

# Meta Learning & Thinking Skills

Dispelling 'Neuromyths'  
Source OECD and CERI research 2007

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- Work format:
- Position game and explanation in plenum

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### What is a “neuro myth”?

1. Science advances through trial and error. Theories are constructed on bumping advance of science.
2. We simplify complex concepts easily in quick simple theories

Mostly they bring unfortunate consequences and must therefore be dispelled.




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## Neuro myths

- They are almost always based on some element of sound science, which makes identifying and refuting them much more difficult. The results on which the neuro myths are built are, however, either misunderstood, incomplete, exaggerated, or extrapolated beyond the evidence, or indeed all of these at once.



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**Neuro myths GAME!**  
Choose your answer by moving to the right or left section in the room!

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Some critical thinking!!

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**“There is no time to lose as everything important about the brain is decided by the age of three”**

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Neuro myth 1

True or false

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### Based on

- Information processing component is the nerve cell or neuron.
- About 100 billion neurons
- Connected to thousand of others
- Through connections synapses occur
- Learning is the creation of synapses
- Age related:
  - 2 months synapse density is low
  - After 10 months exponential increase
  - Stabilisation occurs after age 10



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### Critical thinking and new insights

- For a long time, science believed maximum number was fixed
- **New neurons appear a any point in life**
- **There is little human neuroscientific data on predictive relationship between synopsis density in early life and improved learning capacity**



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# “There are critical periods when certain matters must be taught and learnt”

Neuro myth 2

True or false

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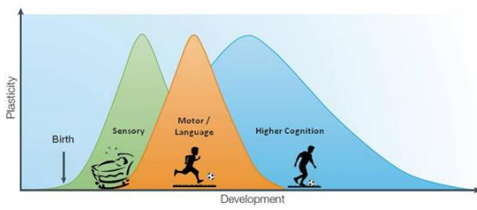
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## Based on

- For a long time it was believed that the brain loses neurons with age
- There are “critical periods” as unique phases during which certain types of learning can only successfully take place



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### Critical thinking and new insights

- Numerous studies have shown that the brain remained plastic throughout the lifespan, in terms of numbers of both neurons and synapses.
- The processes that remodel the brain - neuron synaptogenesis, pruning, development, and modification - are grouped together under the same term: "brain plasticity".
- *No critical period for learning has yet been found for humans* (though they may yet be). It is more appropriate to refer to "sensitive periods", when learning of a particular kind is easier.
- The scientific community acknowledges that there are sensitive periods, particularly for language learning, and has identified several of them (some in adult age).



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## But I read somewhere that we only use 10% of our brain anyway”

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Neuro myth 3

True or false

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### Based on

- Some say it came from Einstein, who responded once during an interview that he only used 10% of his brain.
- In the 1930s, Karl Lashley explored the brain using electric shocks. As many areas of the brain did not react to these shocks, Lashley concluded that these areas had no function.



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### Critical thinking and new insights

- Neuroscience findings now show that the brain is 100% active.
- The myth is implausible for physiological reasons, too. Evolution does not allow waste and the brain, like the other organs but probably more than any other, is moulded by natural selection.

• SEE CLIP ! Next slide...



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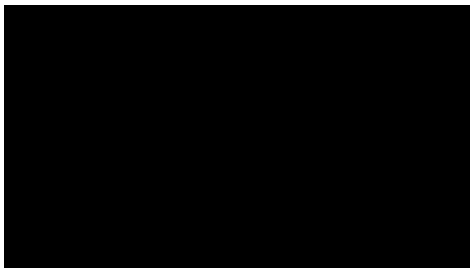
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# “I’m a ‘left-brain’, she’s a ‘right-brain’ person”

Neuro myth 4

True or false

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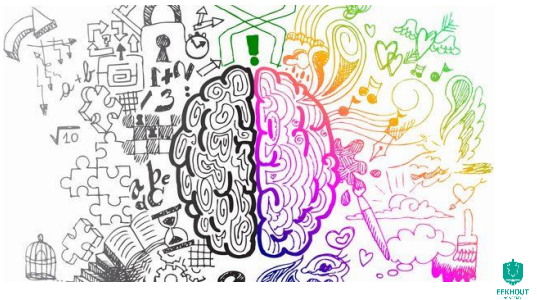
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### Based on

- The brain is composed of a left and a right hemispheres. Each hemisphere is more specialised in certain fields than in others.
- It have served to advance education by diversifying its methods. Nevertheless, insofar as they have borrowed on theories of the brain, they are based on scientific misinterpretation as the two halves of the brain cannot be so clearly separated.

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### Critical thinking an new insights

- it needs to be underlined that the two hemispheres are not separate functional and anatomic entities: nerve structures connect them together (the corpus callosum) and many neurons have their cell nucleus in one hemisphere and extensions in the other.
- Gradually, further myths emerged in which the two hemispheres are associated not just with two ways of thinking but as revelations of two types of personality. The concepts of “left brain thinking” and “right brain thinking”, together with the idea of a dominant hemisphere, led to the notion



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## “Let’s face it - men and boys just have different brains from women and girls”

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Neuro myth 5

True or false

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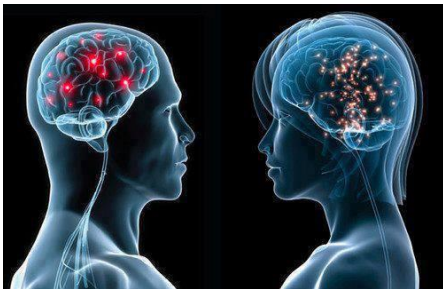
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### Based on

- Is there a “feminine brain” and a “masculine brain”? Should teaching styles be shaped according to gender?
- There are functional and morphological differences between the male and female brain. The male brain is larger, for instance, and when it comes to language, the relevant areas of the brain are more strongly activated in females.



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### Critical thinking and new insights

- No study to date has shown gender-specific processes involved in building up neuronal networks during learning
- Where differences can be shown to exist, they will be small and based on averages.



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**“A young child’s brain can only manage to learn one language at a time”**

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Neuro myth 6

True or false

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### Based on

- Many have believed that learning a new language is problematic for the native language
- Simultaneous learning of two languages during infancy would create a mixture of the two languages in the brain and slow down the development of the child



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### Critical thinking and new insights

- The myth that one has first to speak well one's native language before learning a second language is counteracted by the studies showing that children who master two languages understand the structure of each language better and apply them in a more conscious way.



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# “Improve your memory!”

Neuro myth 7

True or false

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## Based on

- Memory is not infinite and this is because information is stored in neuronal networks, the number of which is itself finite (though enormous).
- “Improve your memory!” “Increase your memory capacity!” “How to get an exceptional memory fast!” cry the marketing slogans for books and pharmaceutical products.



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### Critical thinking and new insights

- Research has also found that the capacity to forget is necessary for good memorisation.



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## “Learn while you sleep!”

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Neuro myth 8

True or false

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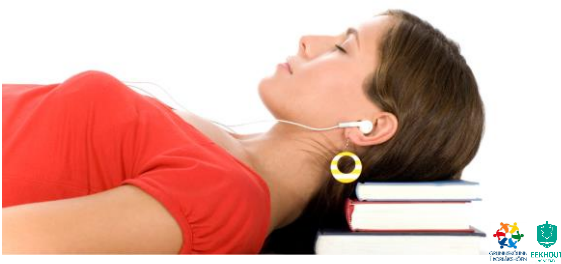
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### Based on

- Learning while you sleep - what a fascinating, appealing idea! Quick, effortless learning is the dream of many of us.



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### Critical thinking and new insights

- If knowledge can be acquired while sleeping, then one does not thereby learn how to use it.
- While western researchers have found no evidence to support the claims of successful learning during sleep, they have been able to identify an effect when someone is under anaesthetic (Schacter, 1996).
- *In sum, no study on learning while sleeping conducted in western countries, with a strict control by EEG on the state of sleep, has been able to demonstrate evidence of learning (Bootzin, Kihlstrom and Schacter, 1990; Wood, 1992).*



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Conclusions

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- The brain is **fashionable**. The media constantly draws in one way or another on the mysteries of this “black box”.
- Most neuro myths, including the main ones described in this chapter, share similar origins. They are almost always based on some element of sound science, which makes identifying and refuting them much more difficult.
- The results on which the neuro myths are built are, however, **either misunderstood, incomplete, exaggerated, or extrapolated beyond the evidence**, or indeed all of these at once.



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### Discussions & questions



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