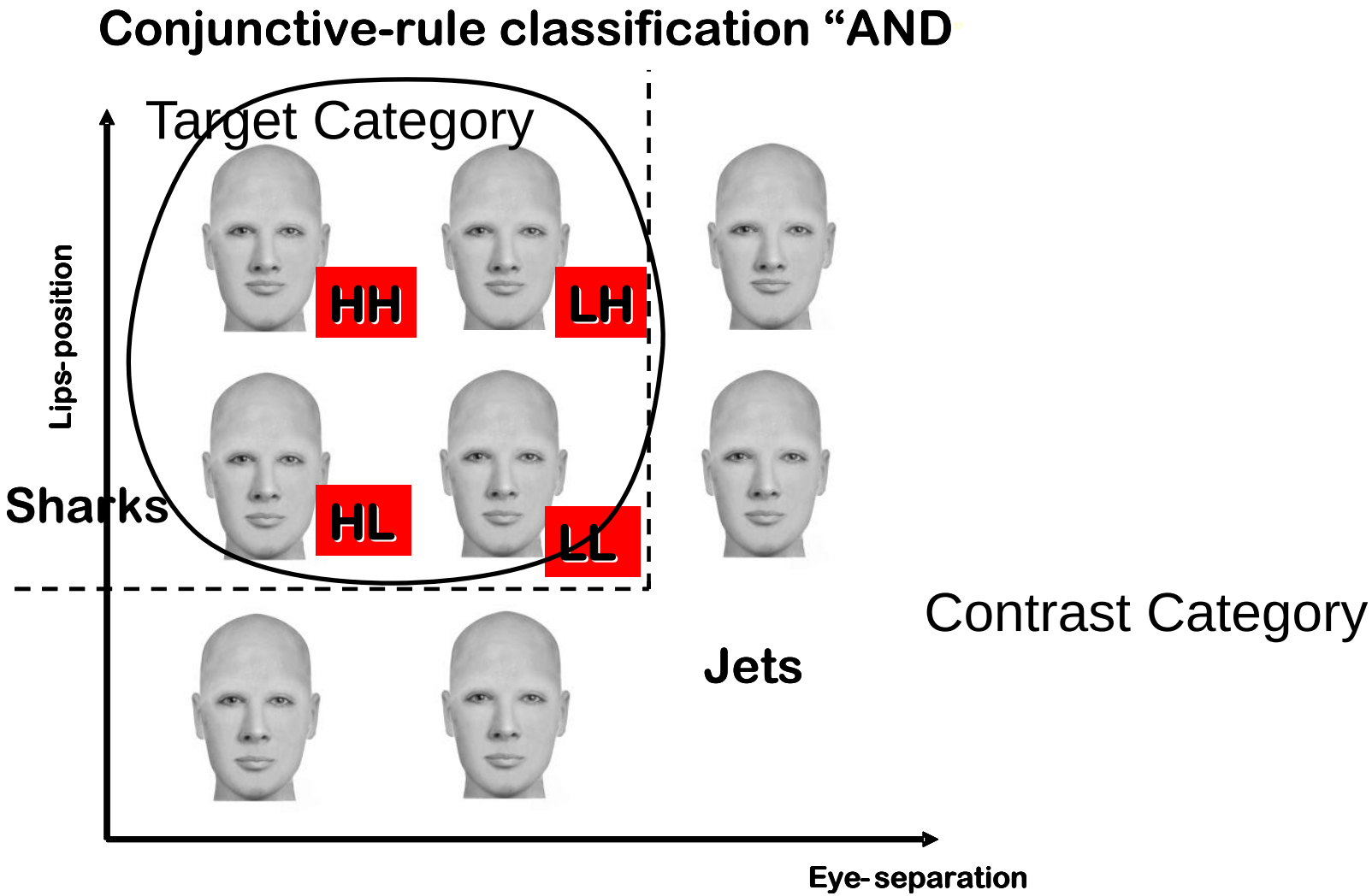
E
Coactive



Strong Holistic

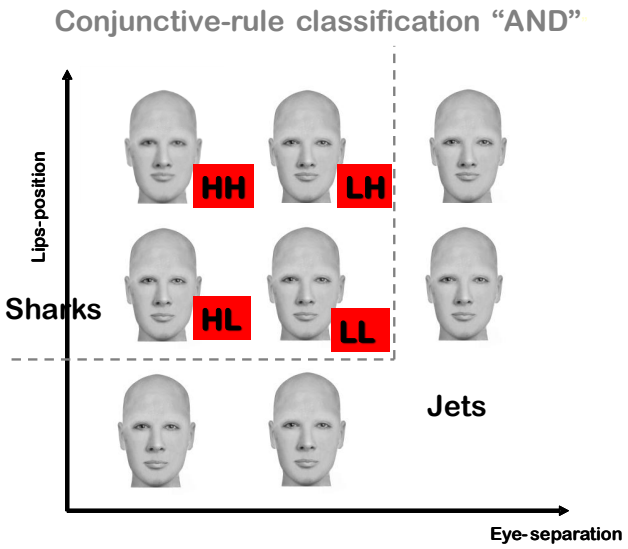


The task

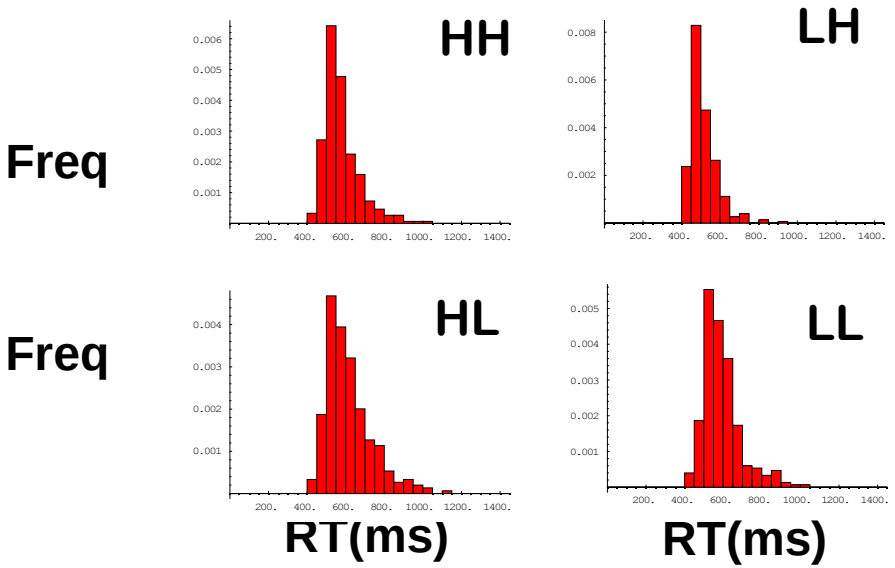


(Fific & Townsend, 2010)

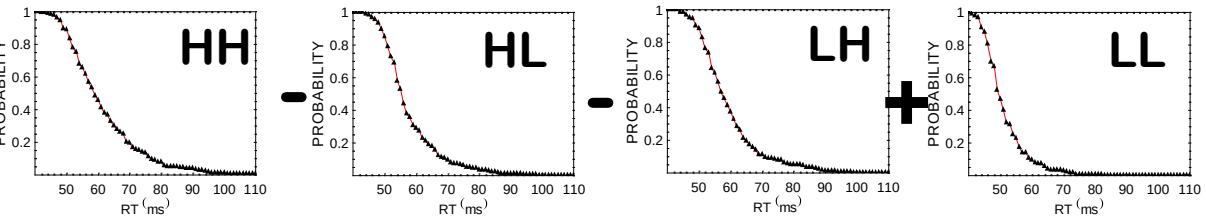
Tutorial: how to calculate the survivor interaction contrast (SIC) function



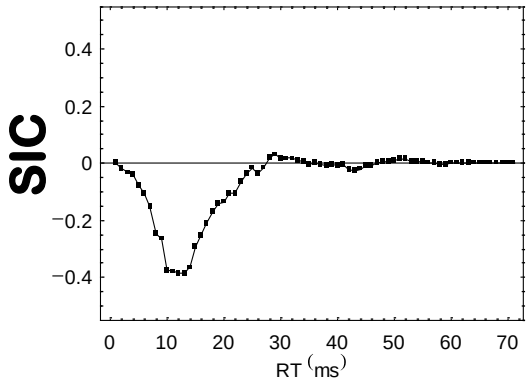
Reaction time histograms



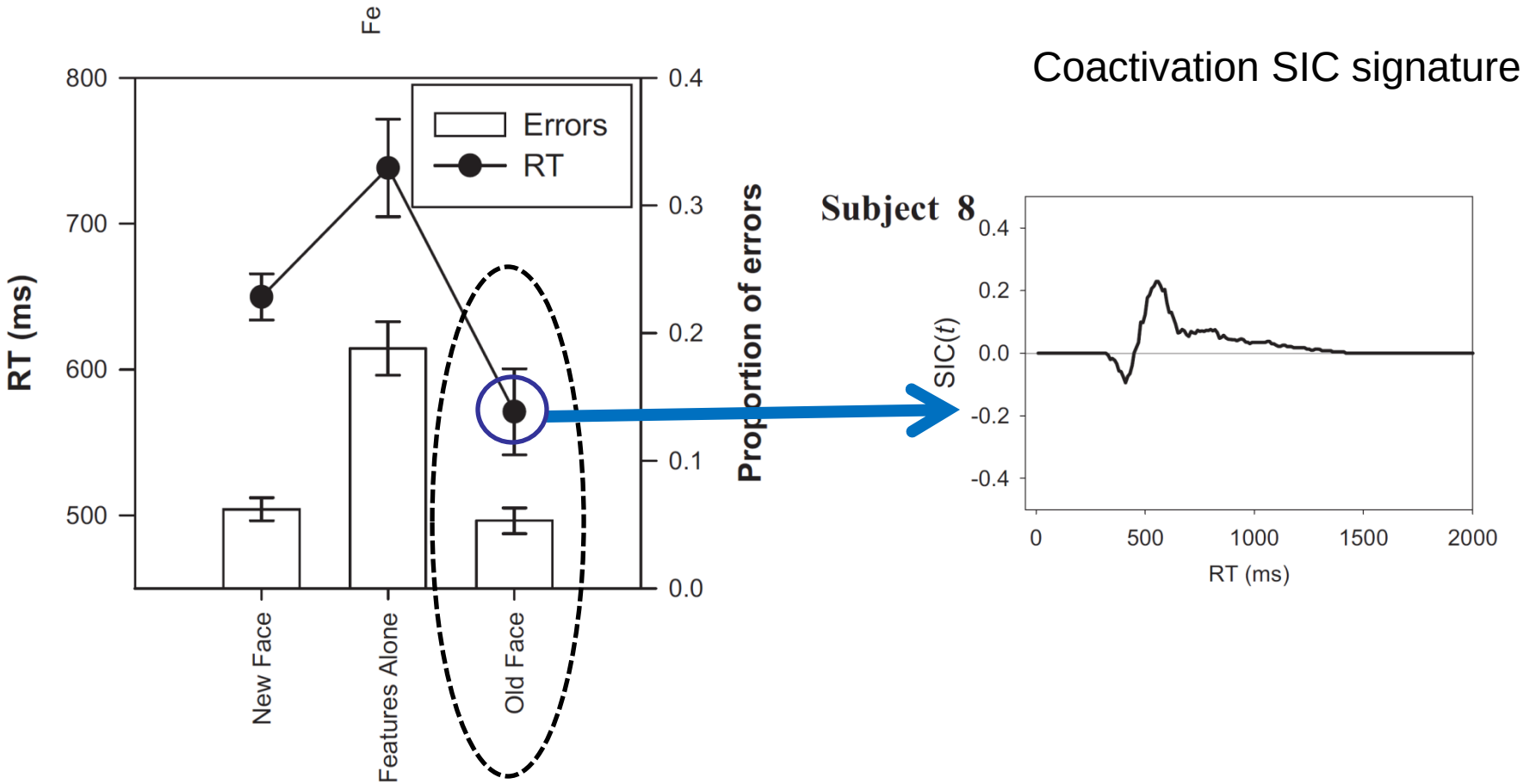
Reaction time Survivor functions



$$SIC(t) = S_{hh}(t) - S_{hl}(t) - (S_{lh}(t) - S_{ll}(t))$$



Part to whole paradigm x SFT Empirical evidence:



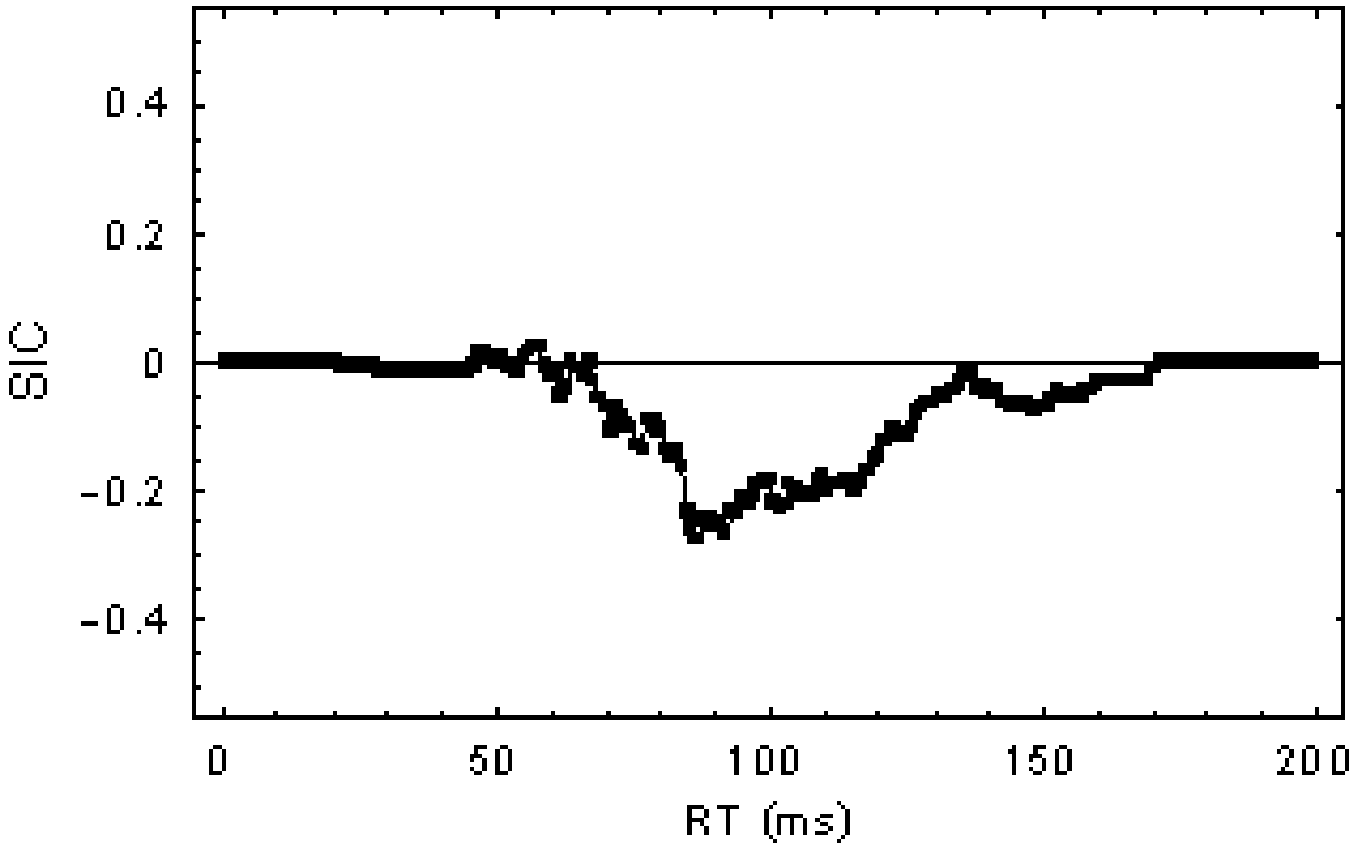
(Fific & Townsend, 2010)

- Can we provide a strong validation of such signature?

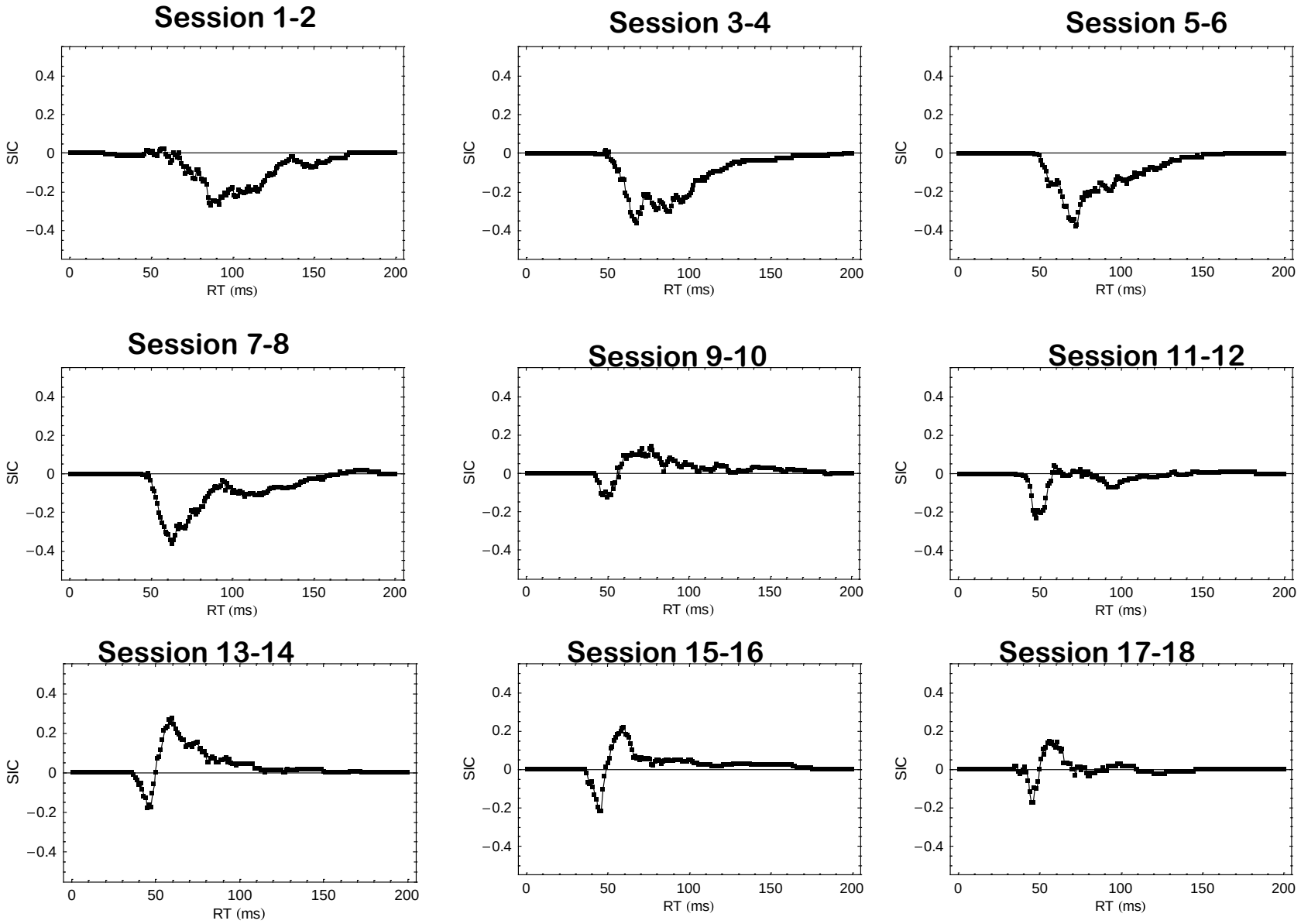
New signature of holistic perception

- Dynamical SIC signature

The signature “Snake Wiggle”



The “Snake Wiggle” signature



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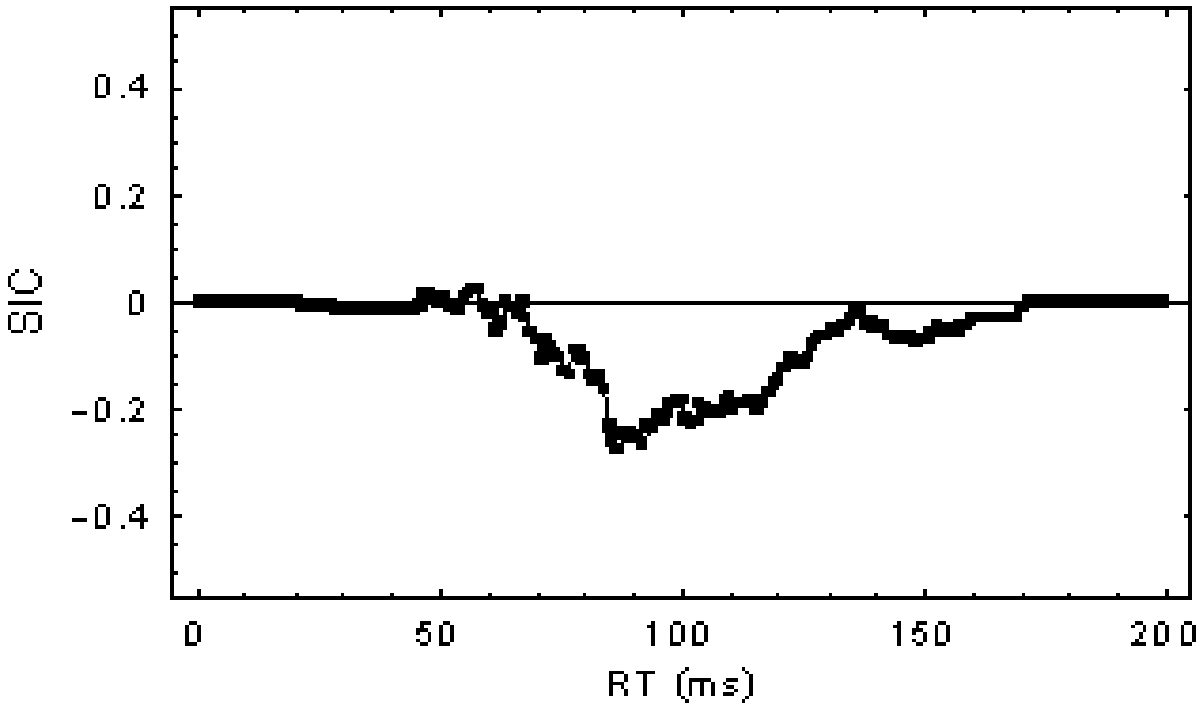

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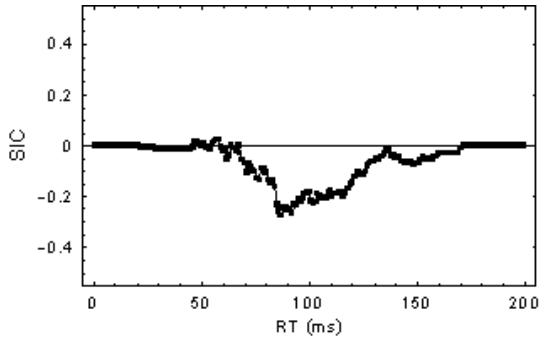
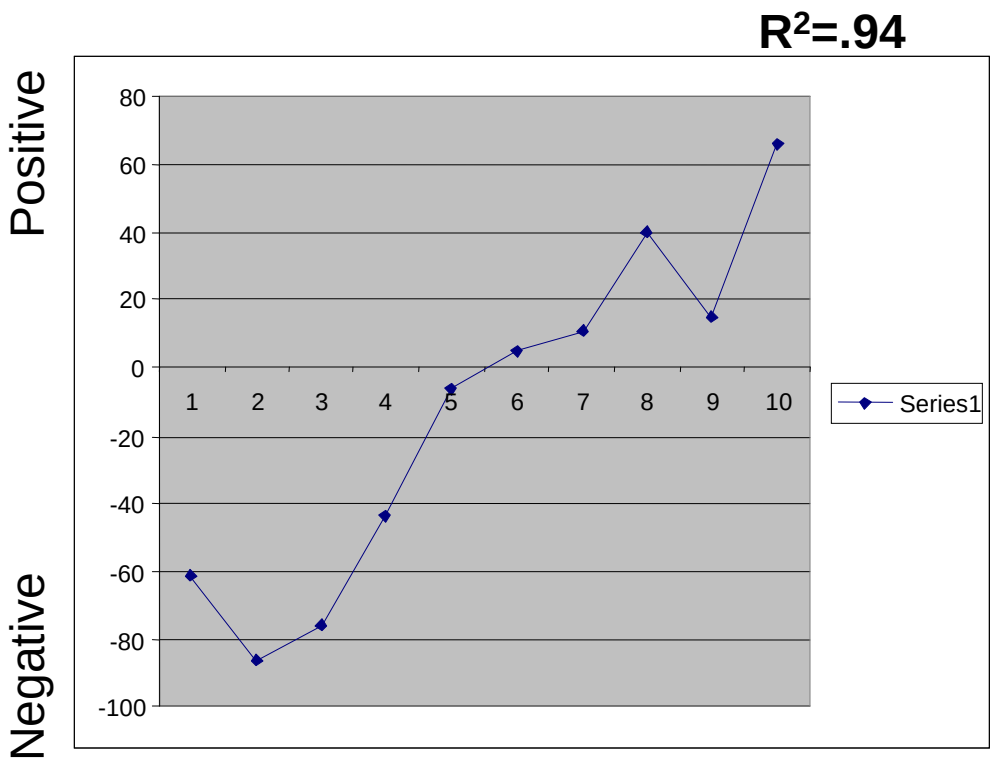
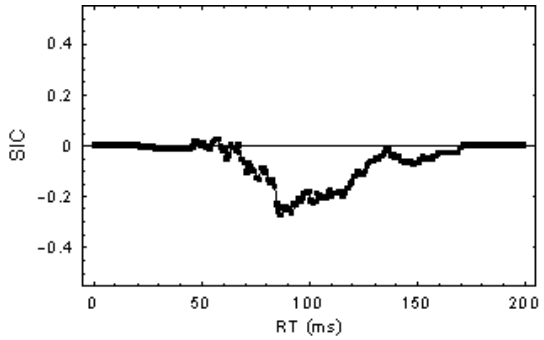


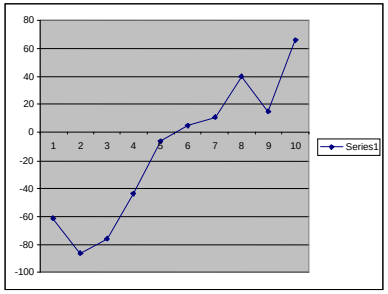
The total area under the curve



The signature “Snake Wiggle”

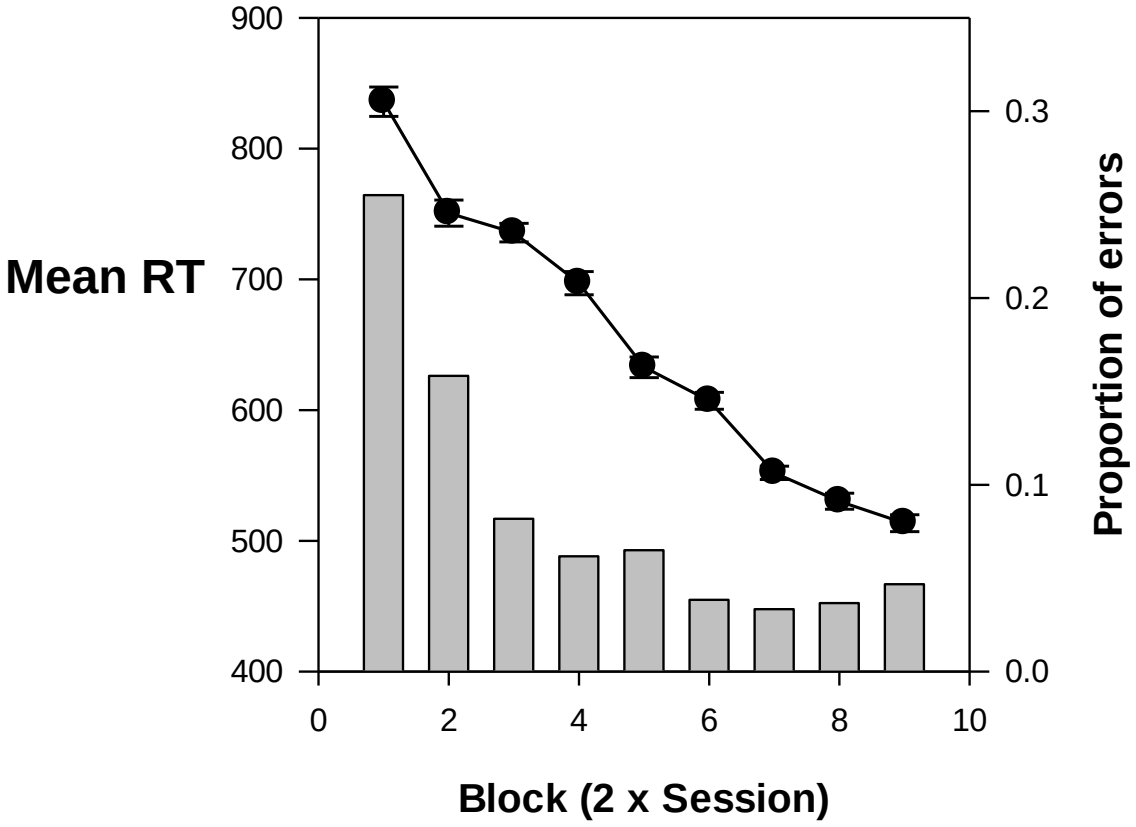


The sum of the area under the curve



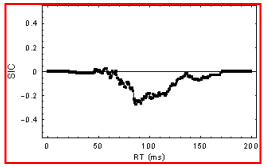
Sessions

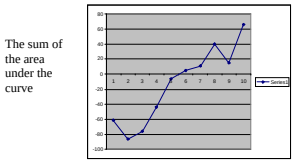
Mean RT trend

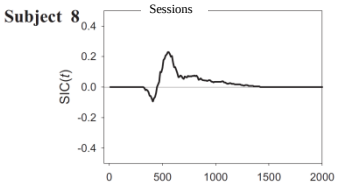


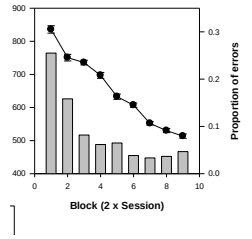
The evidence for “Snake Wiggle”

- **Let’s wiggle**: The SIC function wiggles its way to S-shaped positive function
- **Robustness**: All subjects wiggled
- **Coactivation**: The target signature is Coactive, an indicator of strong holism
- **Performance superiority**: Mean RT decreases, and accuracy improves (superior performance)
- **Introspection**: The verbal reports









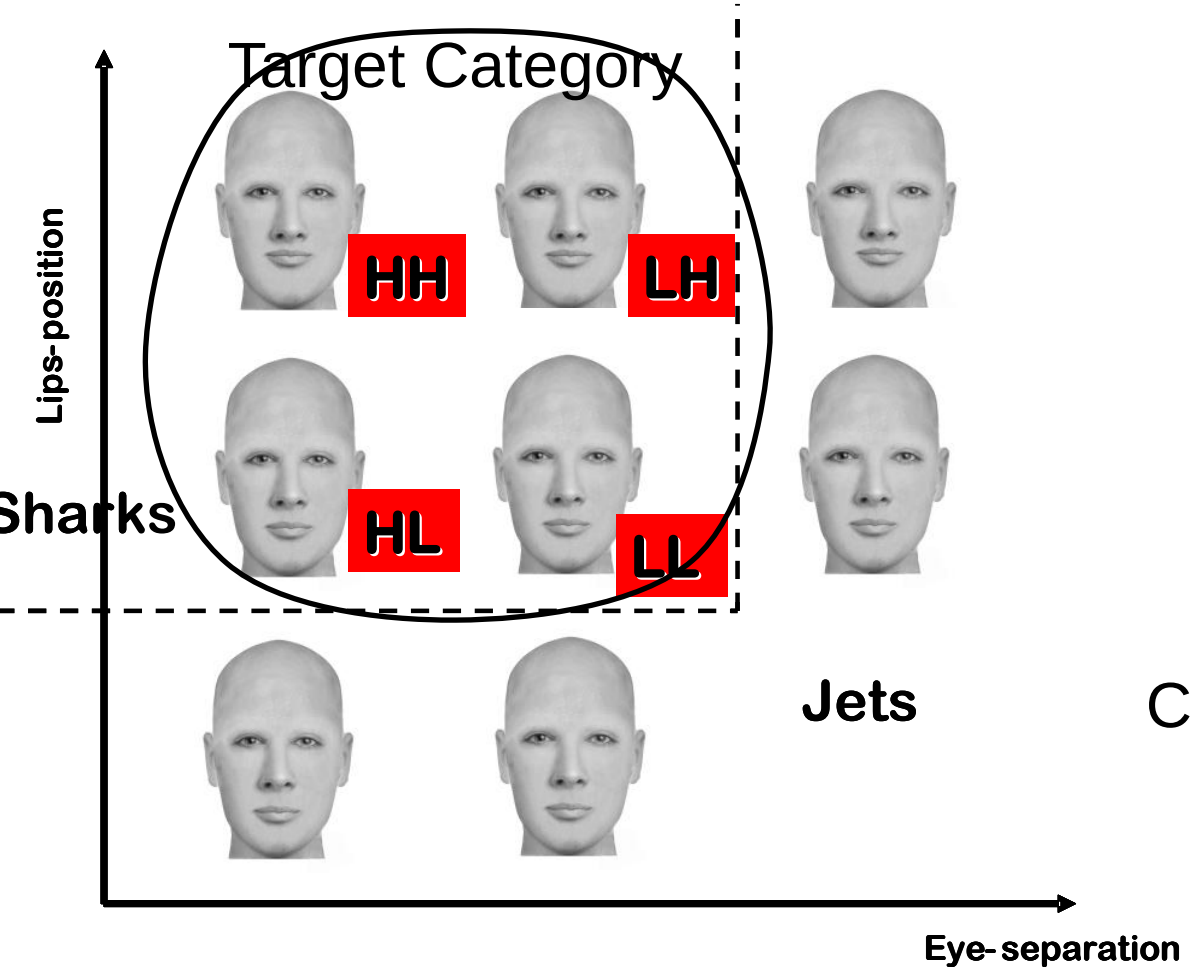
Conclusion

- How strong is the conclusion that a Snake Wiggle signature indicates strong holism?

- Can we make it stronger?

Converging evidence

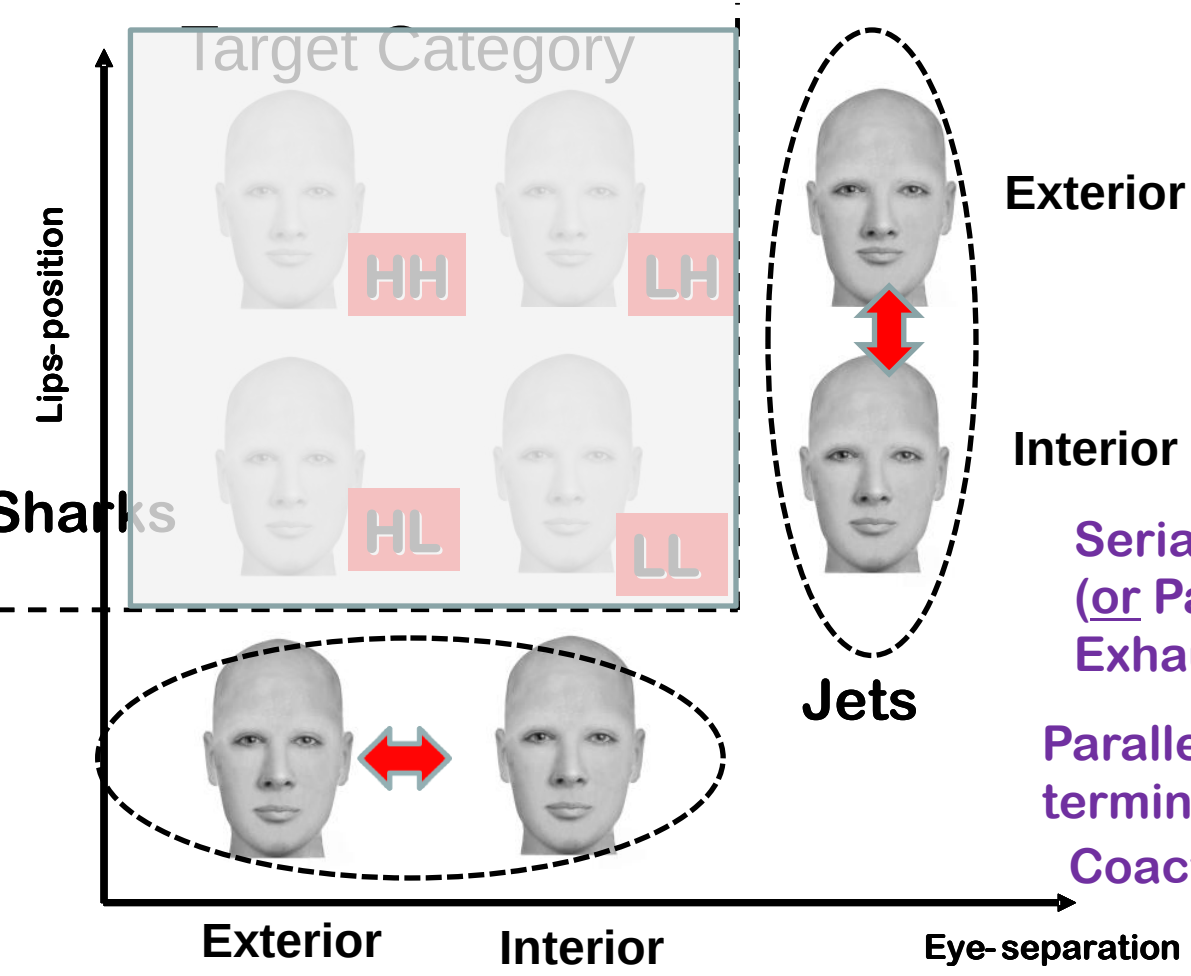
Conjunctive-rule classification "AND"



(Fific & Townsend, 2010)

Converging evidence

Conjunctive-rule classification "AND"



Contrast Category

Exterior

Interior

Serial model (or Parallel Exhaustive) RT[Ext]<RT[Int]

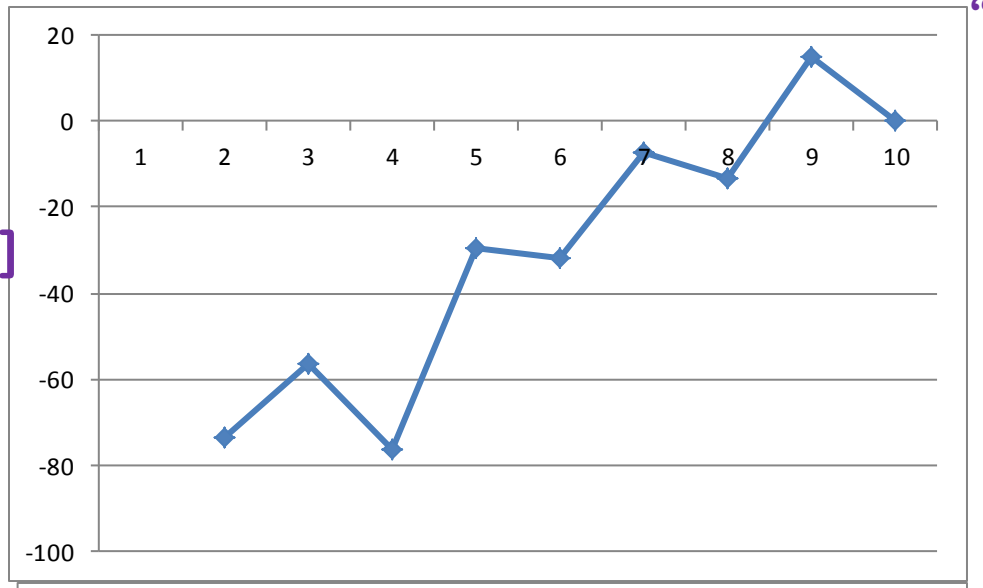
Parallel self-terminating model RT[Ext]=RT[Int]

Coactive RT[Ext]>RT[Int]

(Fific, Little & Nosofsky, 2010; Psych Review)

Converging evidence

RT[Ext]-RT[Int]

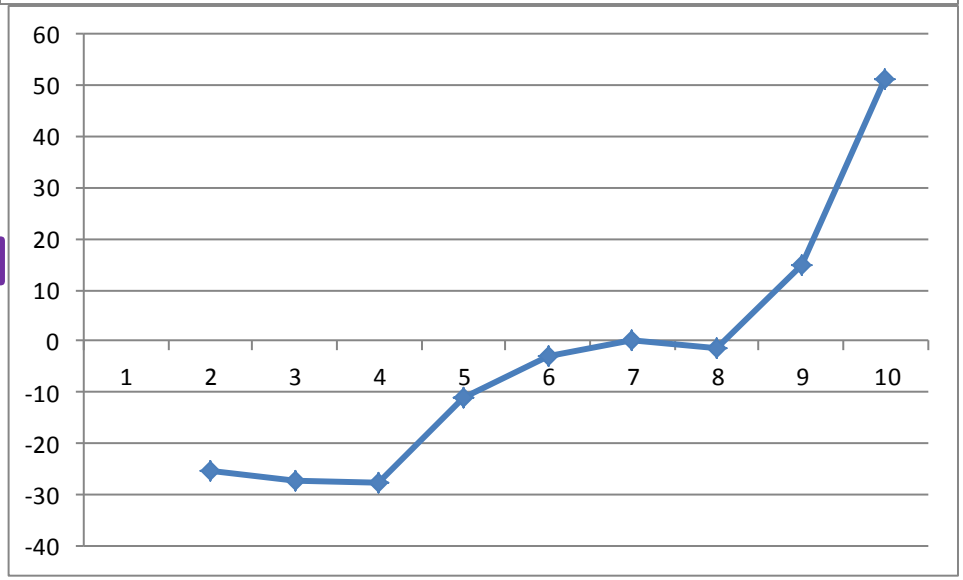


"Coactive"

Snake Wiggle

"Serial or Parallel Exhaustive"

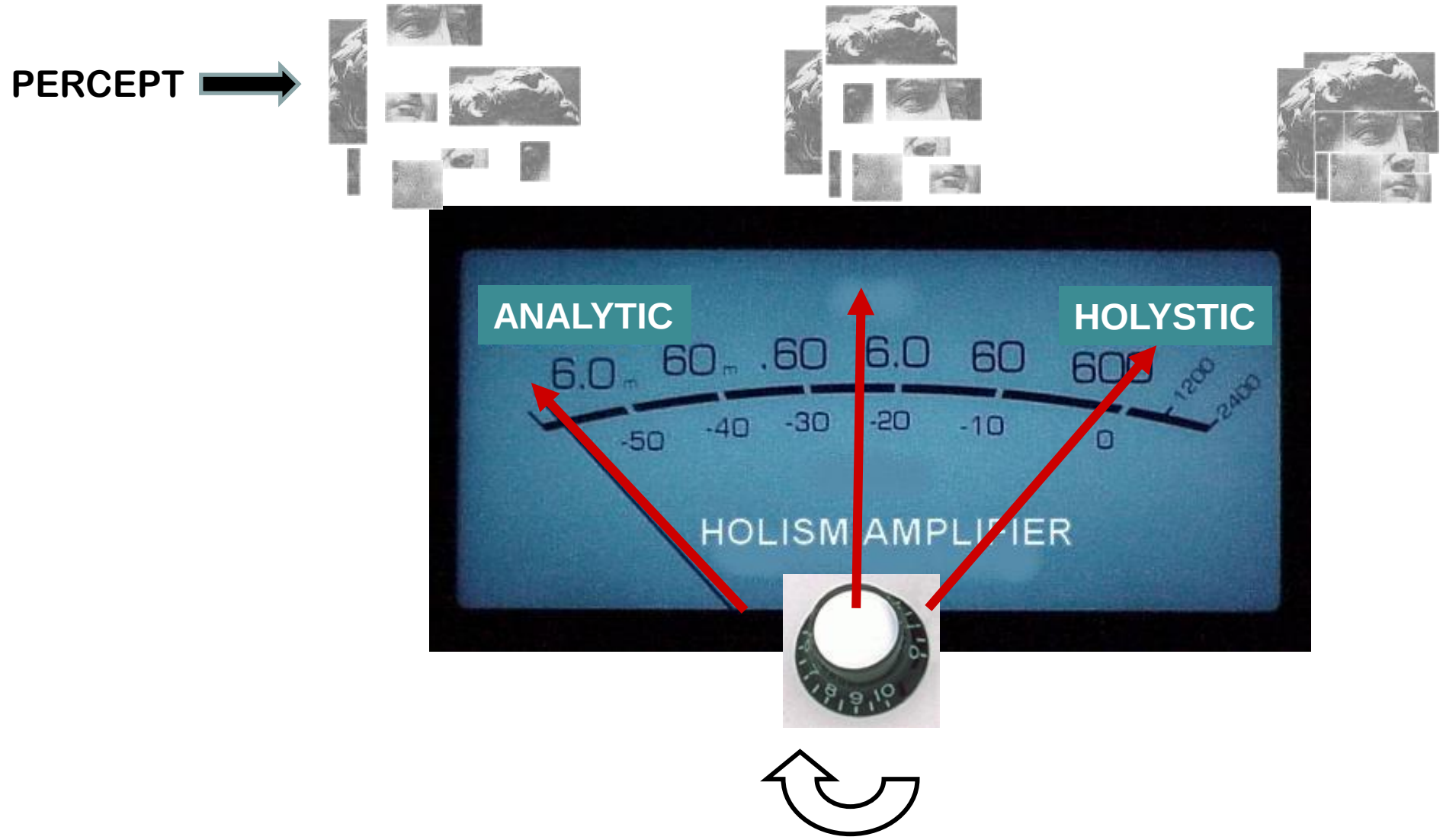
RT[Ext]-RT[Int]



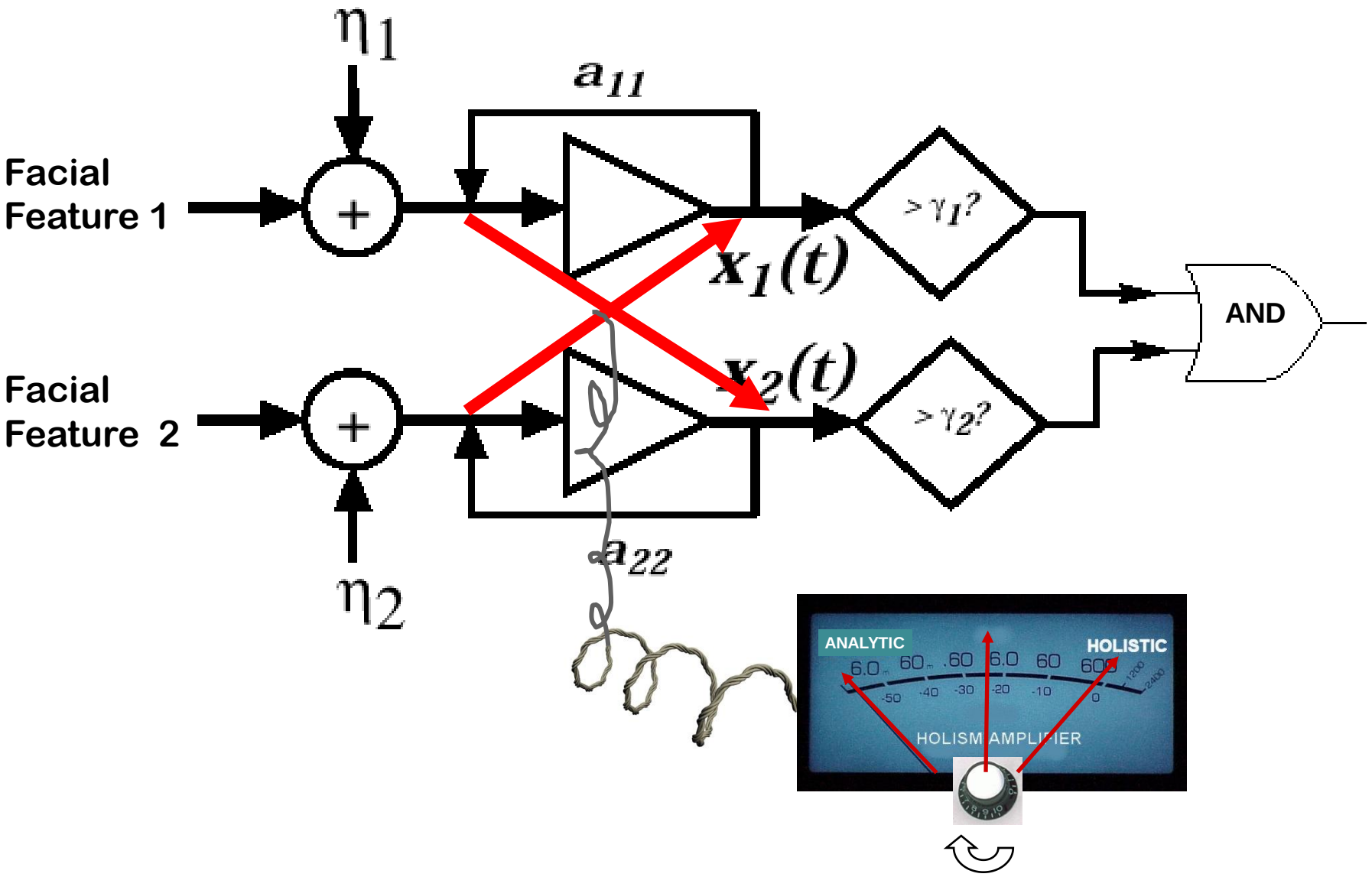
"Coactive"

"Serial or Parallel Exhaustive"

Cognitive control of Analytic/Holistic Perception?



Plausible Model



The snake wiggle

- **The snake wiggle is a dynamic signature of holistic perception**
- **The converging evidence from other sources: superiority, robustness and introspection.**
- **The entire stimulus set wiggles.**
- **Plausible trusted models for dynamical evidence accumulation.** (Houpt & Townsend, 2011; Fific & Townsend, 2010; Eidels, Houpt, Altieri & Townsend, 2011)
- **Let's wiggle.**