



The Human Brain Project,
a high-impact playground for quantitative sciences
Roma, January 25 2016

Rappresentazioni di gerarchie nel cervello dei primati

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La Sapienza



U.S. OPEN - 2015 - semifinale

BREAKING NEWS

SERENA WILLIAMS UPSET AT U.S. OPEN

CNN

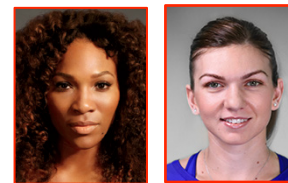
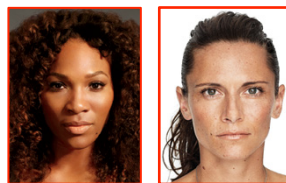
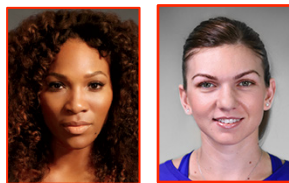
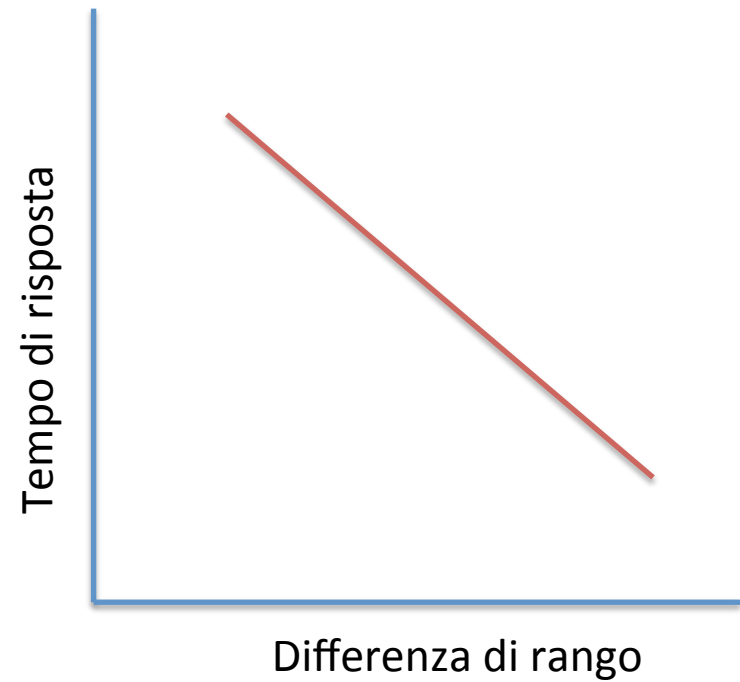
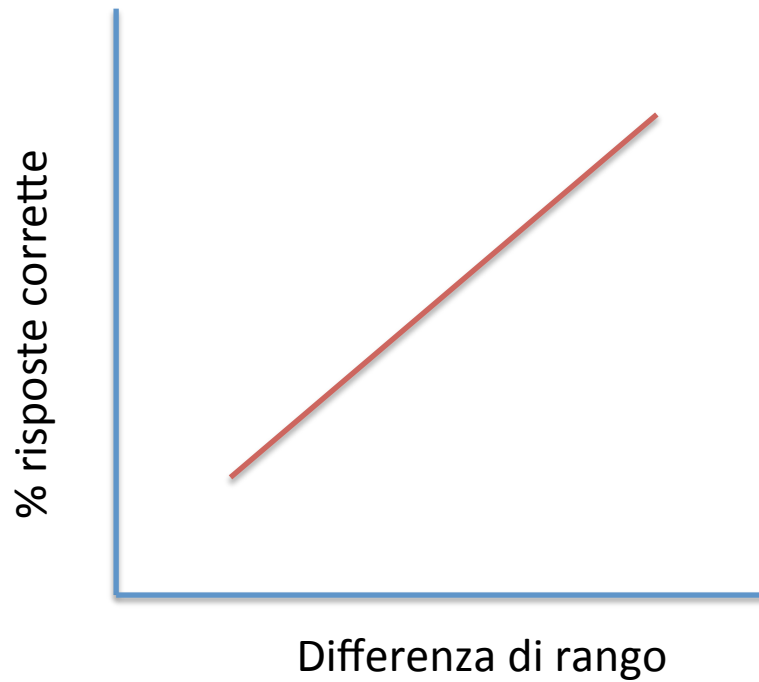
NAS ▲ 13.79

NEWSROOM



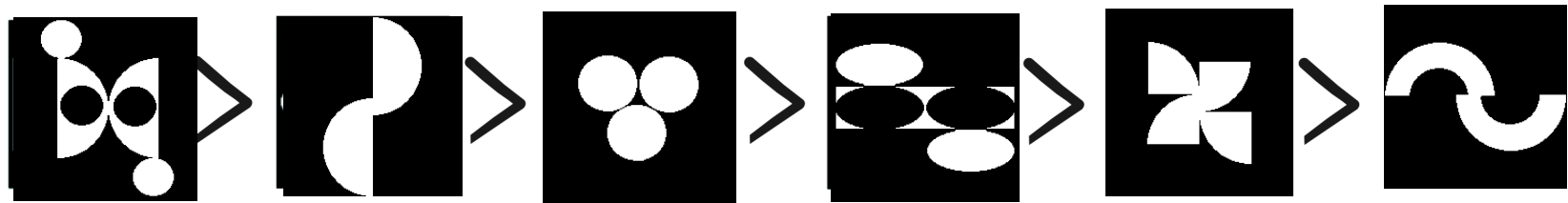
CORRELATI COMPORTAMENTALI

(Effetto della distanza)





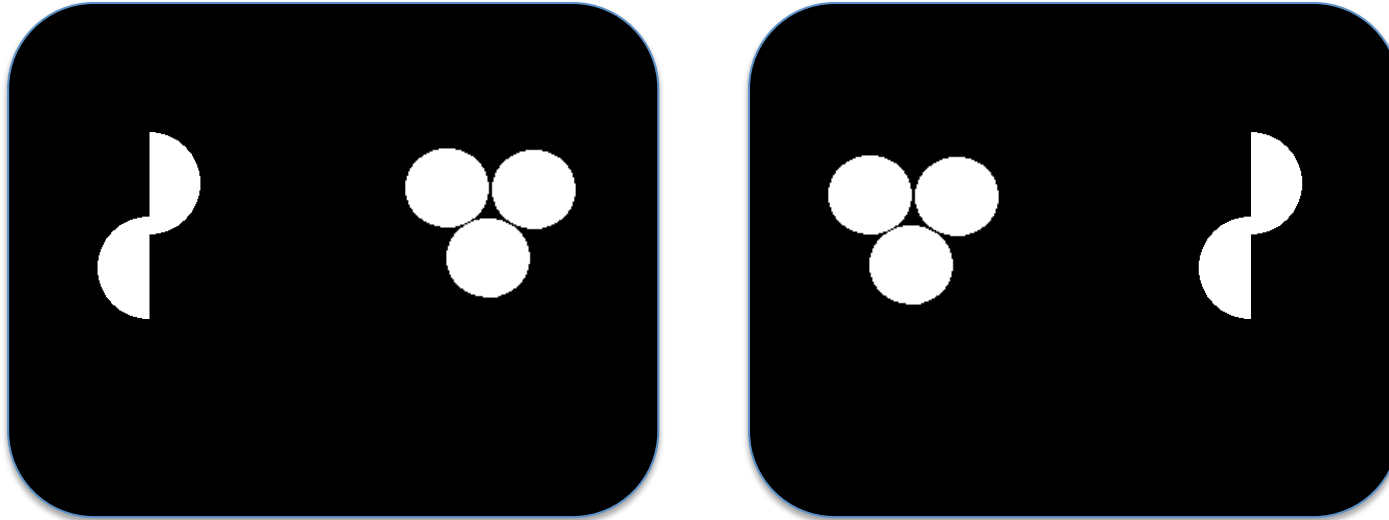
PROCEDURA DI APPRENDIMENTO DELLA SERIE



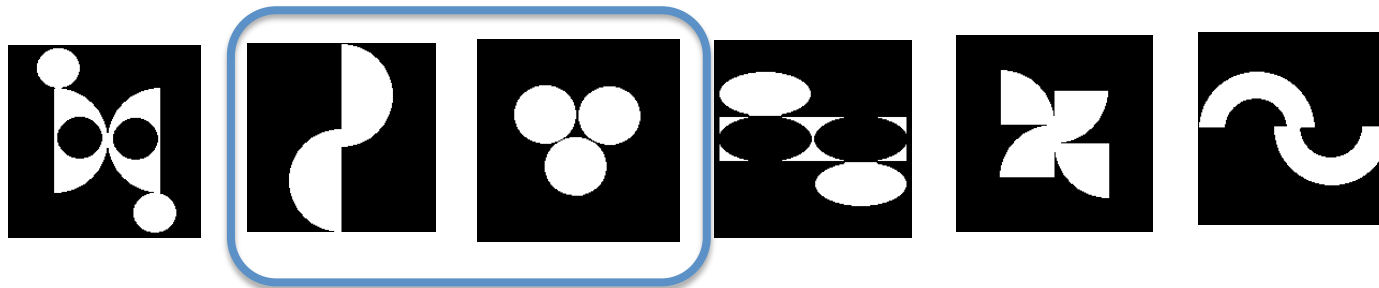
Ogni giorno viene presentata una nuova serie
e lo stesso simbolo non occupa la stessa posizione
in giorni consecutivi

APPRENDIMENTO PER PROVE ED ERRORI

La serie non viene mai presentata all'animale

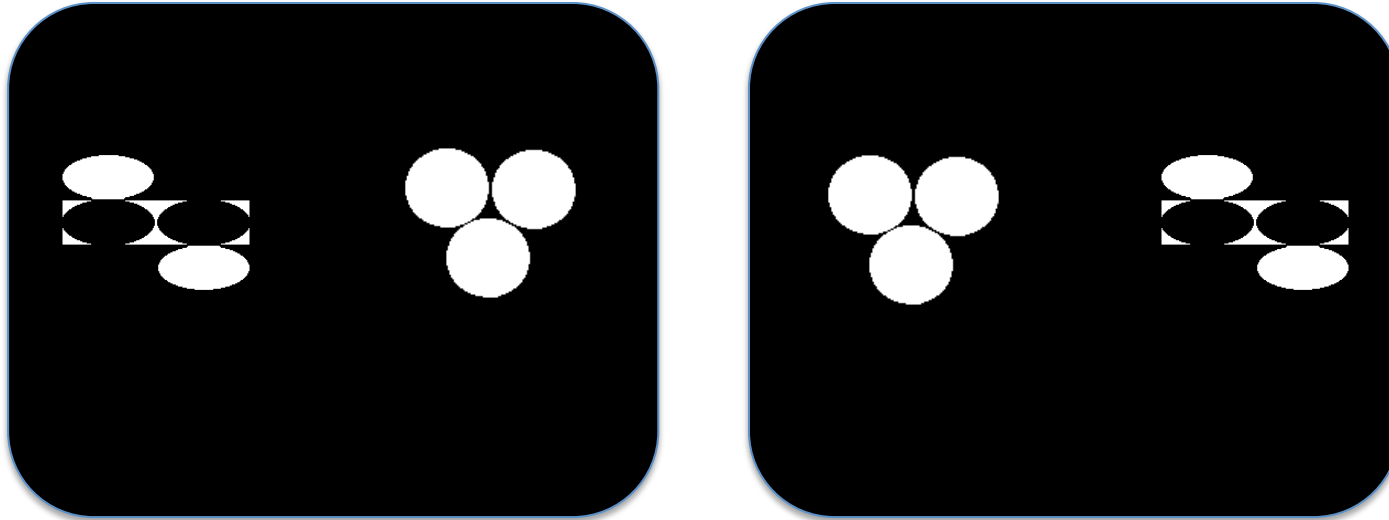


Alla scimmia vengono solo presentate coppie di stimoli adiacenti

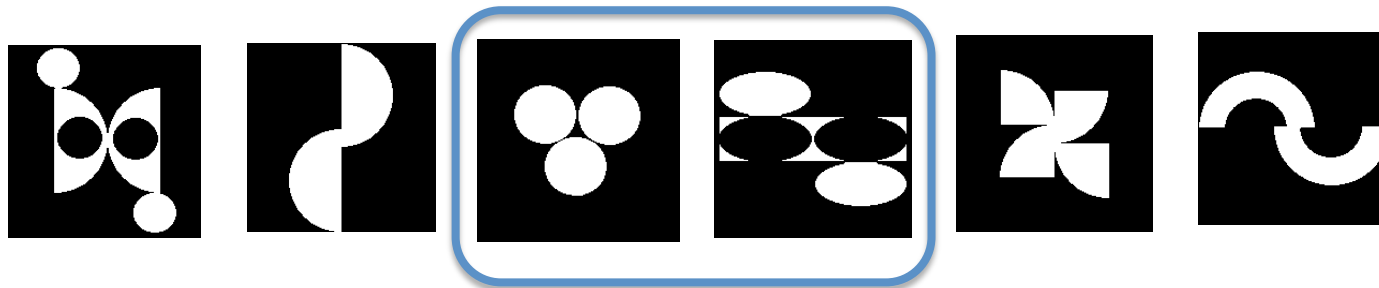


APPRENDIMENTO PER PROVE ED ERRORI

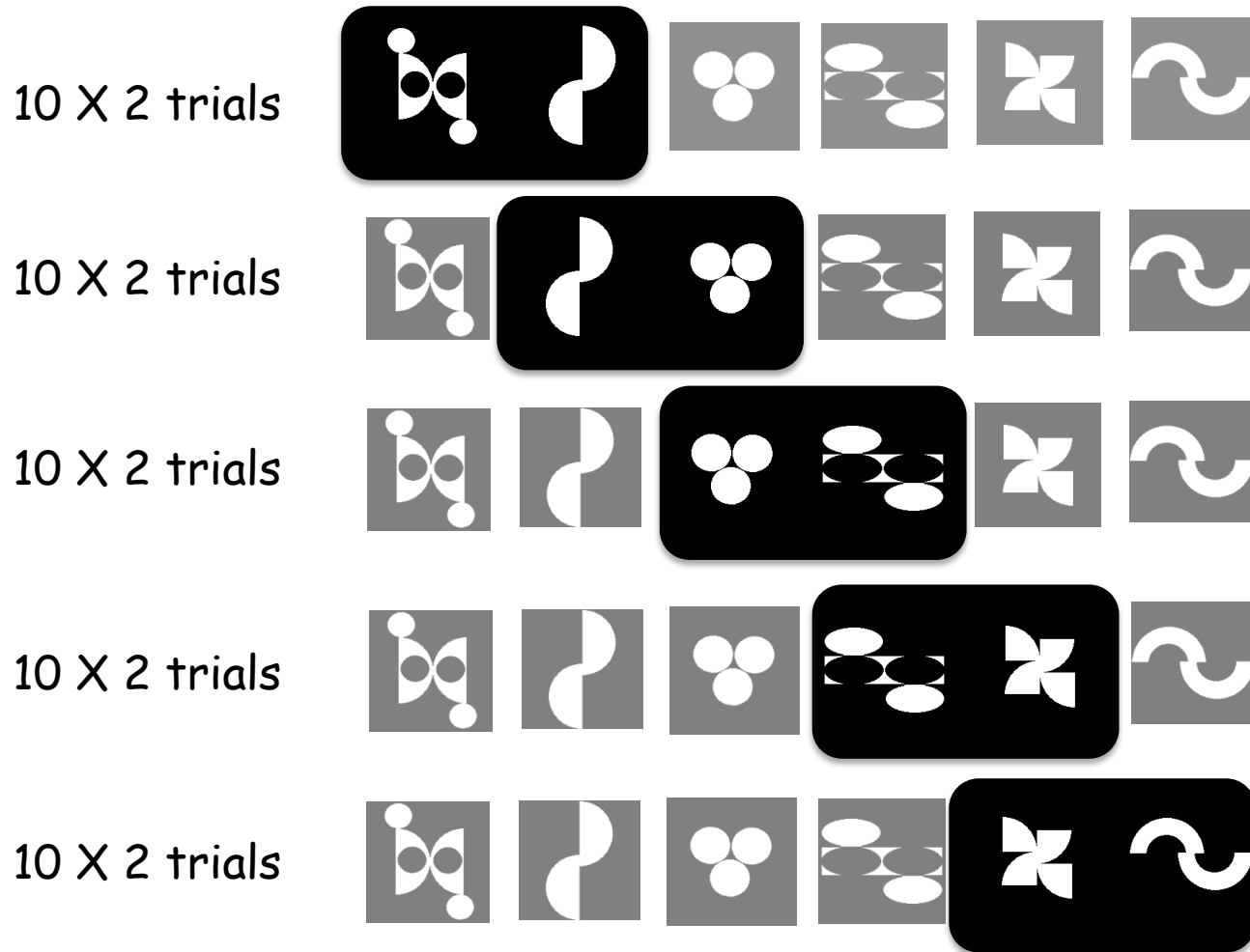
La serie non viene mai presentata all'animale



Alla scimmia vengono solo presentate coppie di stimoli adiacenti



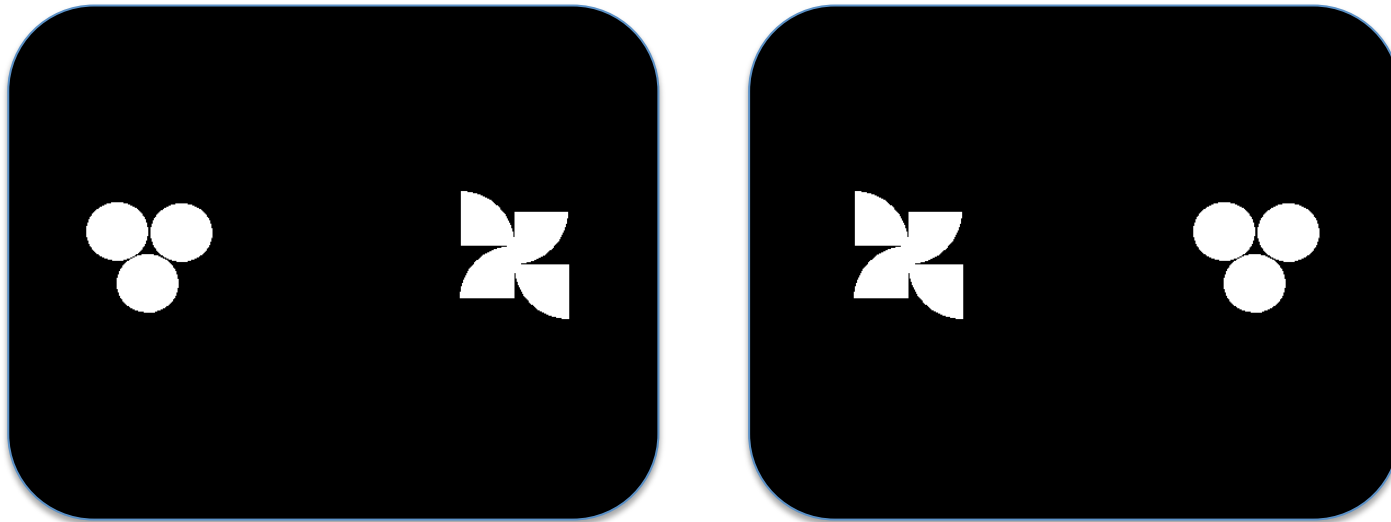
APPRENDIMENTO (dettagli)



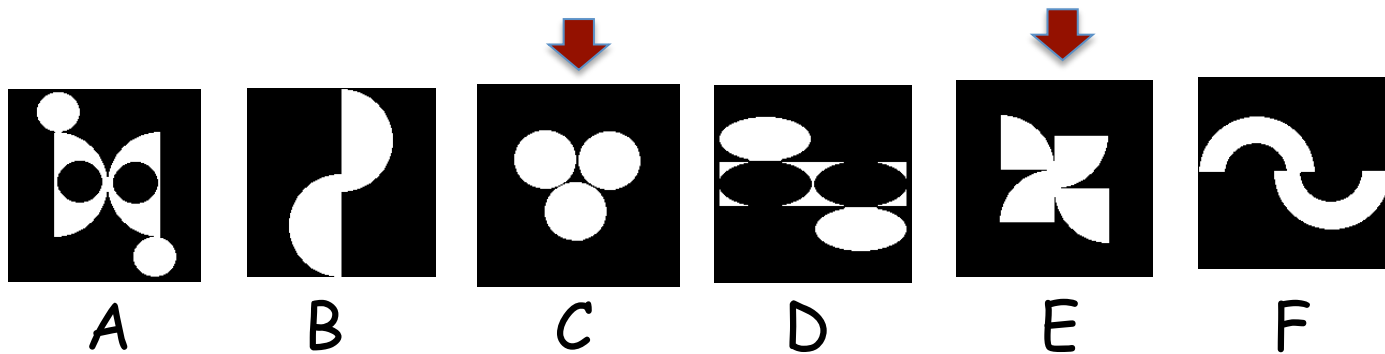
Parte 1: block design.

Parte 2: intermingled design (100 trials ; threshold 66% correct)

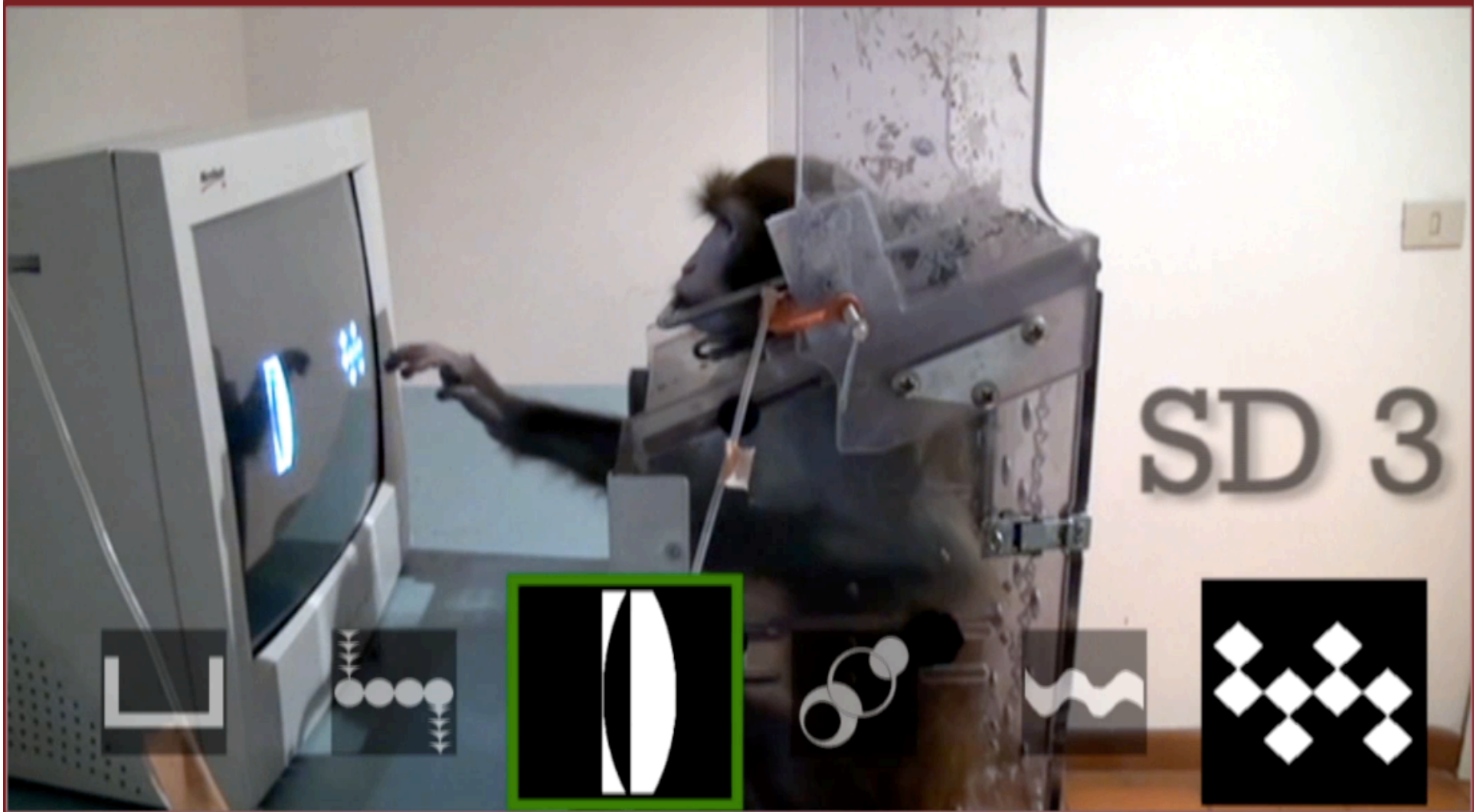
TEST: usare le premesse per trarre conclusioni



se $C > D$ e $D > E$ allora $C > E$

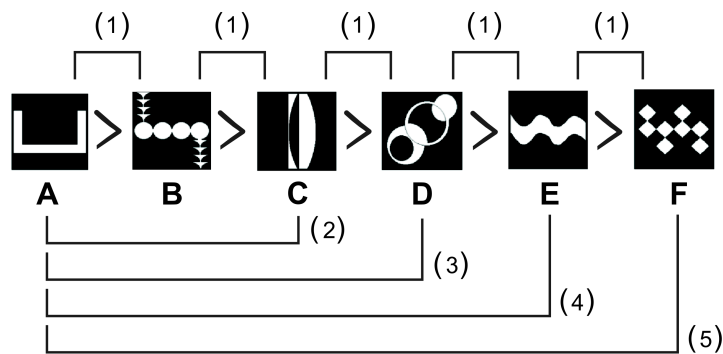


Esempio di Comportamento

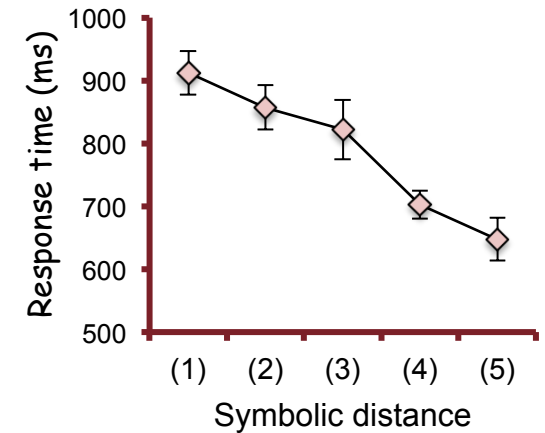
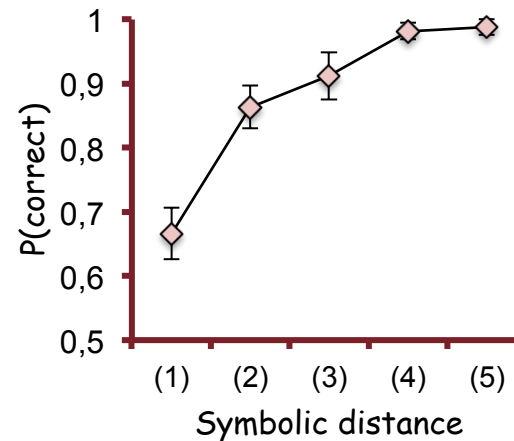


EFFETTO DELLA DISTANZA (simbolica)

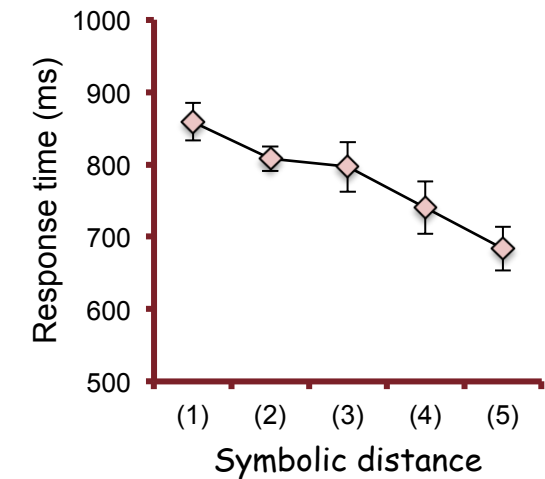
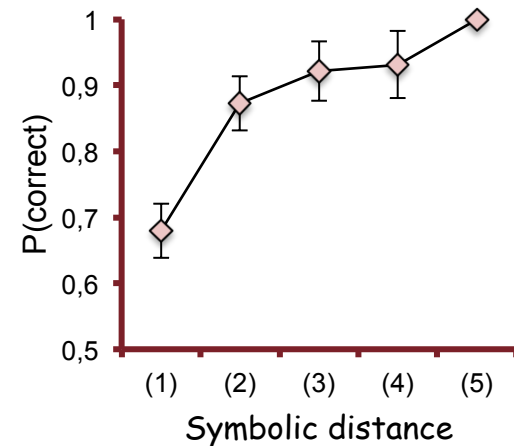
Evidenza comportamentale dell'organizzazione spaziale delle premesse



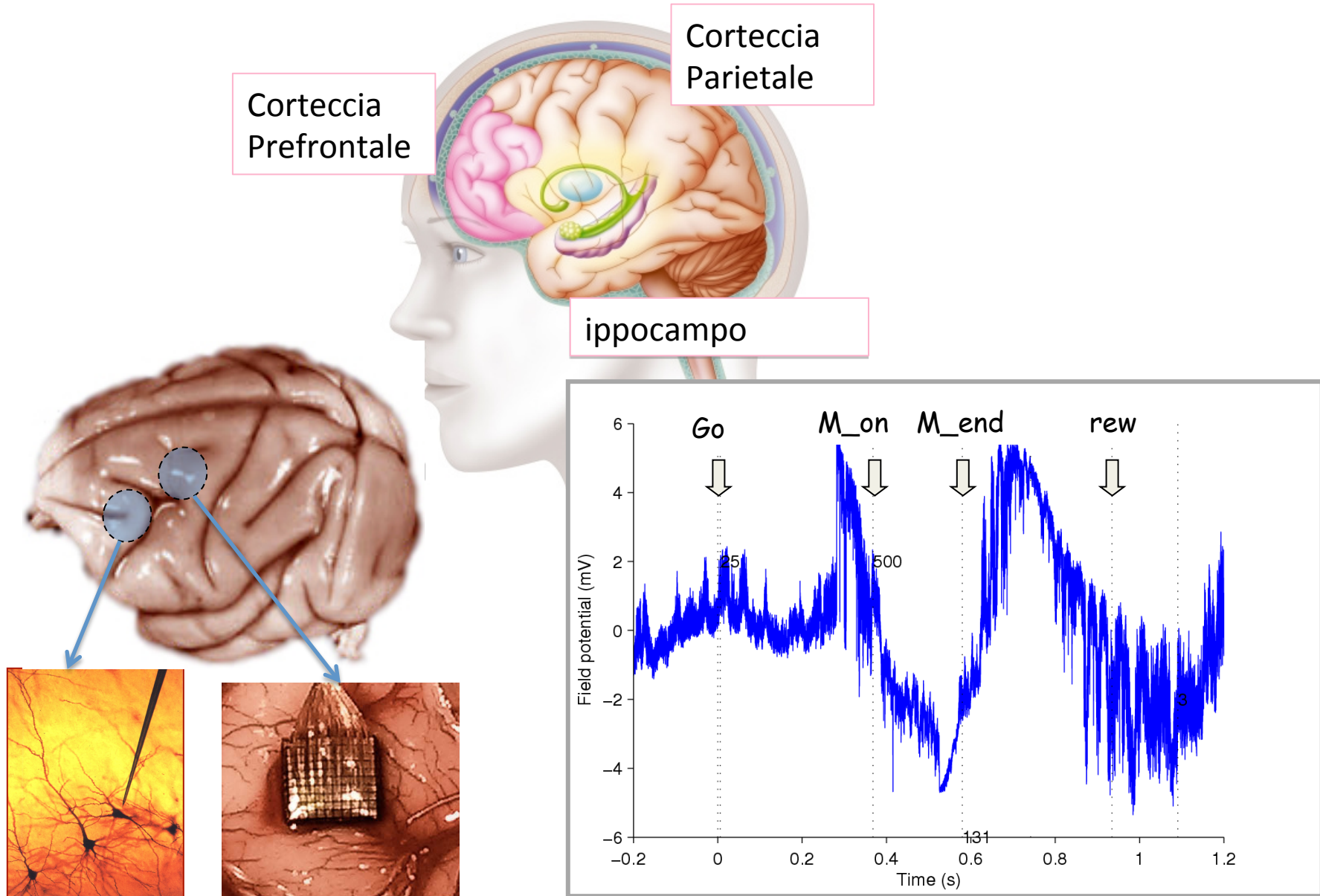
Monkey B



Monkey C

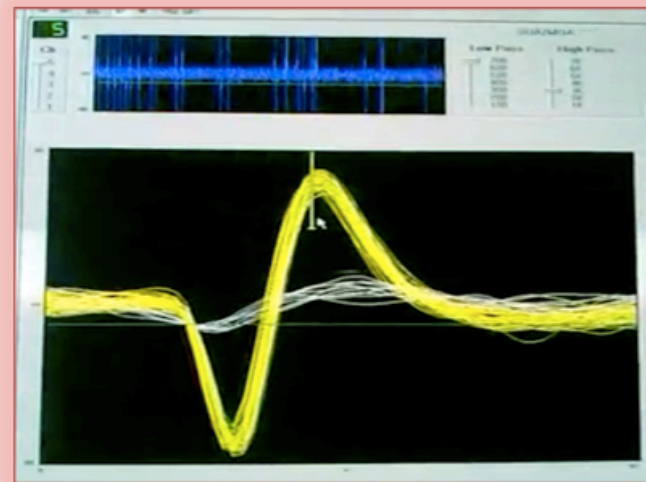
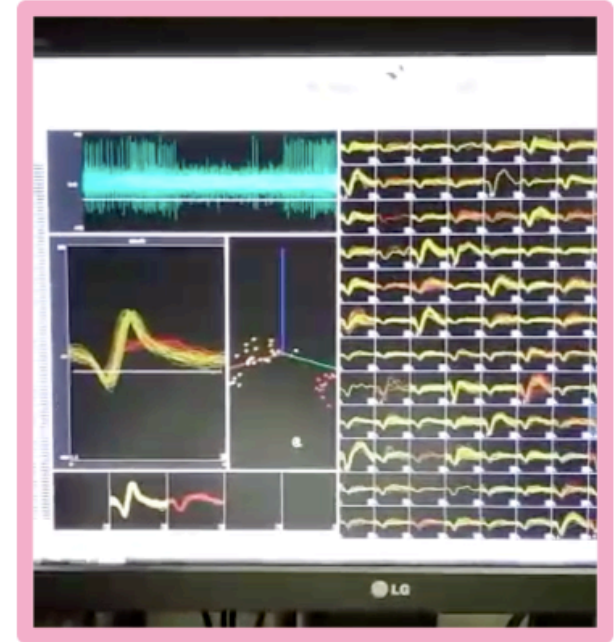
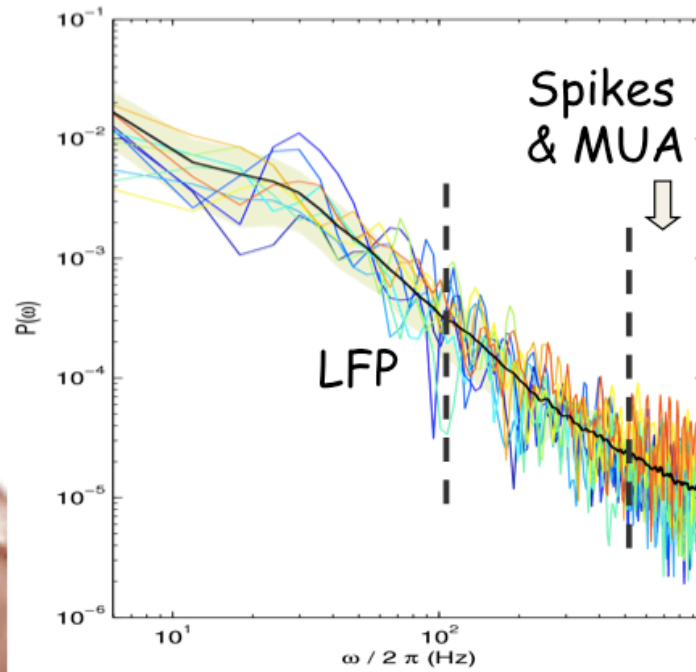
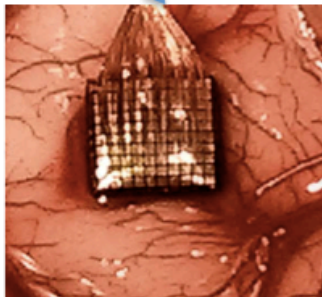
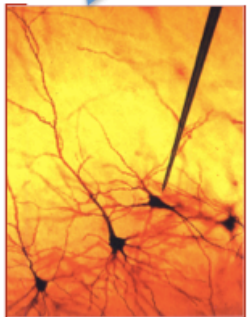
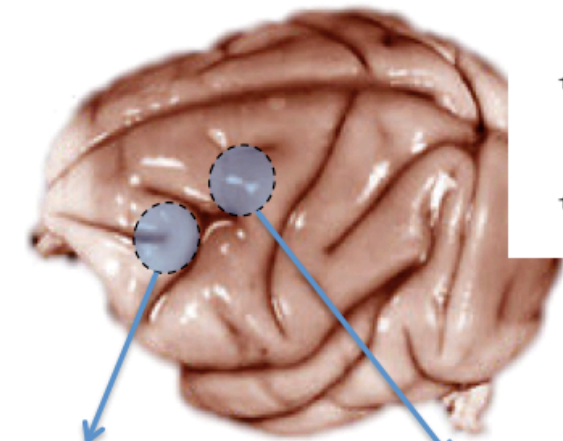


CORRELATI neur(on)ali



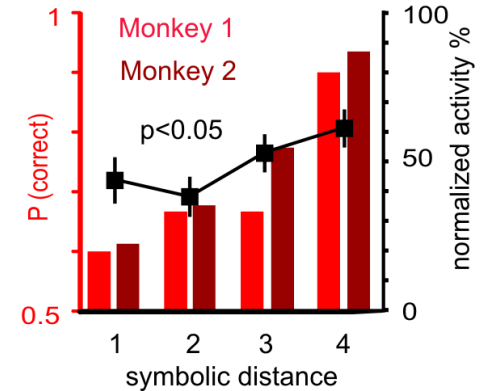
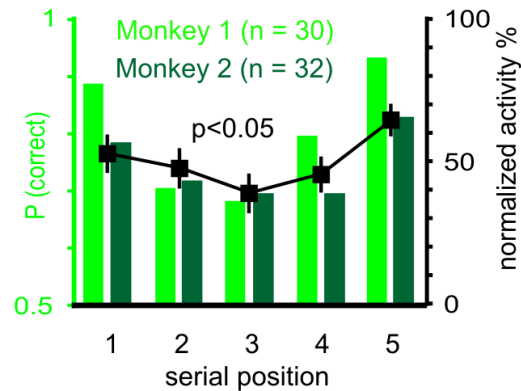
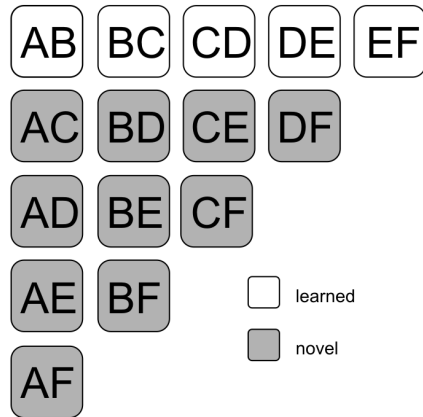
- Signal sampling rate 24kHz

CORRELATI neur(on)ali

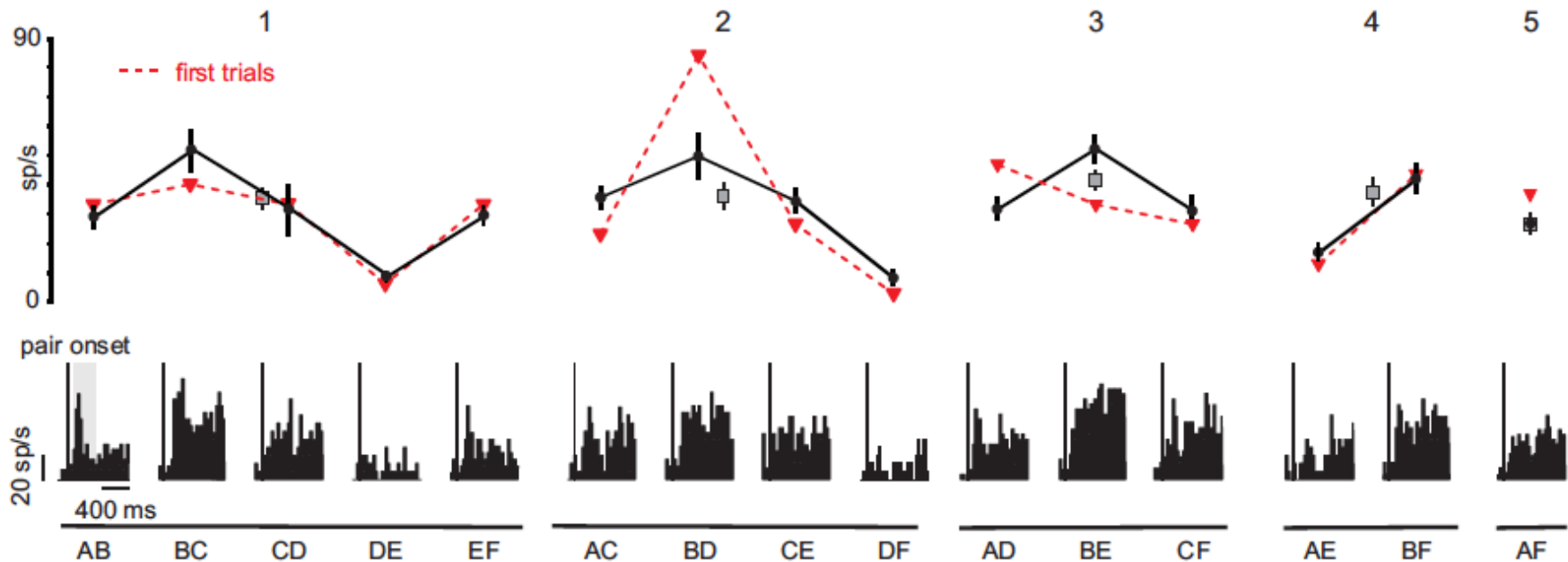


Modulazione neuronale per il task

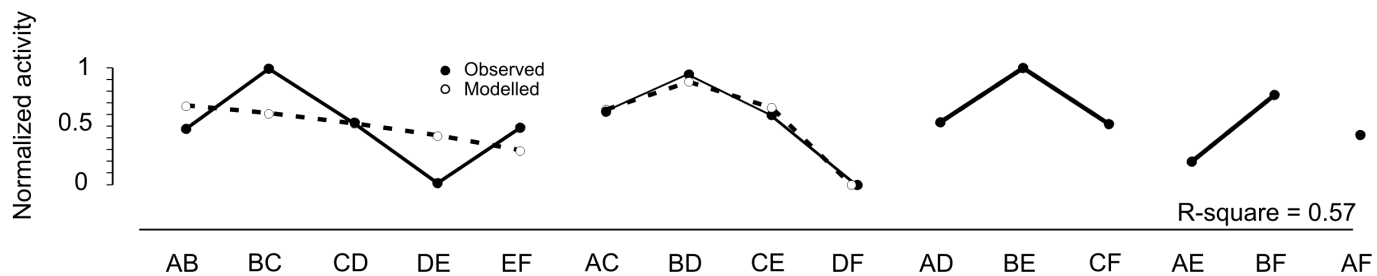
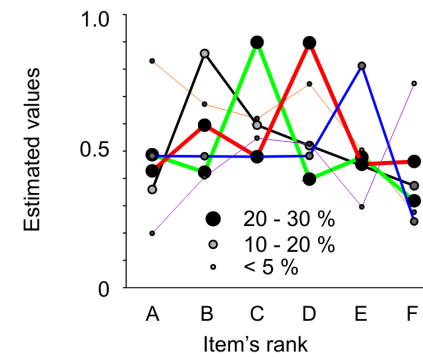
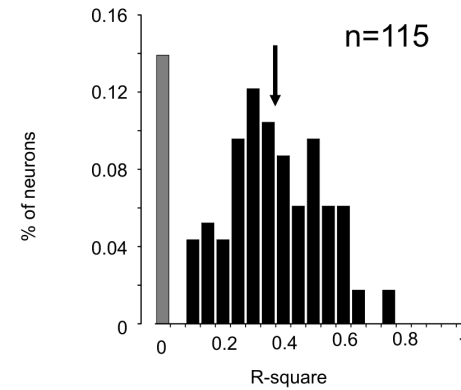
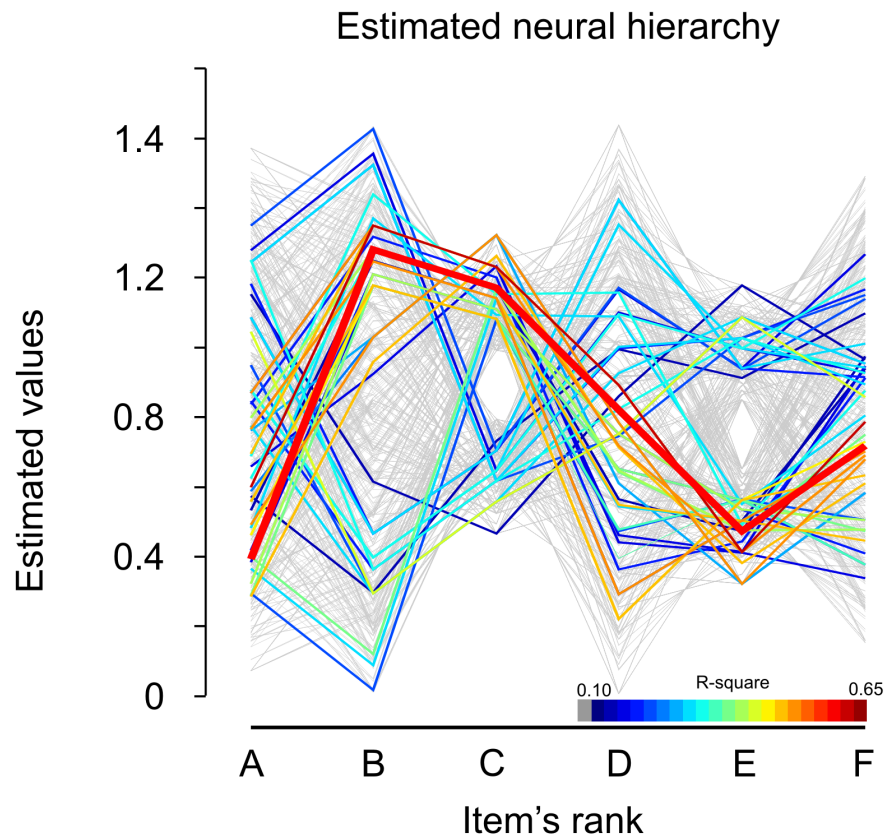
Modulazione al primo trial di test



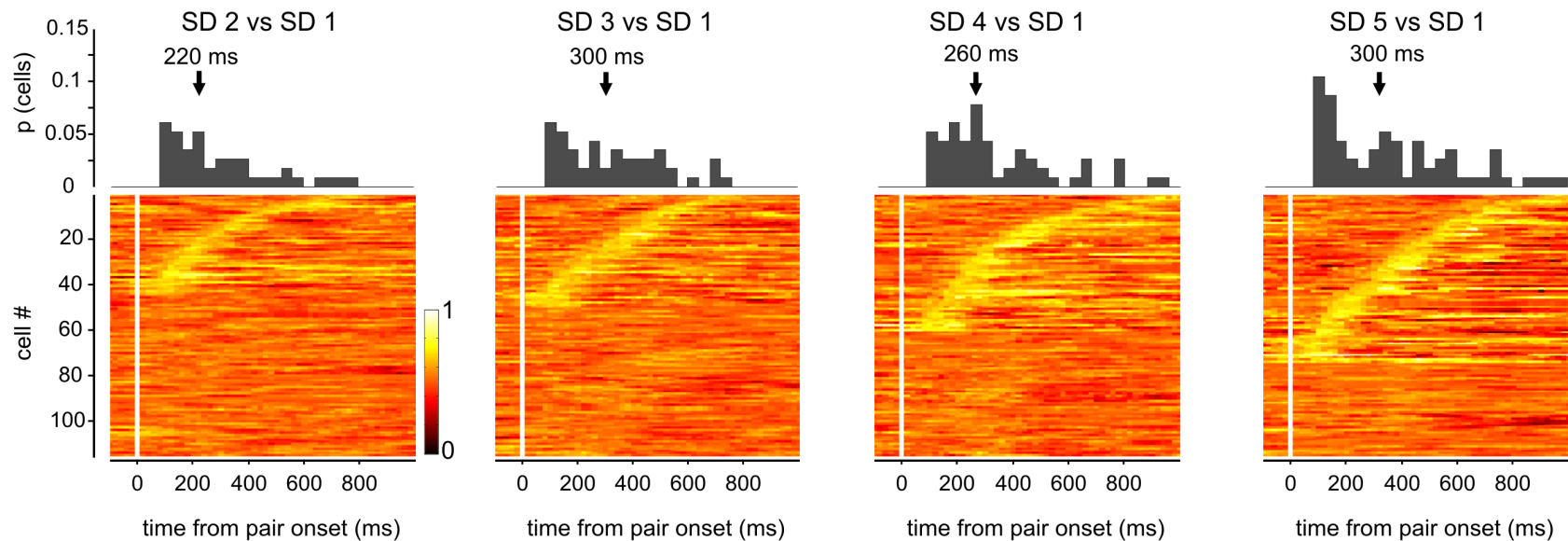
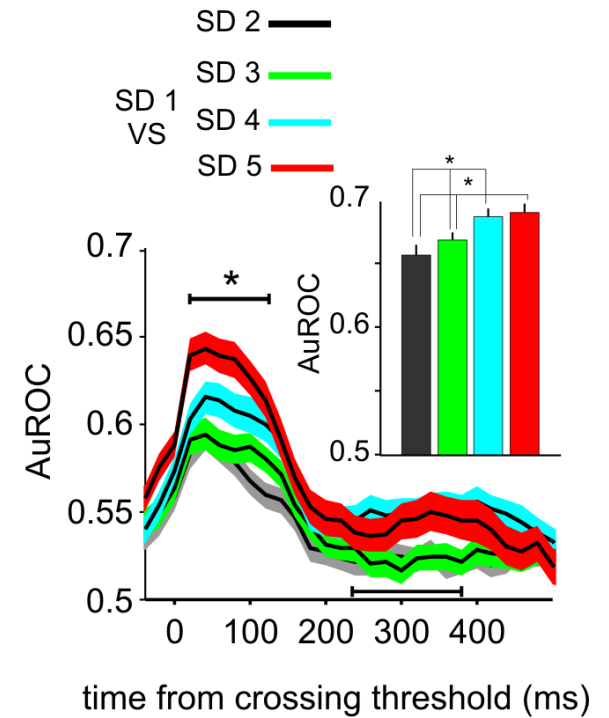
Symbolic distance



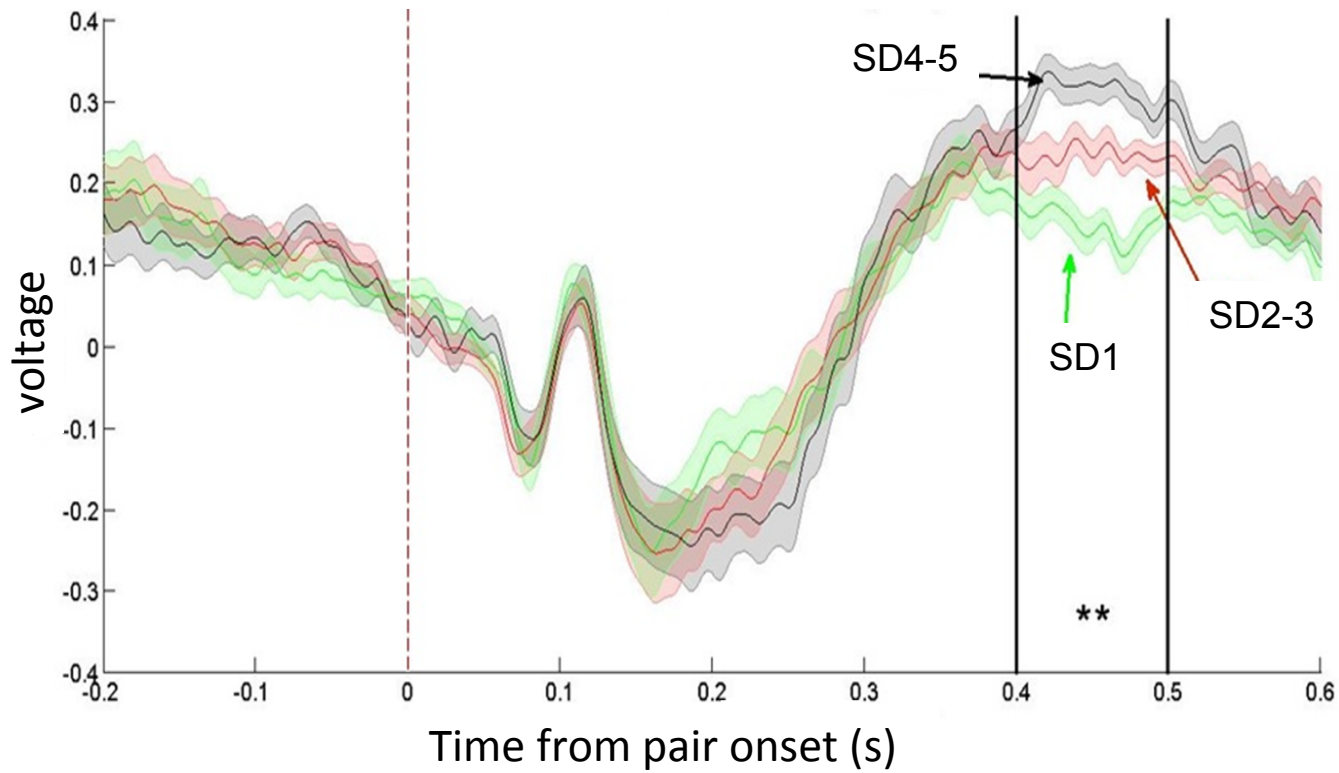
Stima neurale della gerarchia



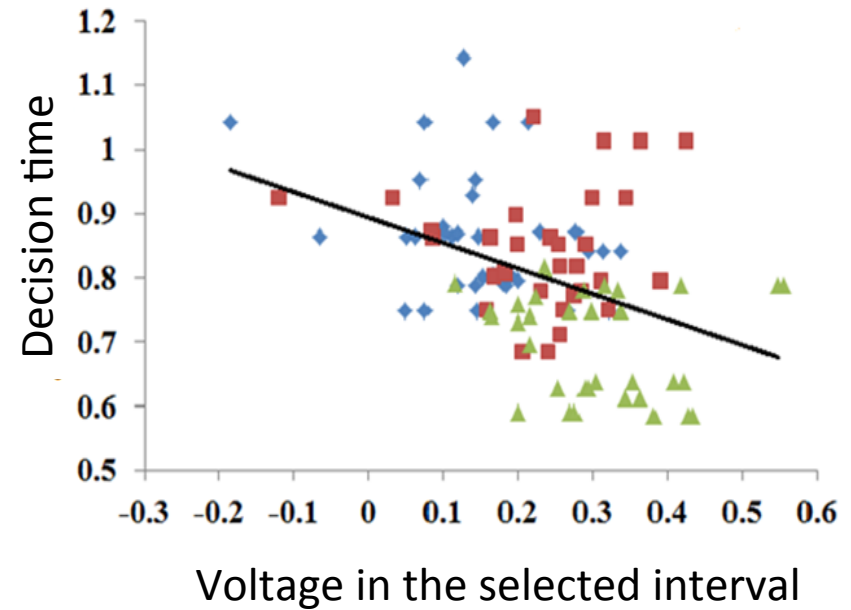
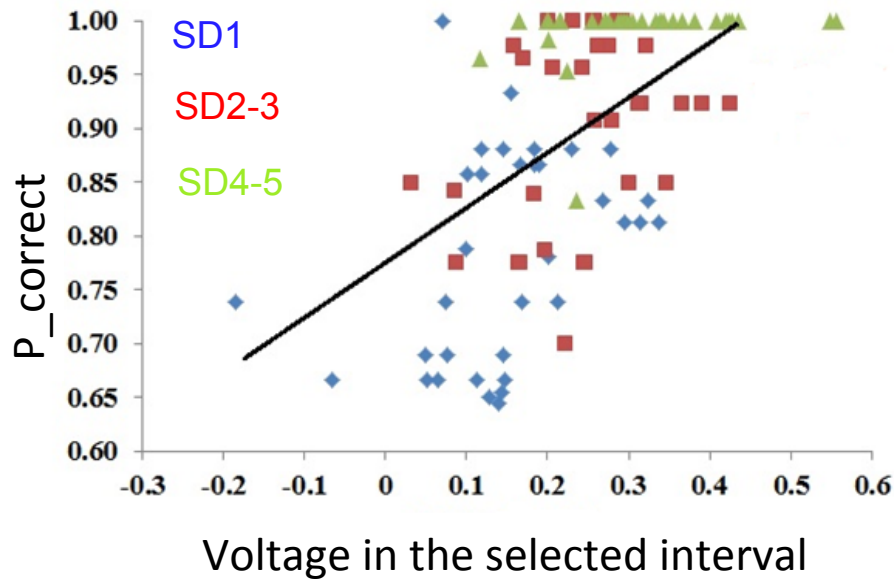
I neuroni in Prefrontale discriminano meglio per simboli a distanza maggiore



Modulazione LFP (passa basso del segnale raw)



Il segnale LFP correla molto bene con la performance



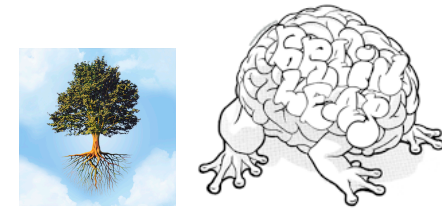
Conclusioni

Le nuove informazioni (di una serie),
quando organizzate secondo il loro rango
sono rappresentate
nella modulazione delle corteccia prefrontale

L'attività neuronale è in grado di spiegare
i correlati comportamentali osservati



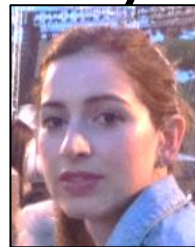
Grazie a...



EC-FP7 BrainLeap Project

Margherita Giamundo

Emiliano Brunamonti



Pierpaolo Pani



Fabio Di Bello



Valentina Mione



motor control and cognition

Per maggiori dettagli: Brunamonti et al. J Neuroscience 2016
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PS: siamo aperti a collaborazioni/proposte di tesi/dottorati