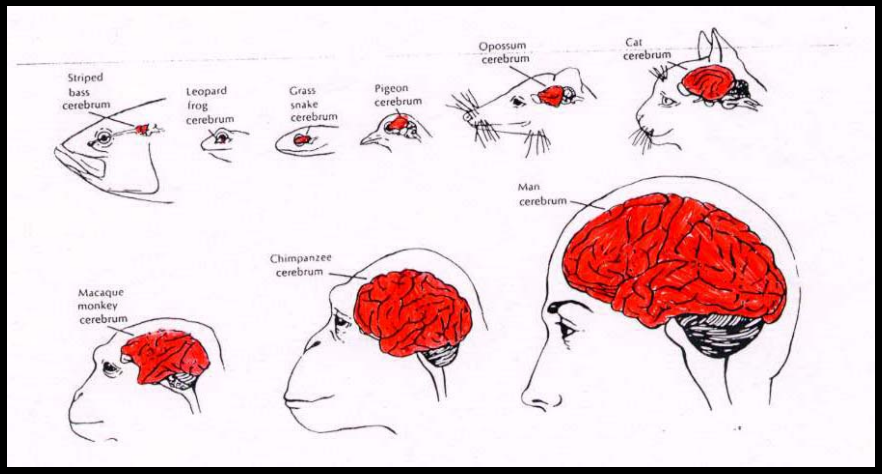
L’evoluzione della comunicazione umana

NICO

Ferdinando Rossi
15 Ottobre 2010



che cosa ha determinato l'espansione della corteccia cerebrale?

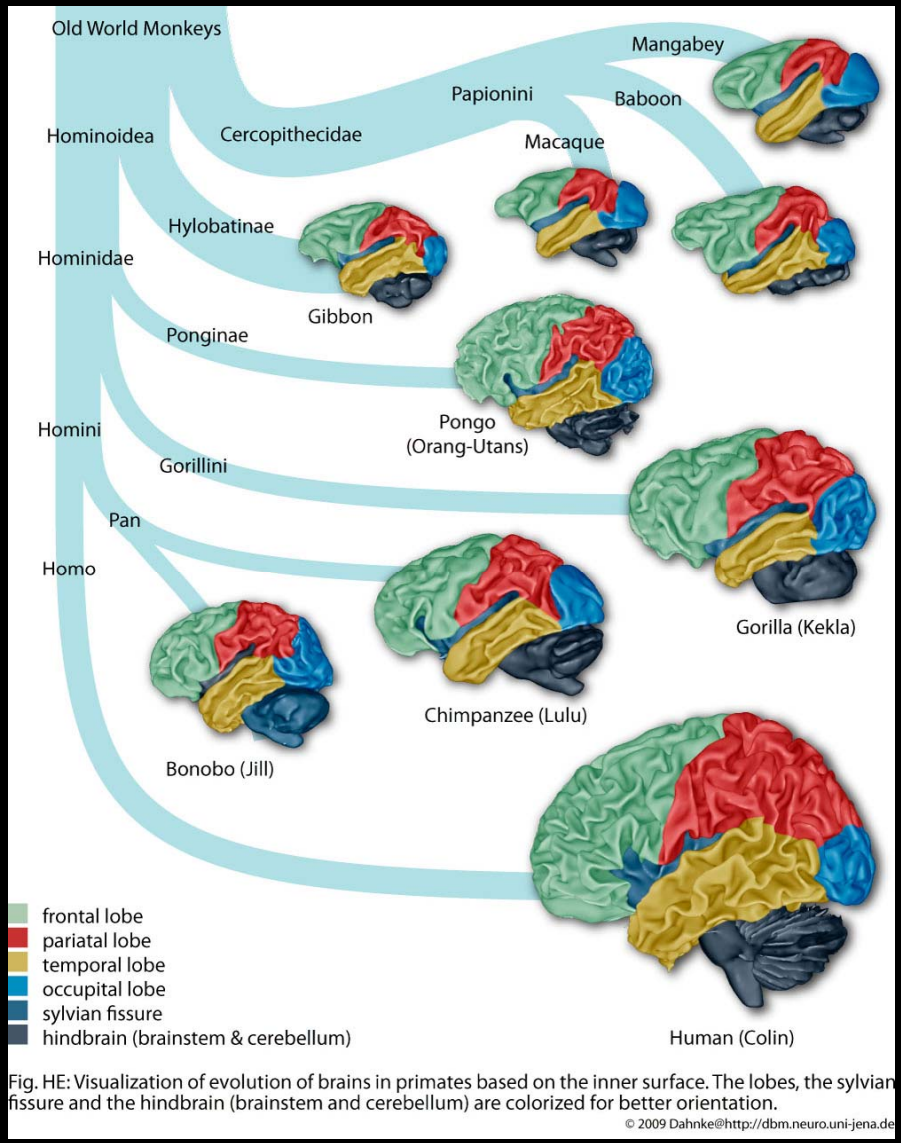


Fig. HE: Visualization of evolution of brains in primates based on the inner surface. The lobes, the sylvian fissure and the hindbrain (brainstem and cerebellum) are colorized for better orientation.

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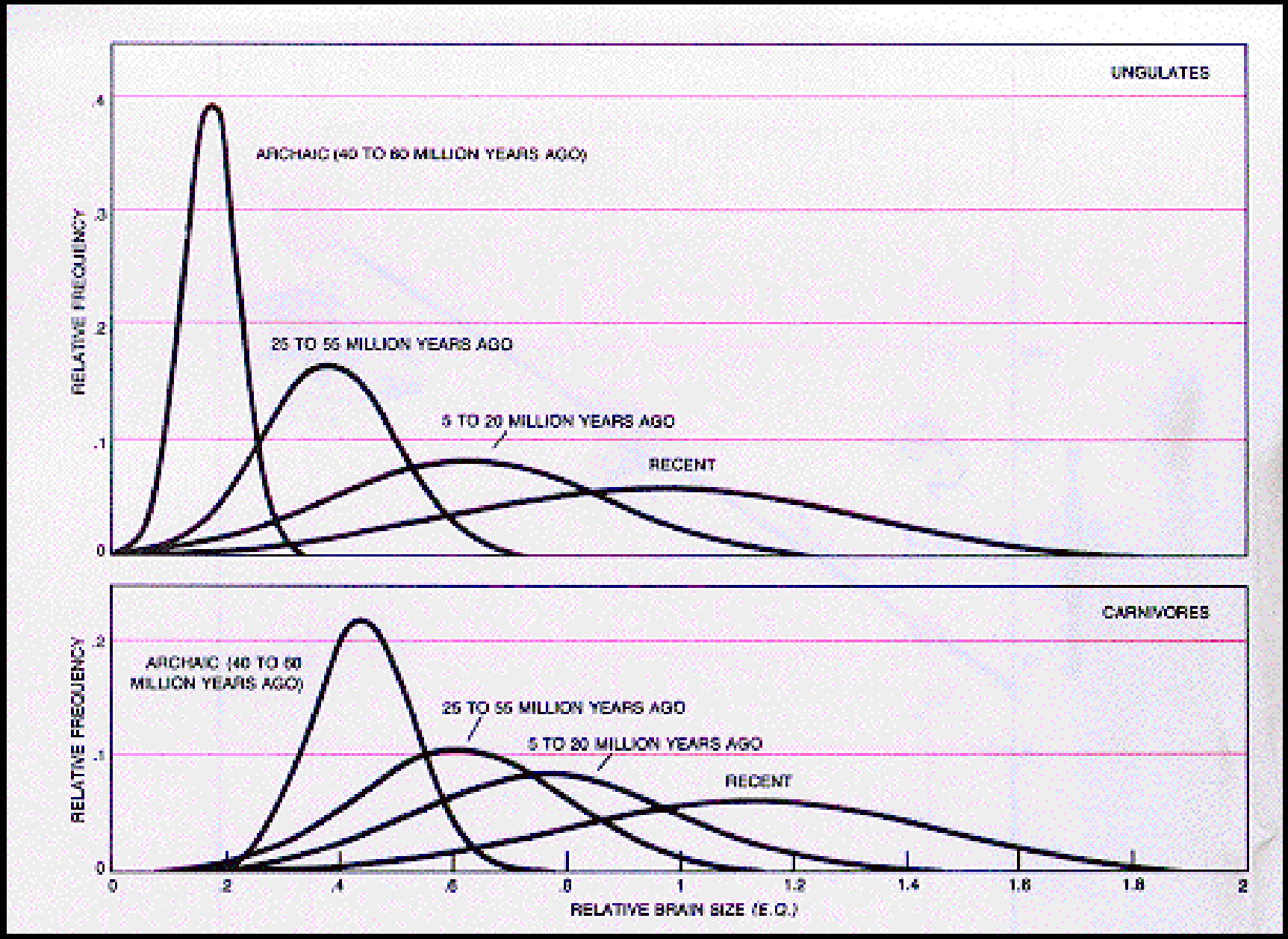
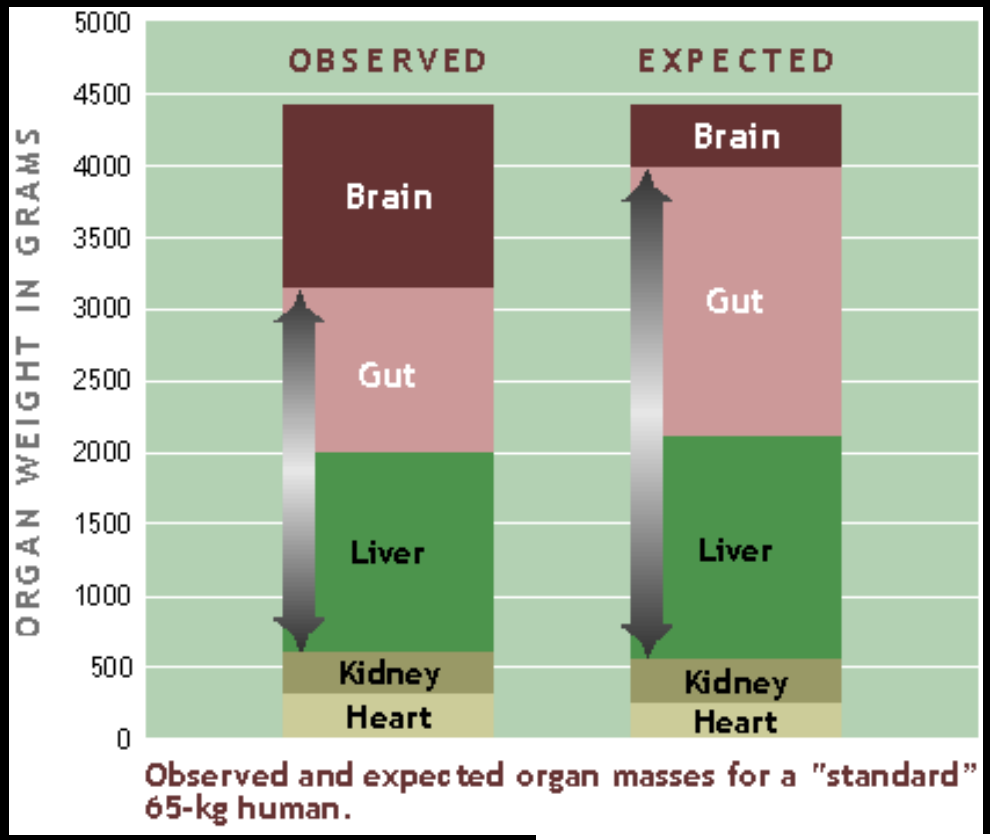
Rispetto agli altri primati, la nostra specie ha

- **il cervello più grande (la neocorteccia più estesa)**
- **un periodo di sviluppo più prolungato**
- **Il cervello più immaturo alla nascita**

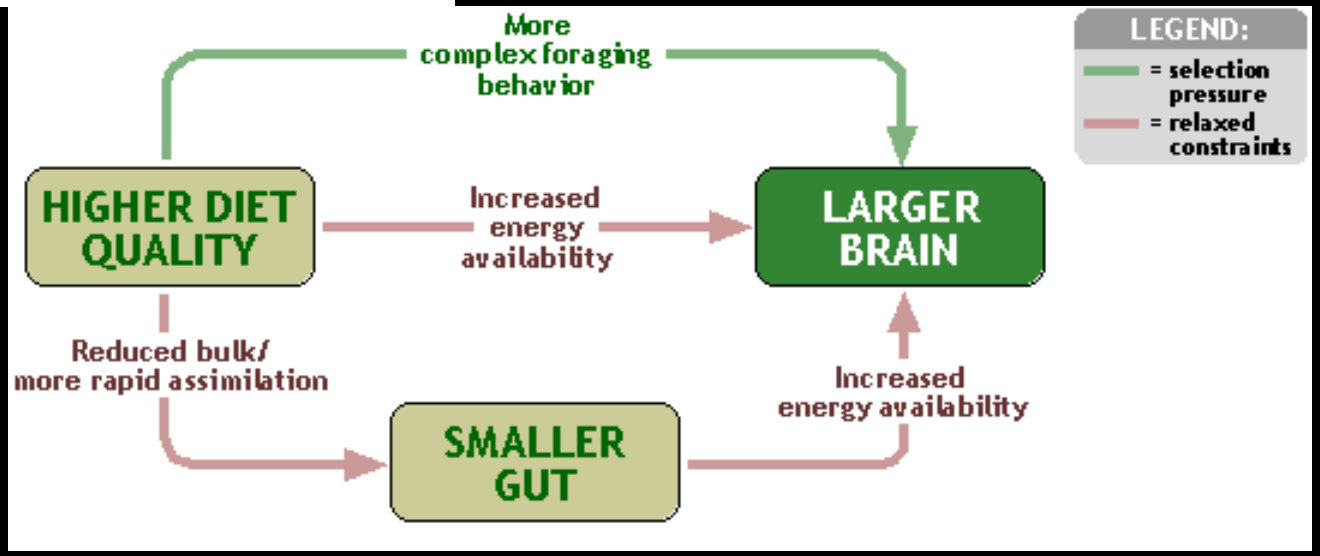
Che relazione c'è fra questi fatti?
Qual è la spinta evoluzionistica che ha indotto la crescita del cervello?


UNGULATES
ARCHAIC (40 TO 60 MILLION YEARS AGO)
25 TO 55 MILLION YEARS AGO
5 TO 20 MILLION YEARS AGO
RECENT
RELATIVE FREQUENCY
.4
.3
.2
.1
0
CARNIVORES
ARCHAIC (40 TO 60 MILLION YEARS AGO)
25 TO 55 MILLION YEARS AGO
5 TO 20 MILLION YEARS AGO
RECENT
RELATIVE FREQUENCY
.2
.1
0
0
.2
.4
.6
.8
1
1.2
1.4
1.6
1.8
2
RELATIVE BRAIN SIZE (E.Q.)

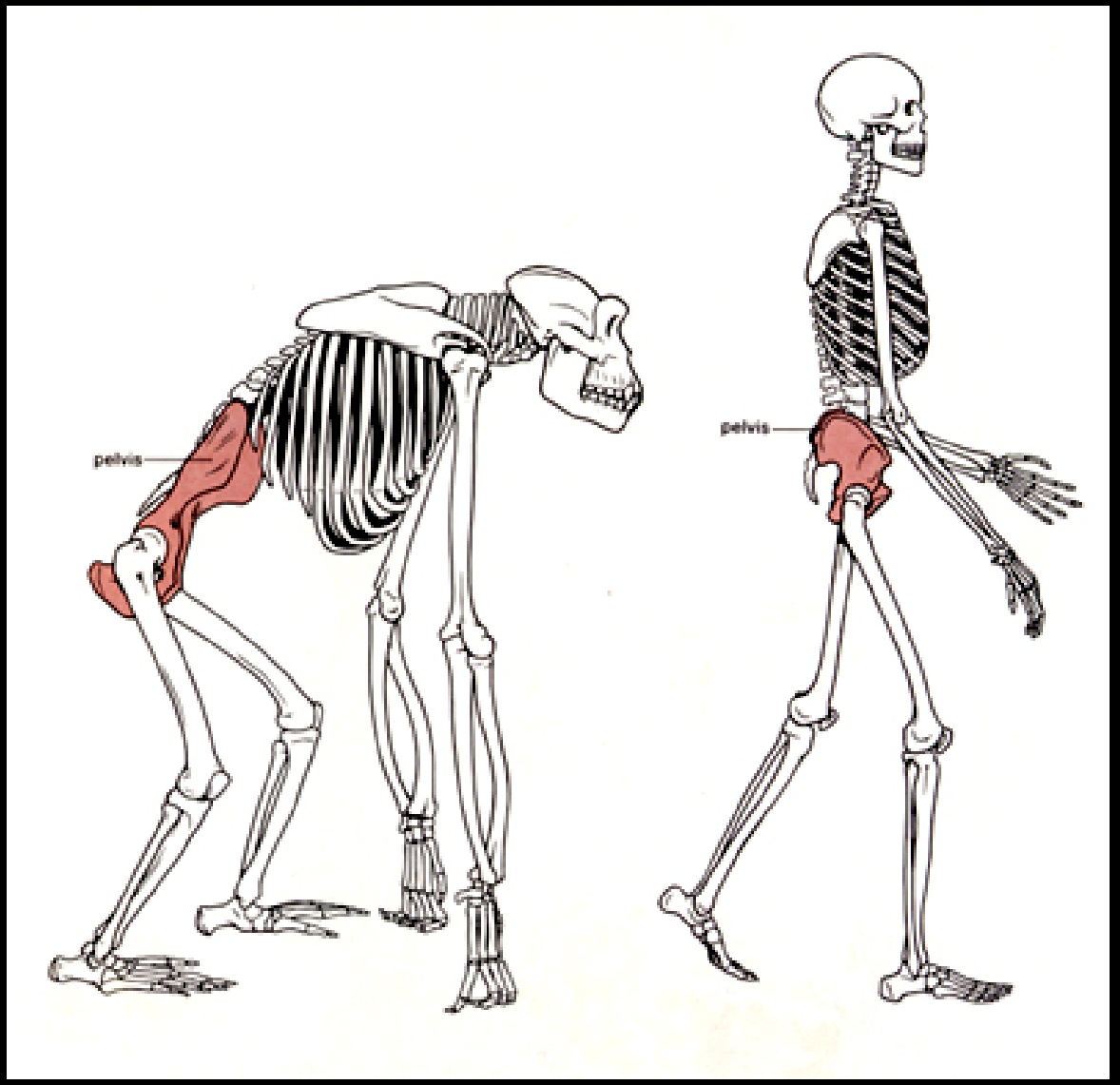
Una nuova dieta



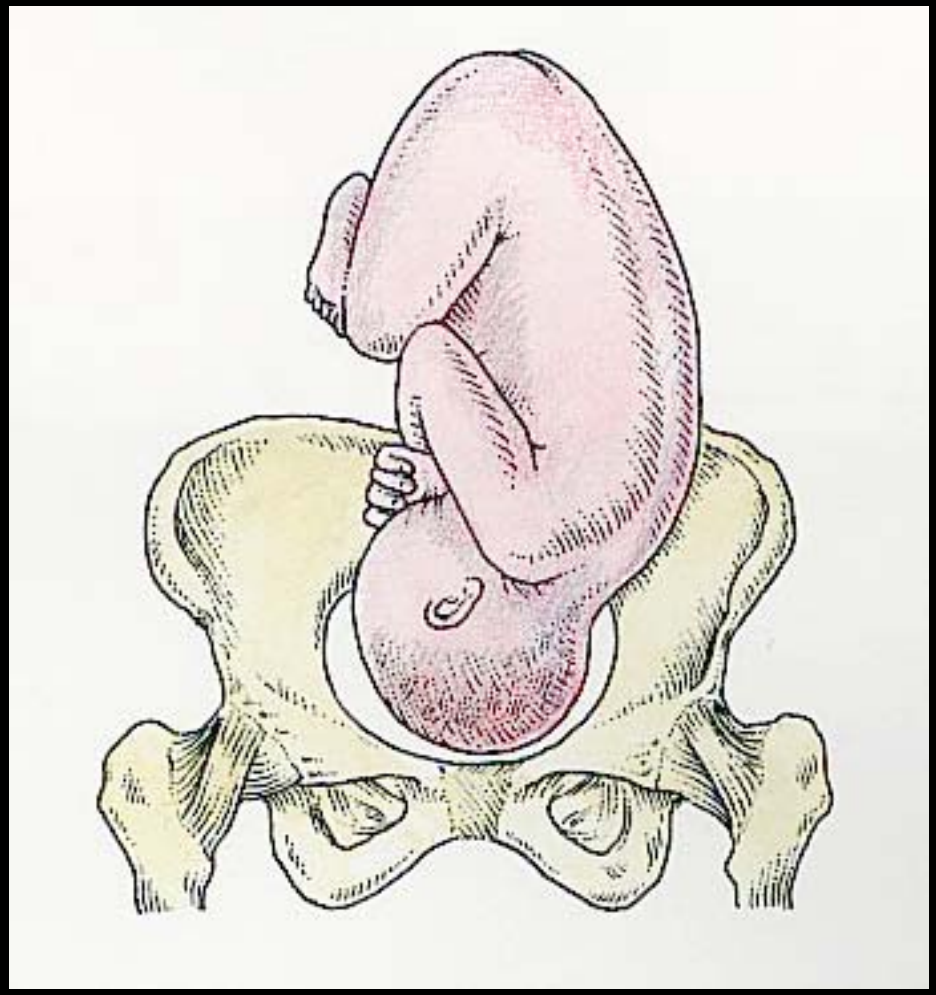
Observed and expected organ masses for a "standard" 65-kg human.

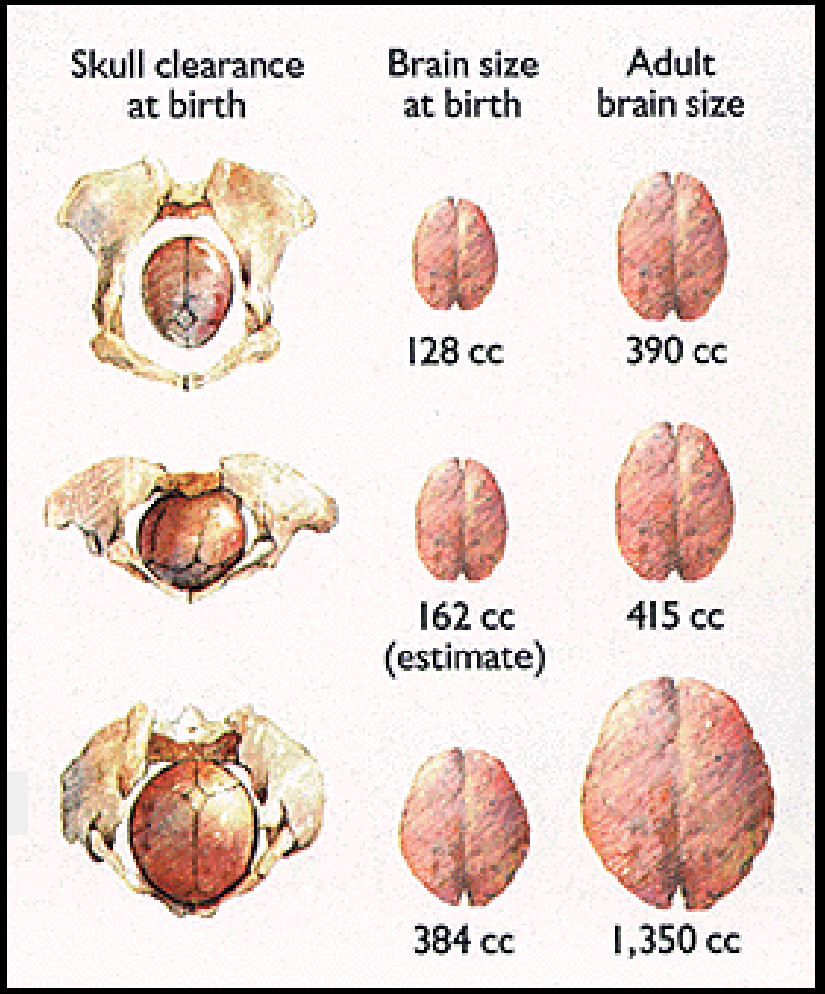


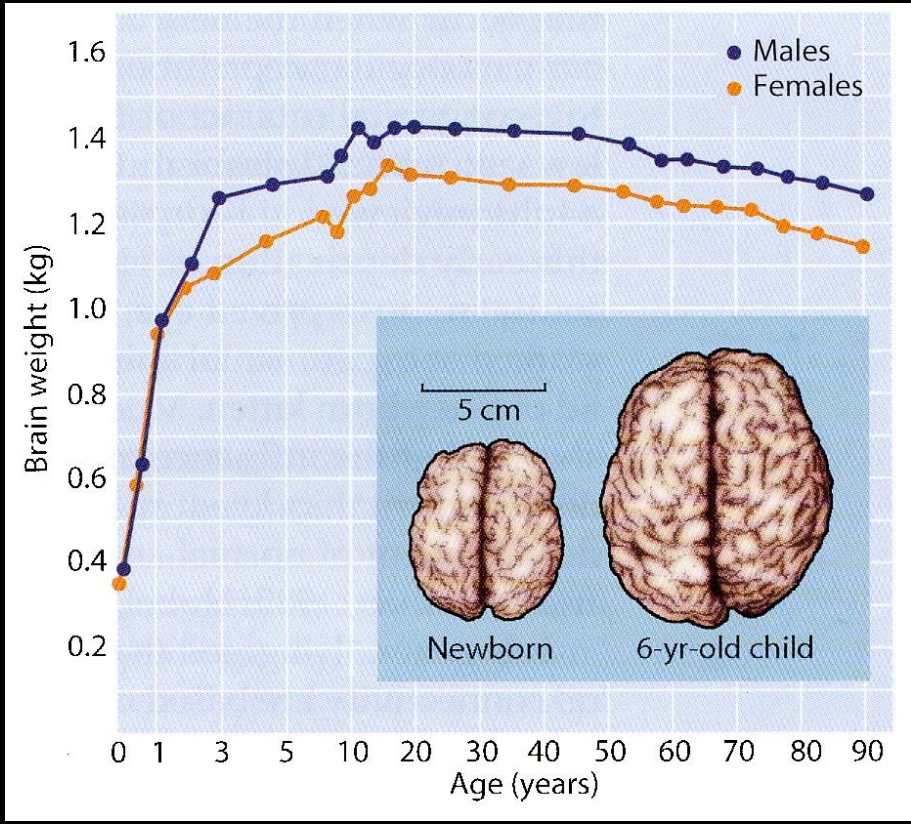
bipedismo

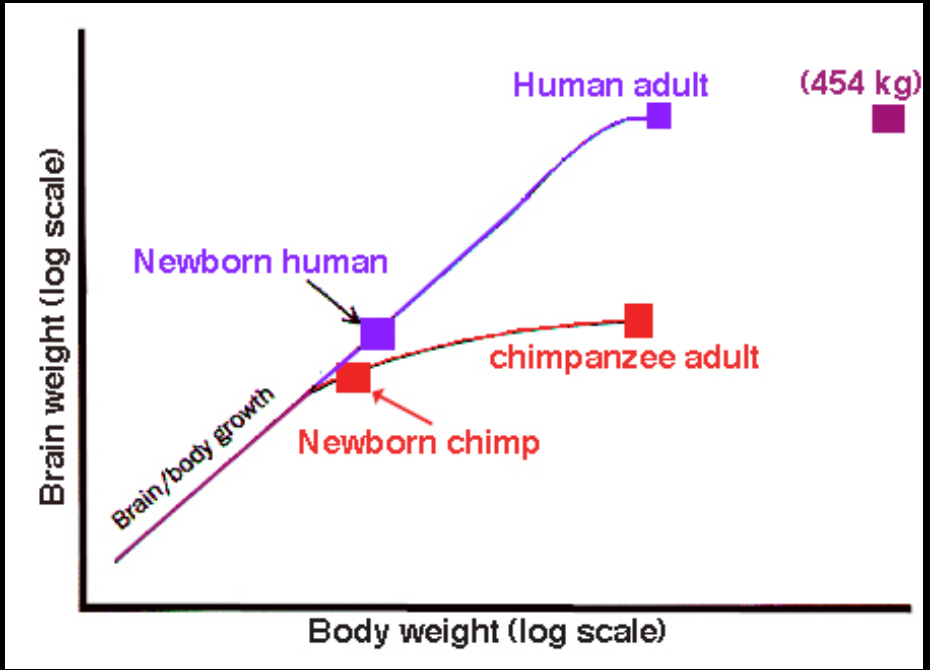


Il bipedismo ha senso solo se gli arti liberati dal compito di sostenere il corpo assumono una nuova funzione




Skull clearance at birth
Brain size at birth
Adult brain size
128 cc
390 cc
162 cc (estimate)
415 cc
384 cc
1,350 cc


Males
Females
Brain weight (kg)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0 1 3 5 10 20 30 40 50 60 70 80 90
Age (years)
5 cm
Newborn
6-yr-old child

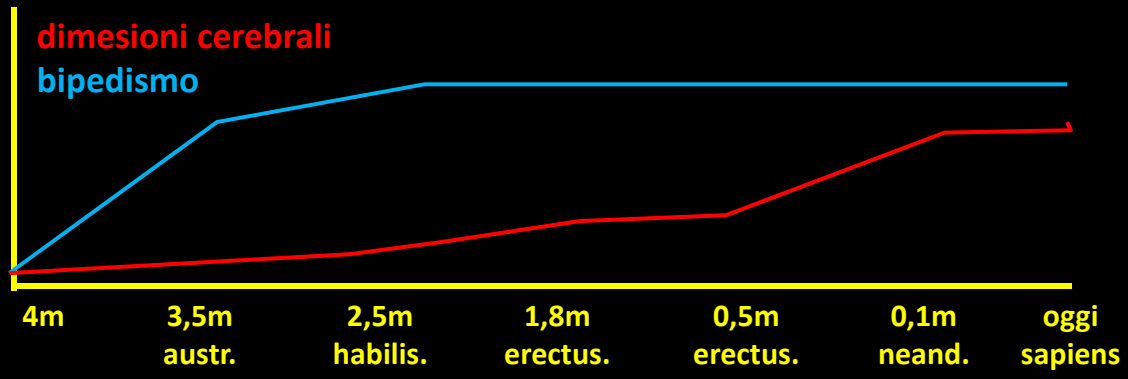

Human adult
(454 kg)
Newborn human
chimpanzee adult
Newborn chimp
Brain/body growth
Brain weight (log scale)
Body weight (log scale)

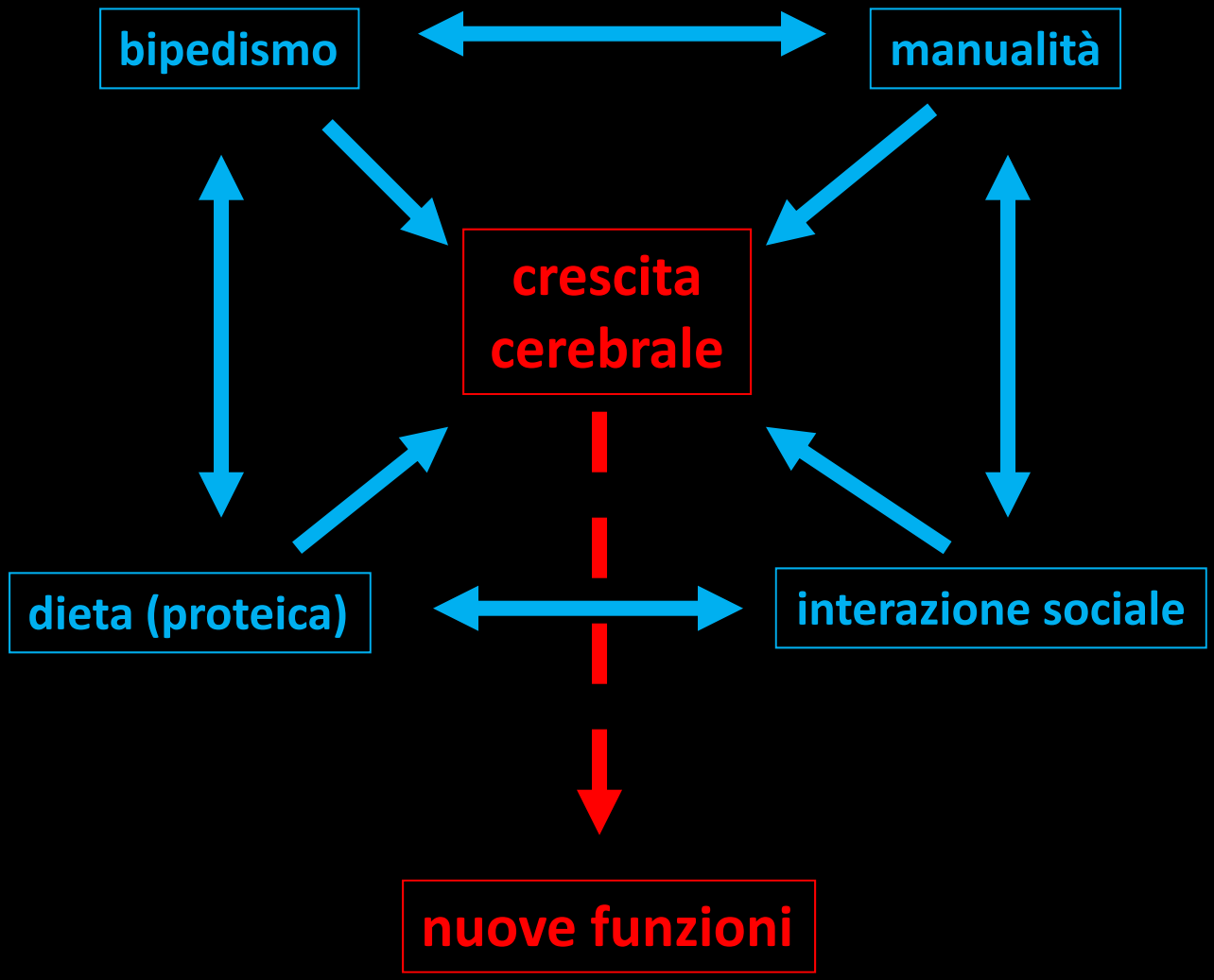
Il bipedismo lascia le mani libere

Le mani libere permettono

La produzione di strumenti
La comunicazione gestuale

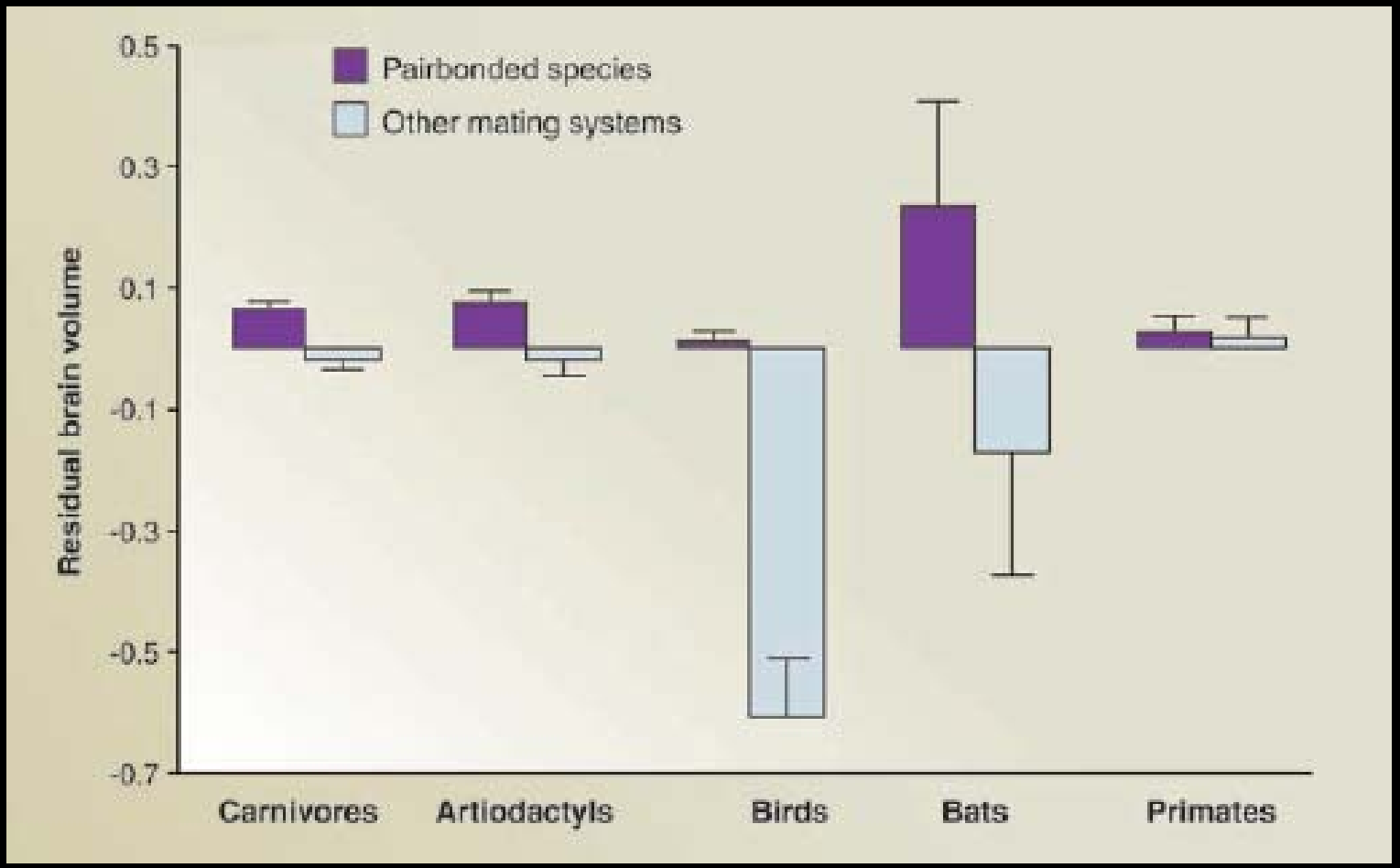
bipedismo → mani libere → controllo motorio → crescita cerebrale



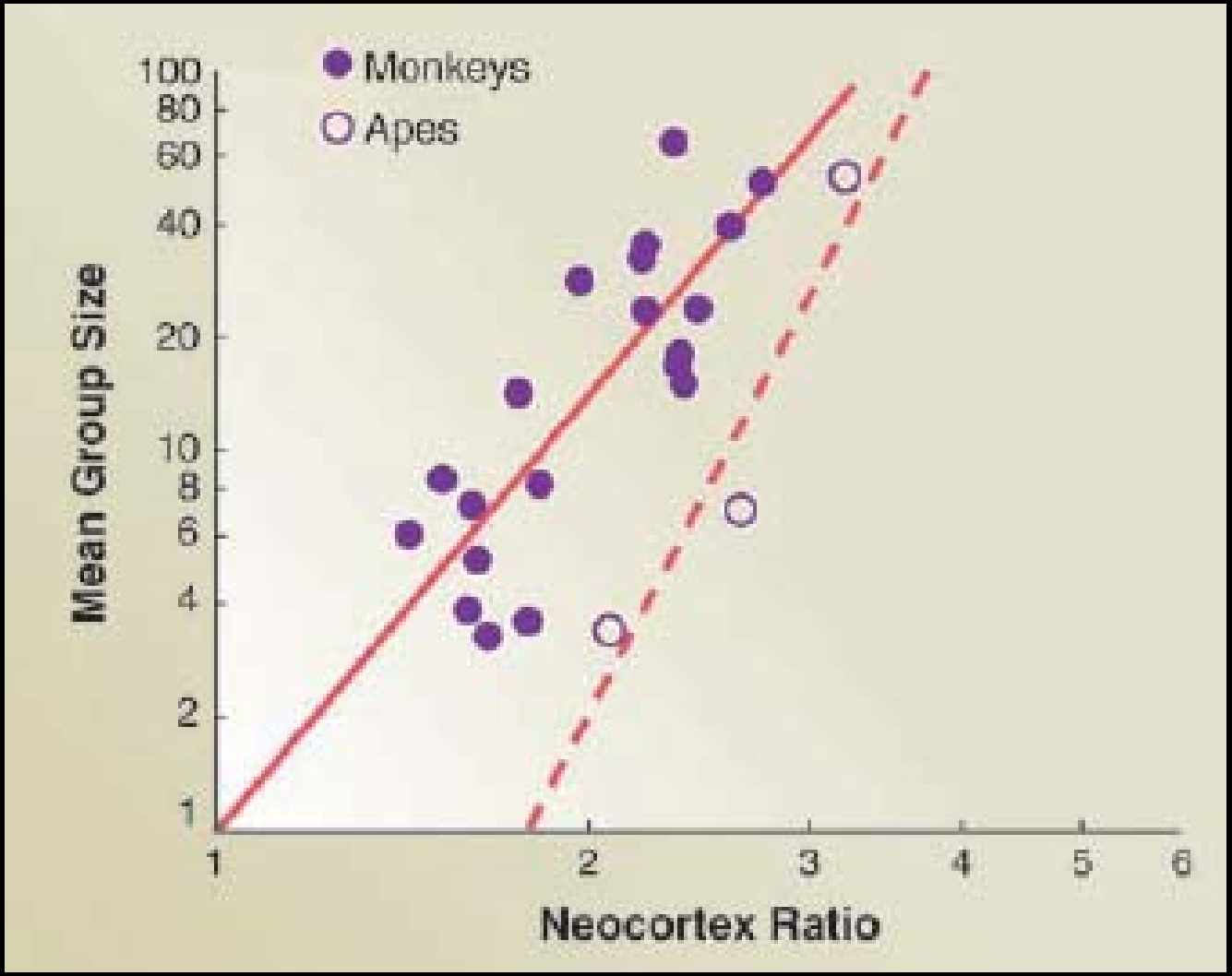


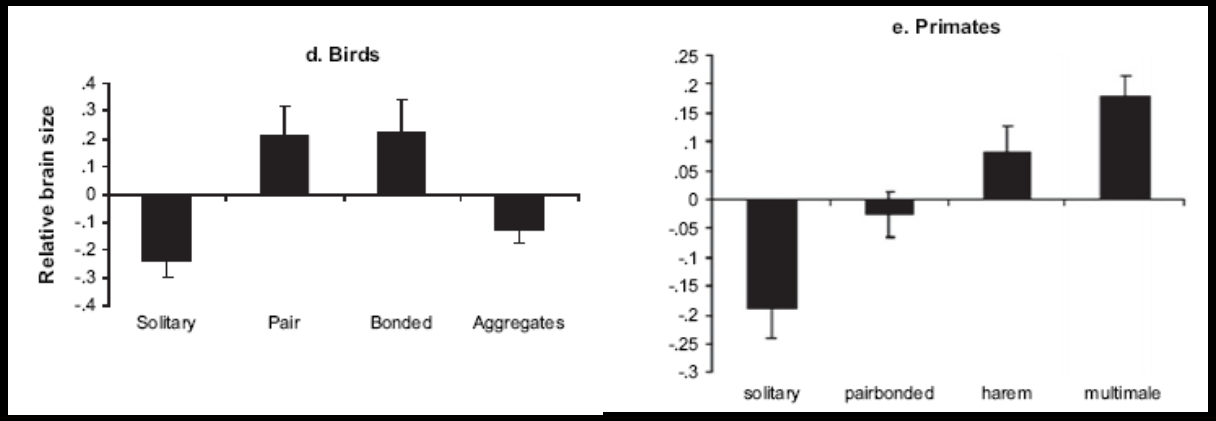
fine dell'evoluzione biologica, inizio dell'evoluzione culturale

Dimensione cerebrale e modalità di accoppiamento



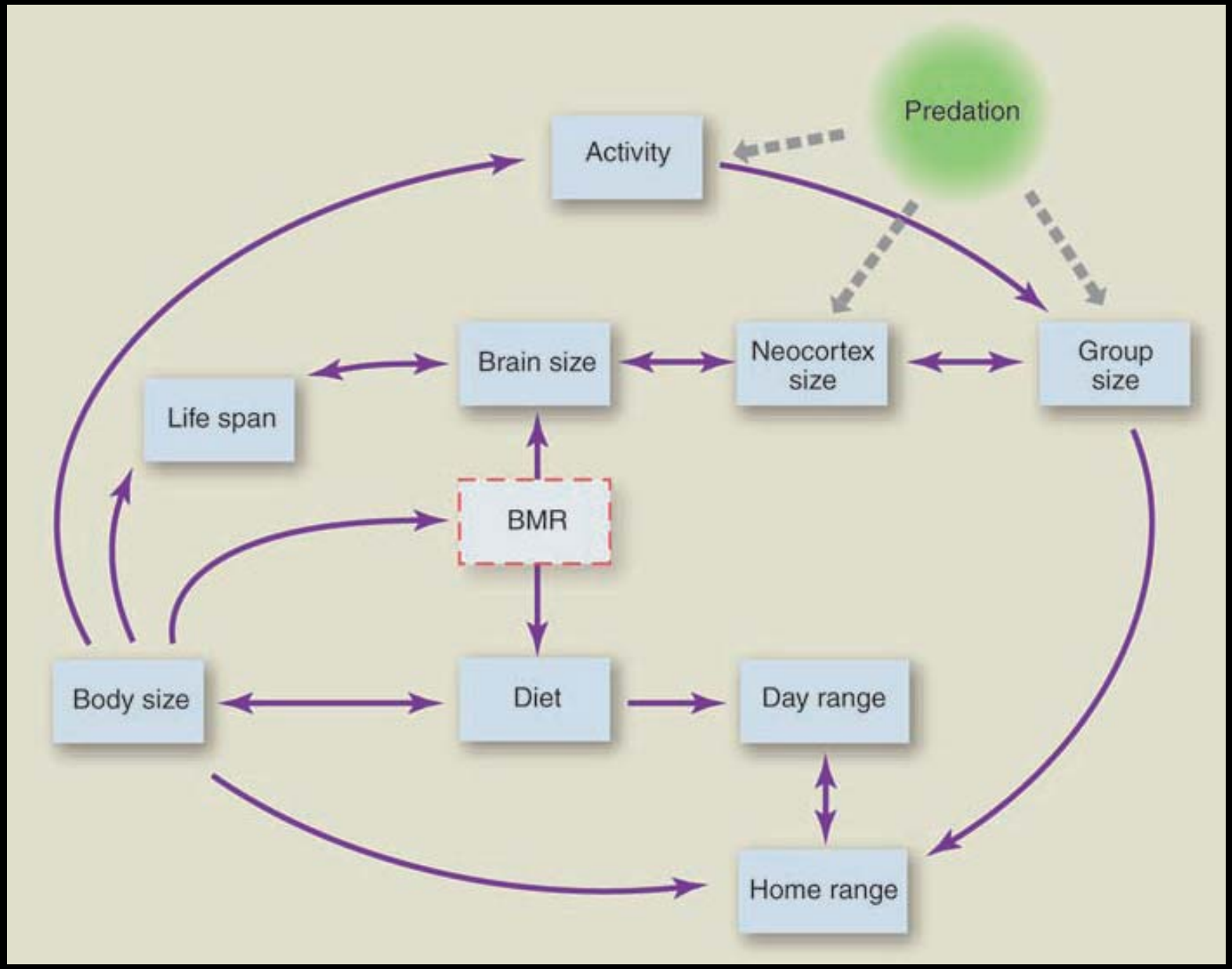
Dimensione cerebrale e dimensione del gruppo sociale



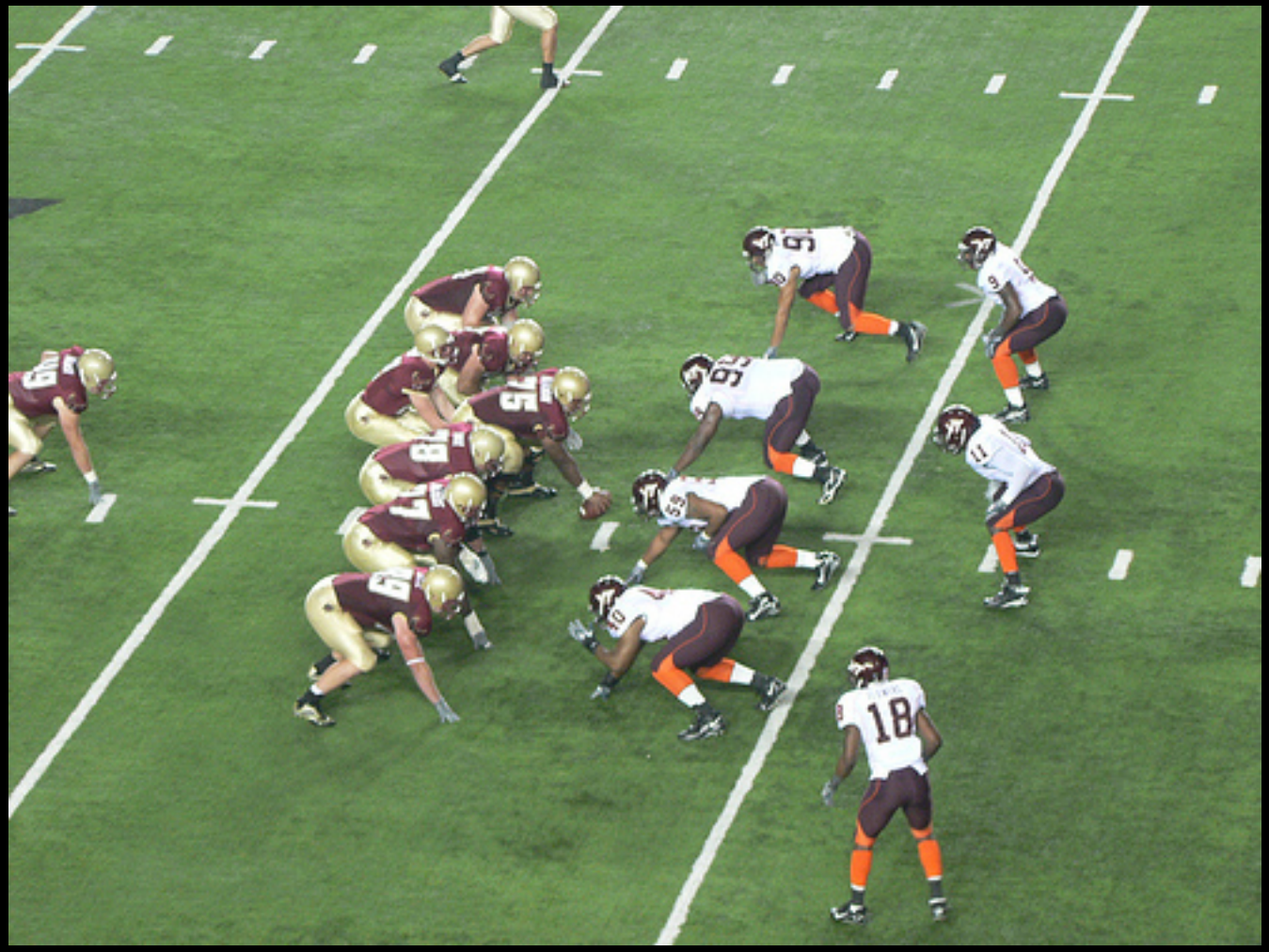


Uccelli/mammiferi = relazione *qualitativa* fra dimensione cerebrale e modalità di accoppiamento

Primati = relazione *quantitativa* fra dimensione cerebrale e dimensione del gruppo sociale


Predation
Activity
Brain size
Neocortex size
Group size
Life span
BMR
Body size
Diet
Day range
Home range

Interazione sociale: competizione vs cooperazione



Aiutare gli altri a raggiungere il proprio scopo (agendo in loro favore)

Condividere le risorse con gli altri

Informare gli altri su fatti o cose di loro interesse

Aiutare gli altri a raggiungere il proprio scopo (agendo in loro favore)

Out-of-reach

A person accidentally drops an object on the floor and unsuccessfully reaches for it.

Physical Obstacle

A person wants to put a pile of books into a cabinet, but she cannot open the closed doors because her hands are full.

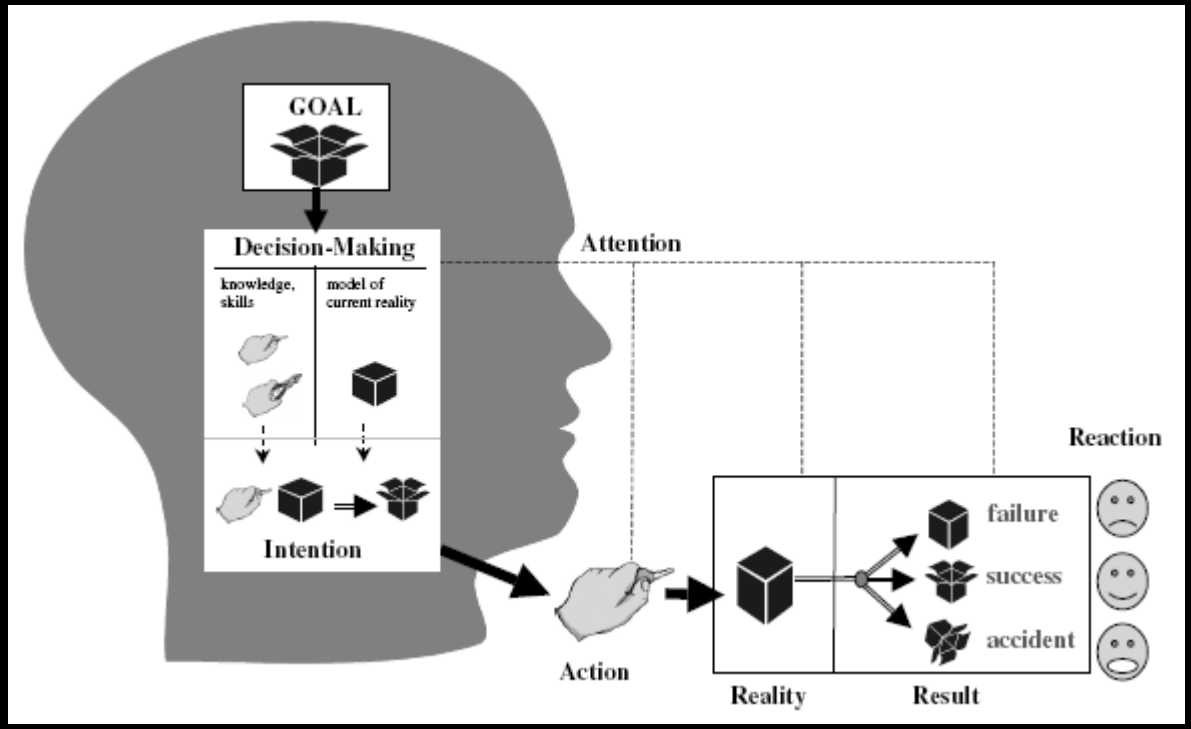
Wrong Means

An object drops through a hole into a box and the person unsuccessfully tries to grasp it through the small hole, ignorant of a flap on the side of the box.

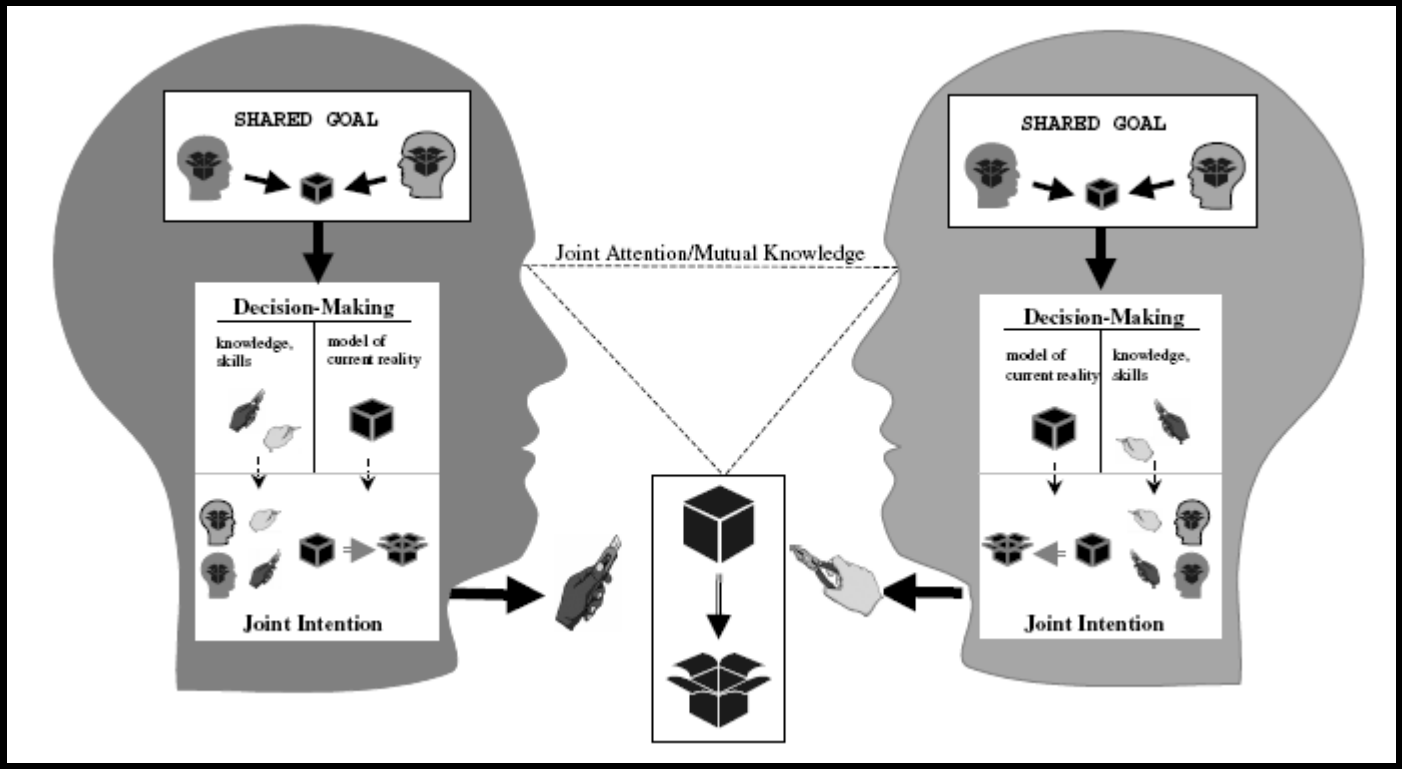
Condividere le risorse con gli altri

Informare gli altri su fatti o cose di loro interesse

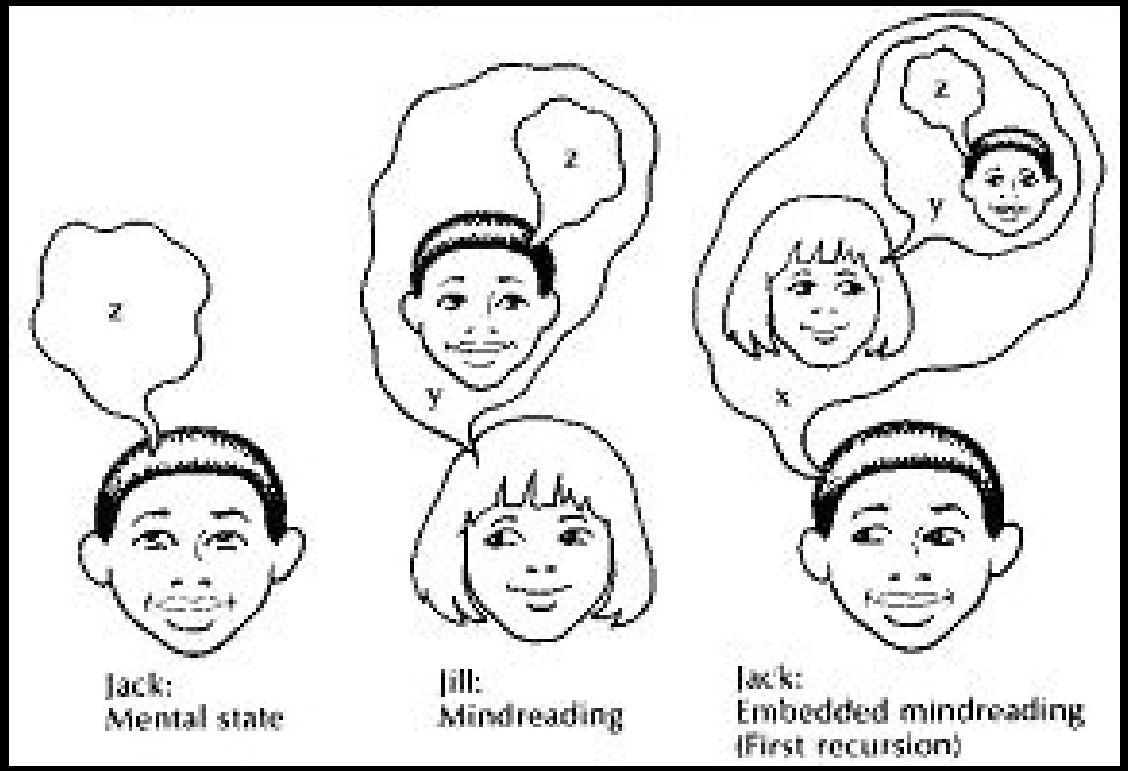
Intenzionalità e pianificazione

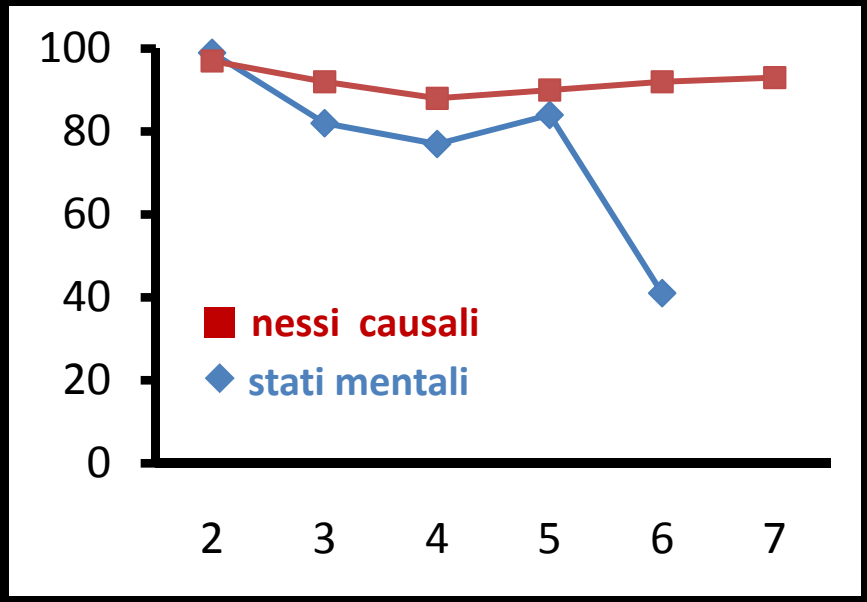


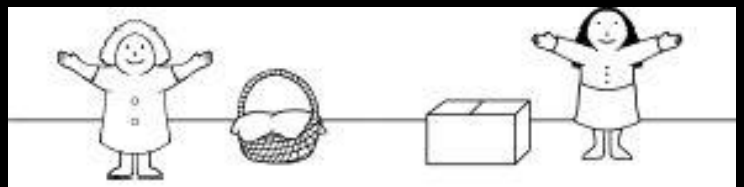
intenzionalità condivisa
pianificazione collaborativa



So quel che pensi: la teoria della mente

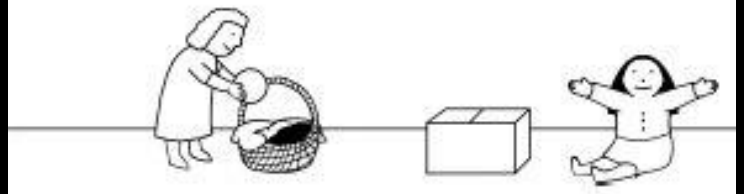

z
Jack:
Mental state
z
y
Jill:
Mindreading
z
y
x
Jack:
Embedded mindreading
(First recursion)


100
80
60
40
20
0
nessi causali
stati mentali
2
3
4
5
6
7

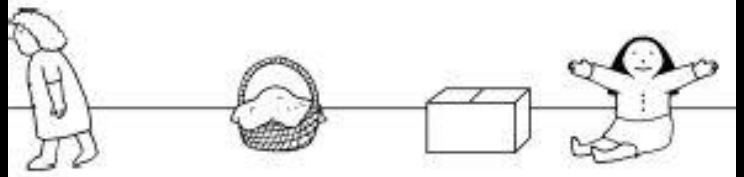


This is Sally.

This is Ann.



Sally has a ball. She puts it into her basket.



Sally goes out for a walk.
Ann takes the ball out of the basket.

Ann then puts the ball in the box.

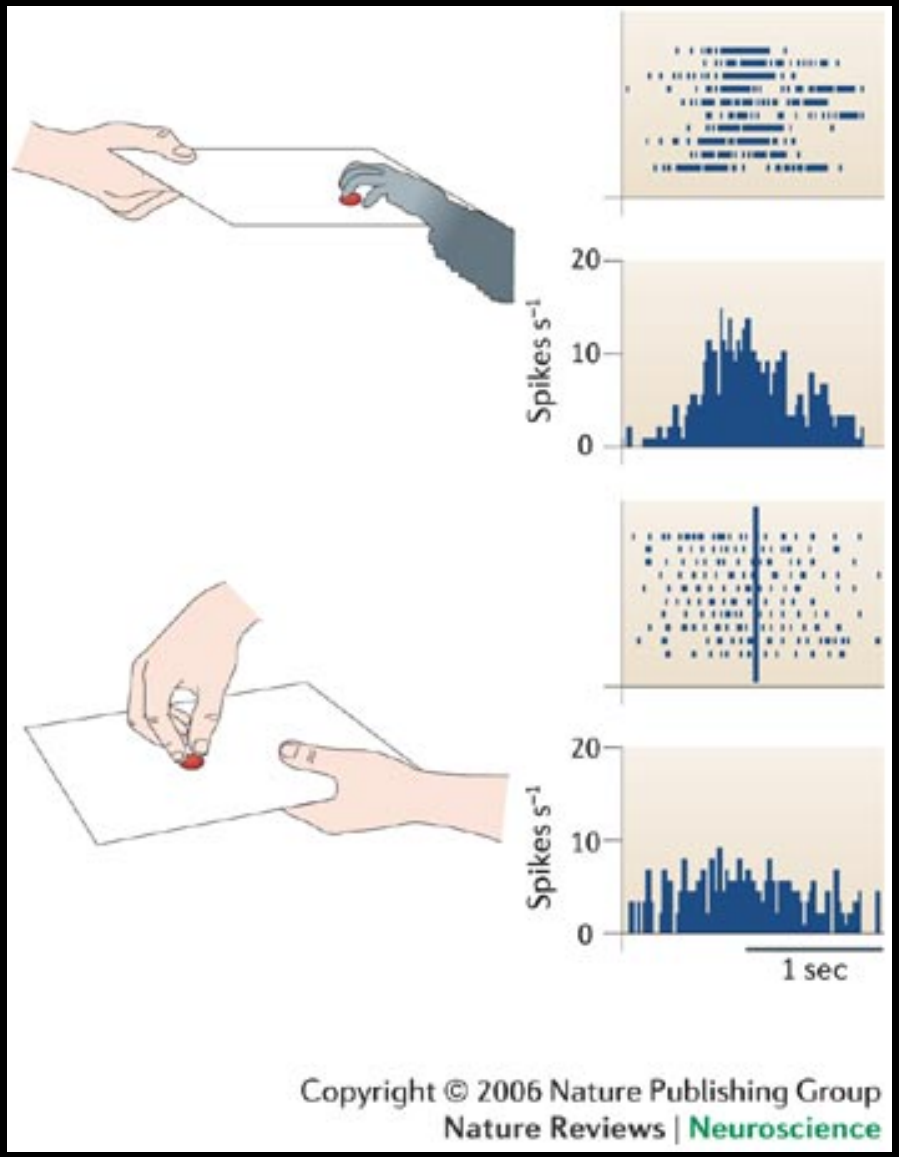
Now Sally comes back.

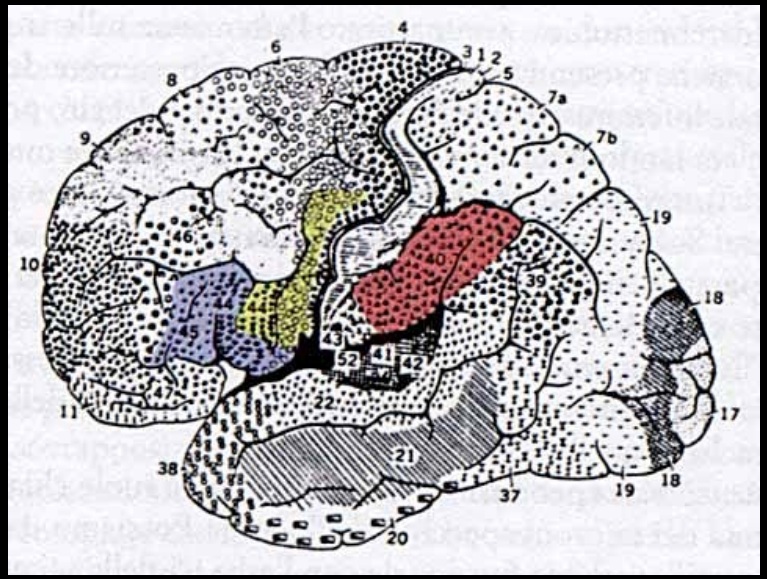
She wants to play with the ball.

Where will Sally look for the ball?

Shakespeare vuole (1)
che il pubblico comprenda (2)
che Iago agisce (3)
in modo che Otello creda (4)
che Desdemona lo tradisce (5) con Cassio

So quel che fai, so quel che provi: i meccanismi specchio

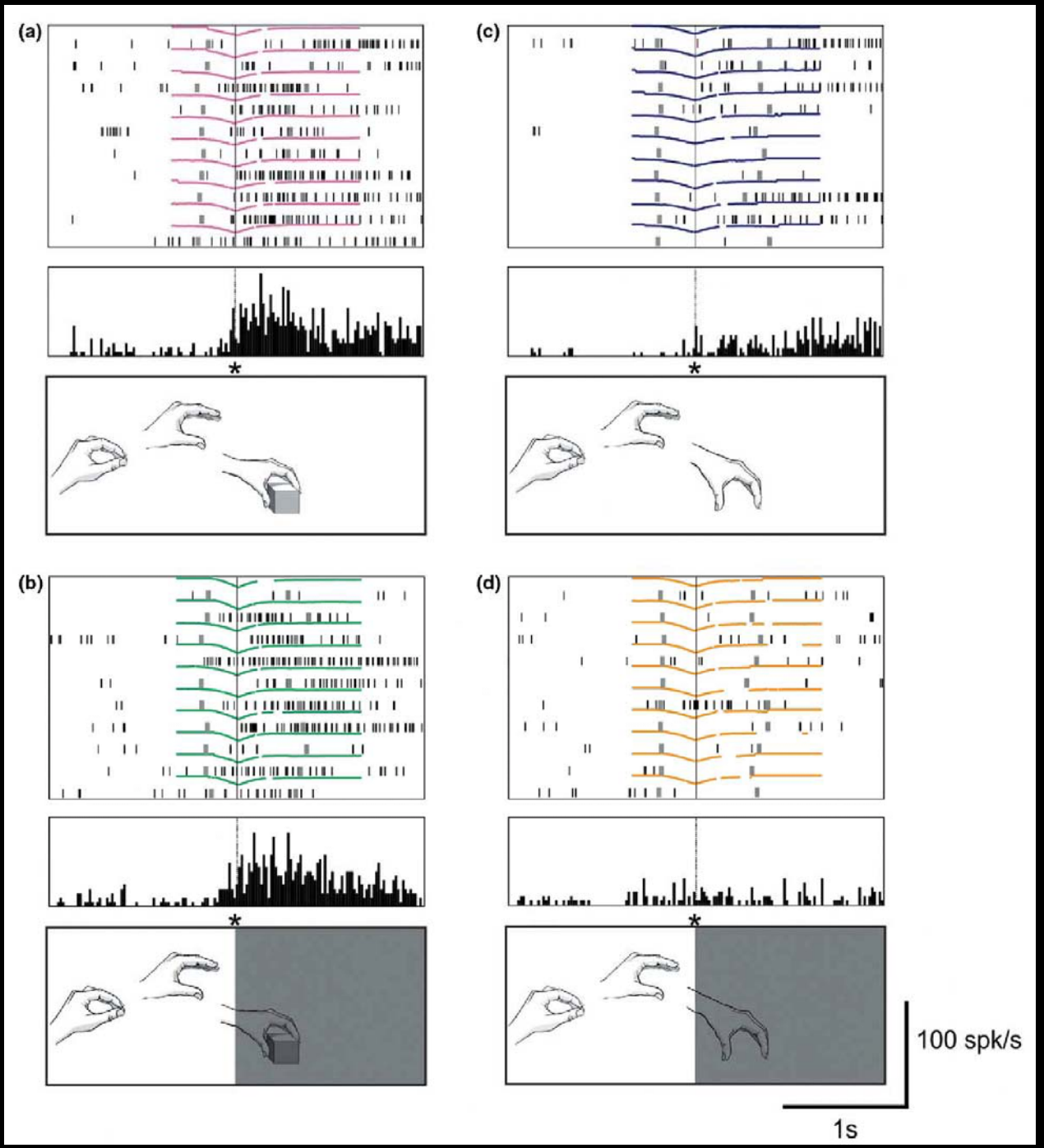


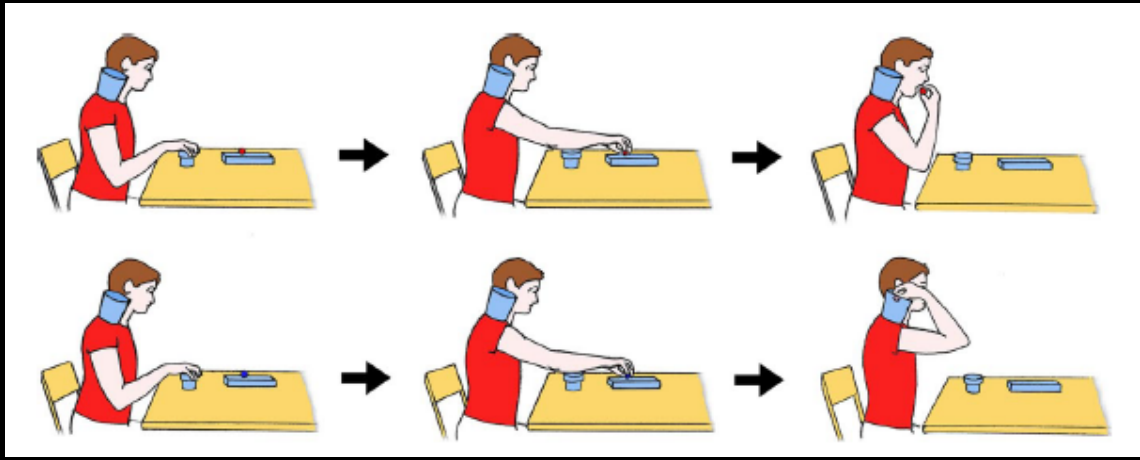


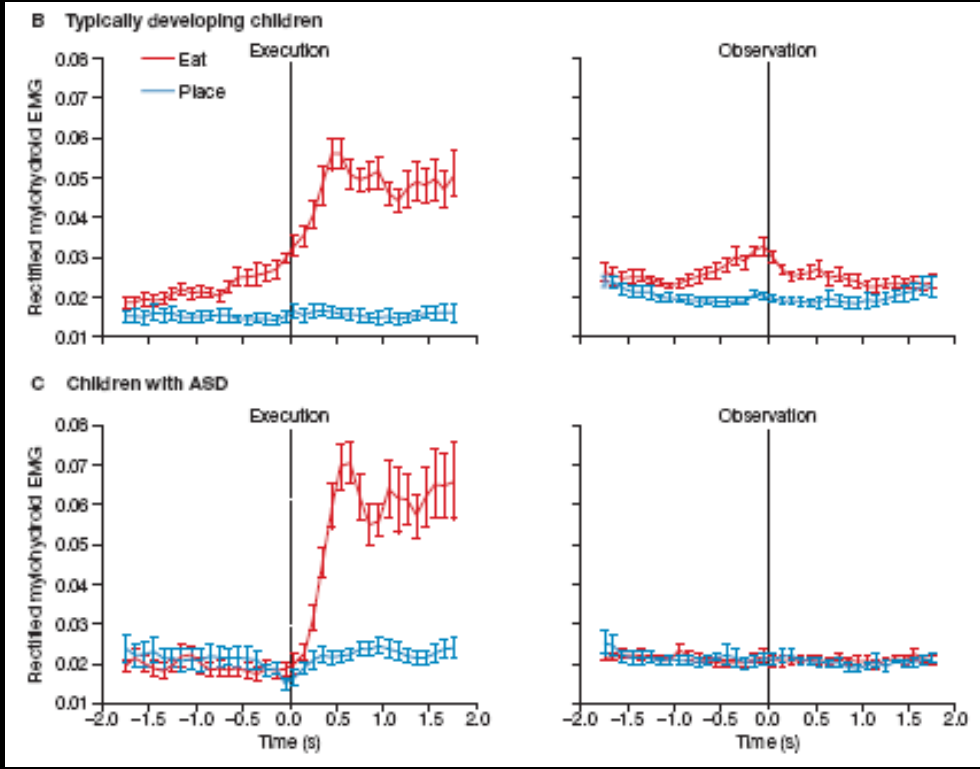
Comprendere le azioni degli altri

azione visibile

azione nascosta







Comprendere le intenzioni degli altri

Teorie fredde

disgusto

rappresentazione visiva

rappresentazione sensori-motoria

elaborazione cognitiva

Teoria calda

Attivazione delle strutture che mediano il disgusto

sensazione emozione

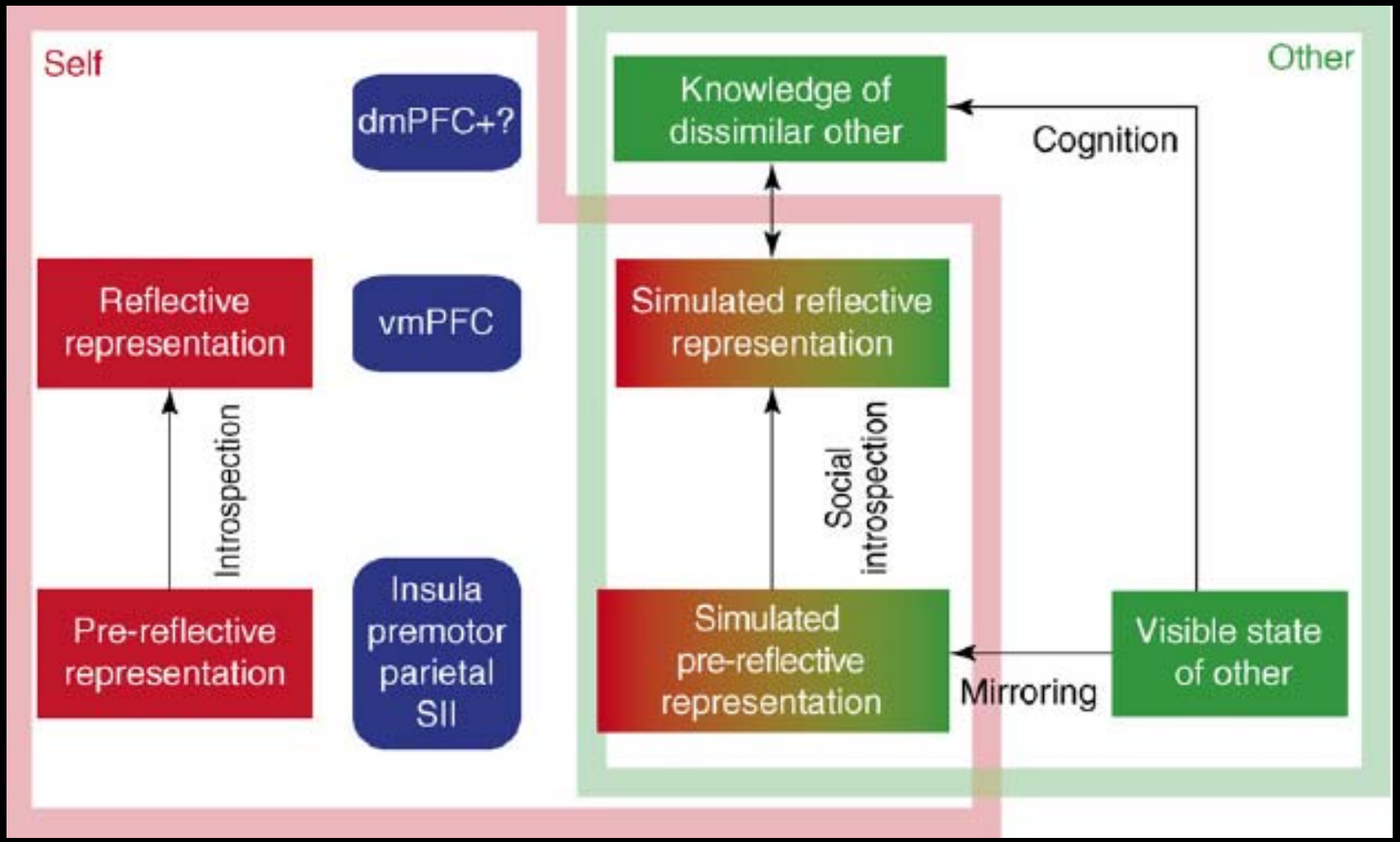
Comprendere le emozioni degli altri

Empatia e meccanismi specchio

La rappresentazione mirror di emozioni o sensazioni svolge due funzioni

Crea una rappresentazione soggettiva della situazione che ci permette di predire gli effetti che avrebbe lo stimolo su noi stessi (*rappresentazione protettiva*)

Determina la nostra capacità di comprendere l'effetto emozionale che un un certo stimolo provoca su un altro individuo e di predirne le conseguenze (*rappresentazione empatica*).


Self
Other
dmPFC+?
Knowledge of dissimilar other
Cognition
Reflective representation
vmPFC
Simulated reflective representation
Introspection
Social introspection
Pre-reflective representation
Insula premotor parietal SII
Simulated pre-reflective representation
Mirroring
Visible state of other