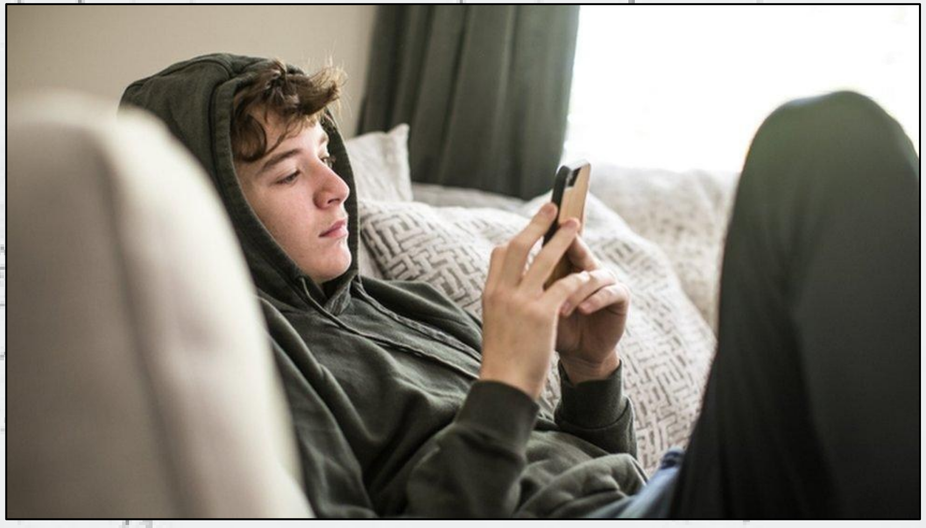
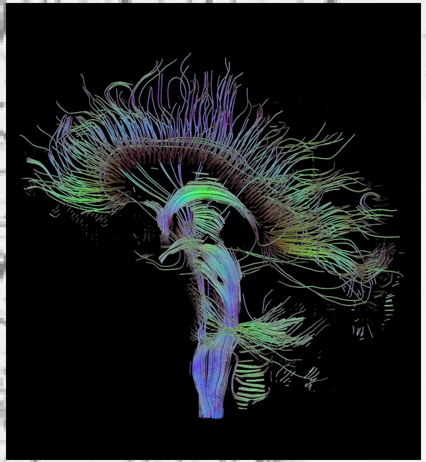
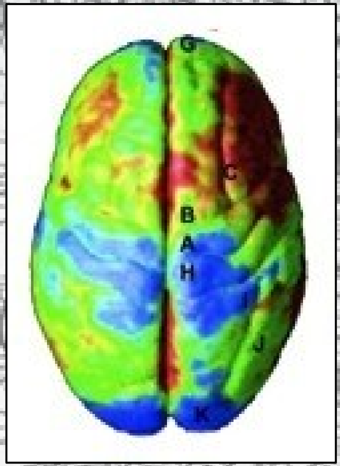
Take Action On Distraction

Insights from developmental neuroscience into supporting children's concentration

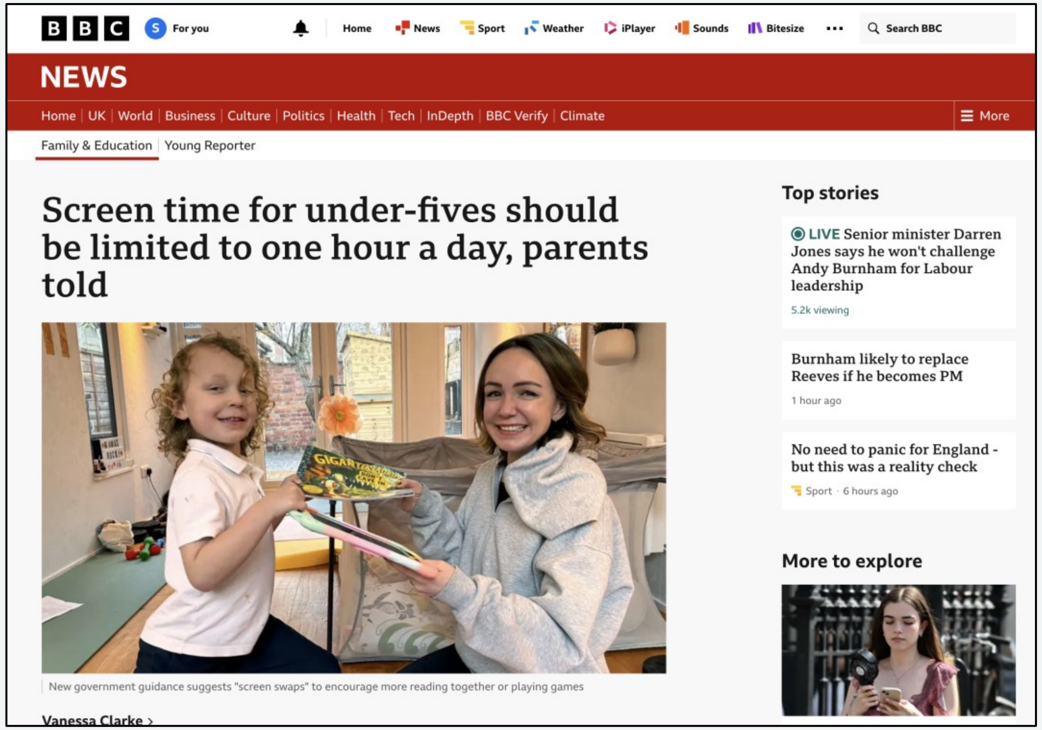






Professor Sam Wass

Department for Education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Screen time for under-fives should be limited to one hour a day, parents told

New government guidance suggests "screen swaps" to encourage more reading together or playing games

Vanessa Clarke >

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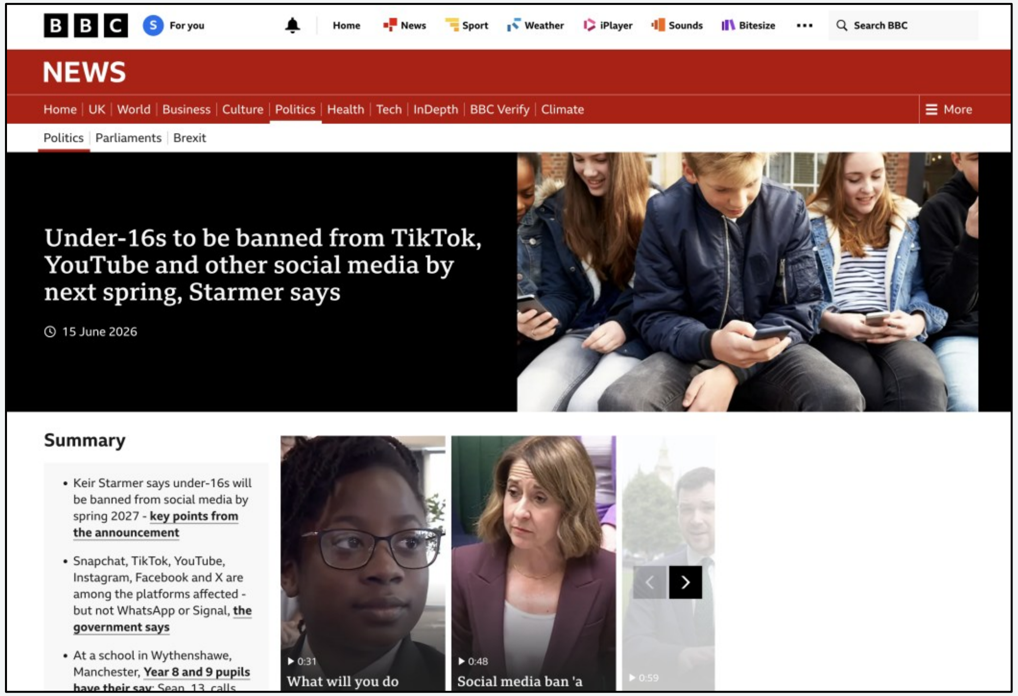
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Under-16s to be banned from TikTok, YouTube and other social media by next spring, Starmer says

15 June 2026

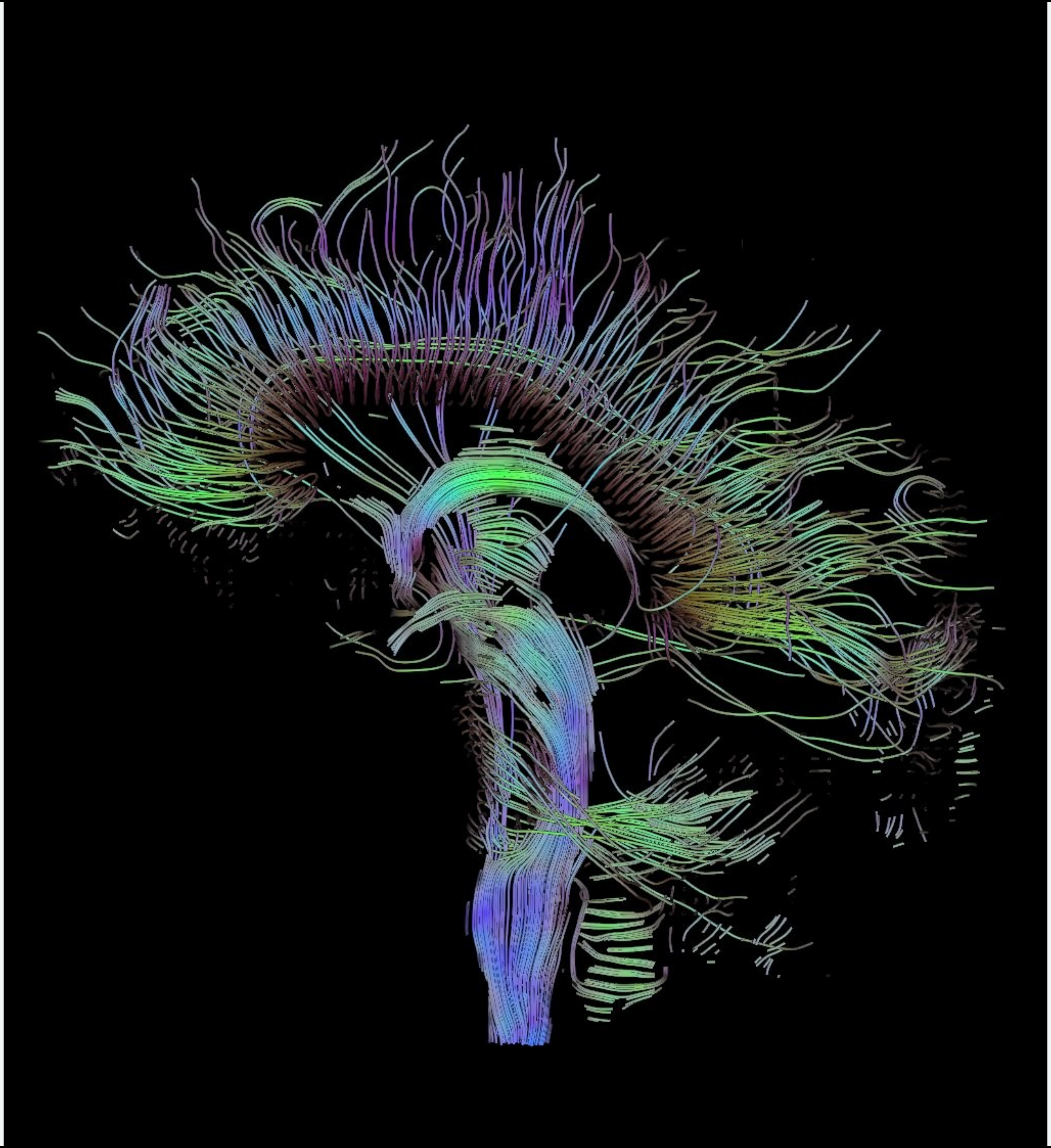
Summary

- Keir Starmer says under-16s will be banned from social media by spring 2027 - key points from the announcement
- Snapchat, TikTok, YouTube, Instagram, Facebook and X are among the platforms affected - but not WhatsApp or Signal, the government says
- At a school in Wythenshawe, Manchester, Year 8 and 9 pupils have their say: Sean, 13, calls

0:31 What will you do

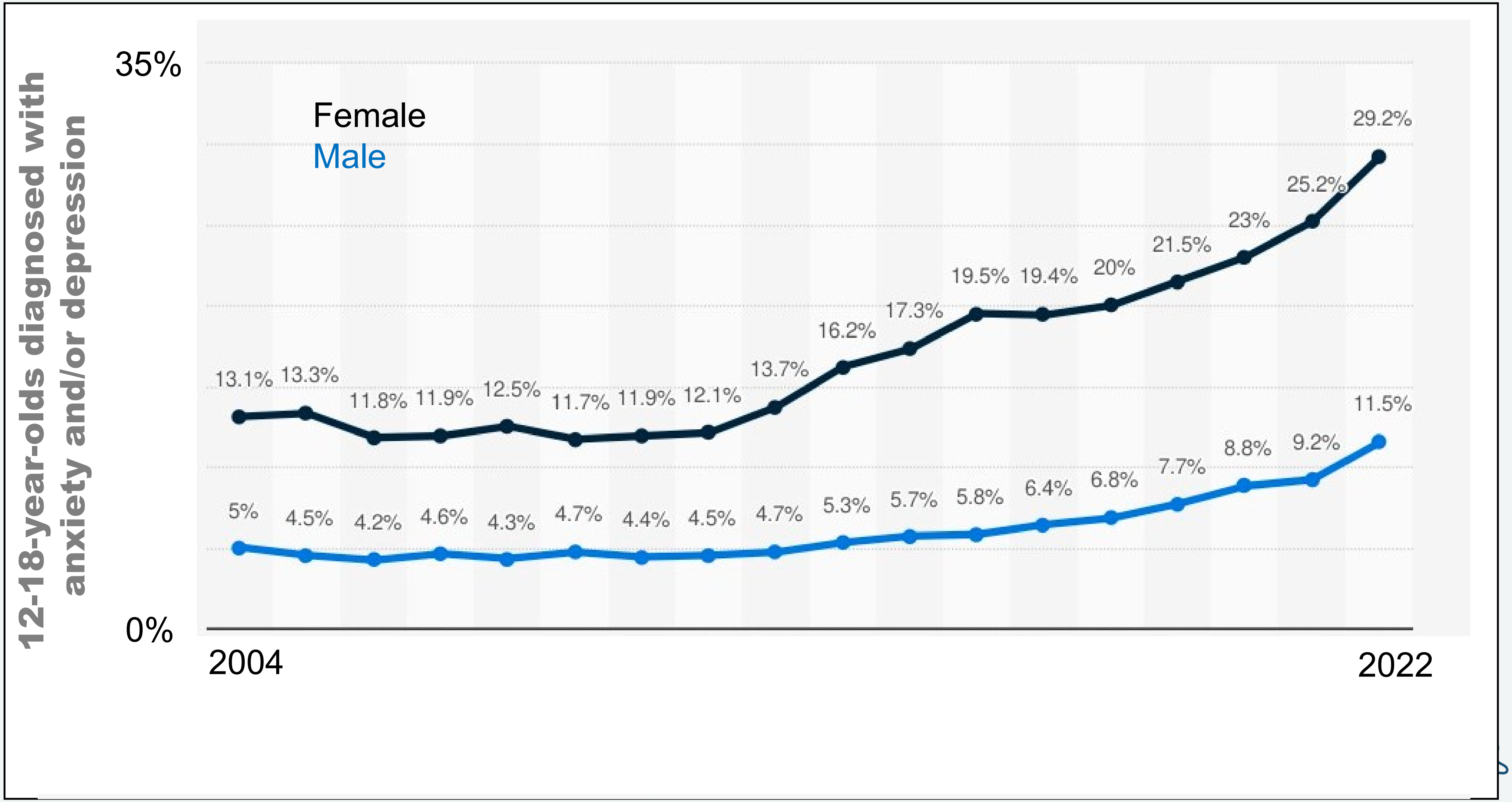
0:48 Social media ban 'a

0:59



INSTITUTE FOR THE SCIENCE
OF EARLY YEARS & YOUTH

Children are changing



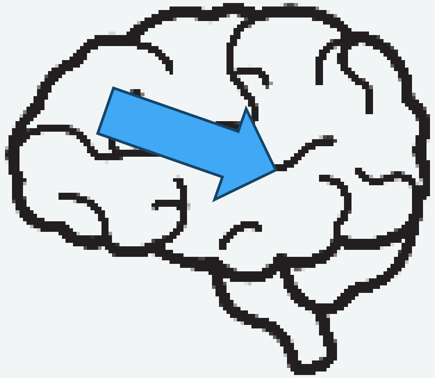
She didn’t understand what she was seeing, so what kept her watching?

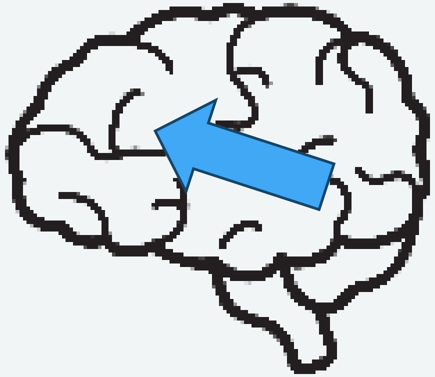
She didn’t understand what she was seeing, so what kept her watching?

Why did it make her ratty afterwards?

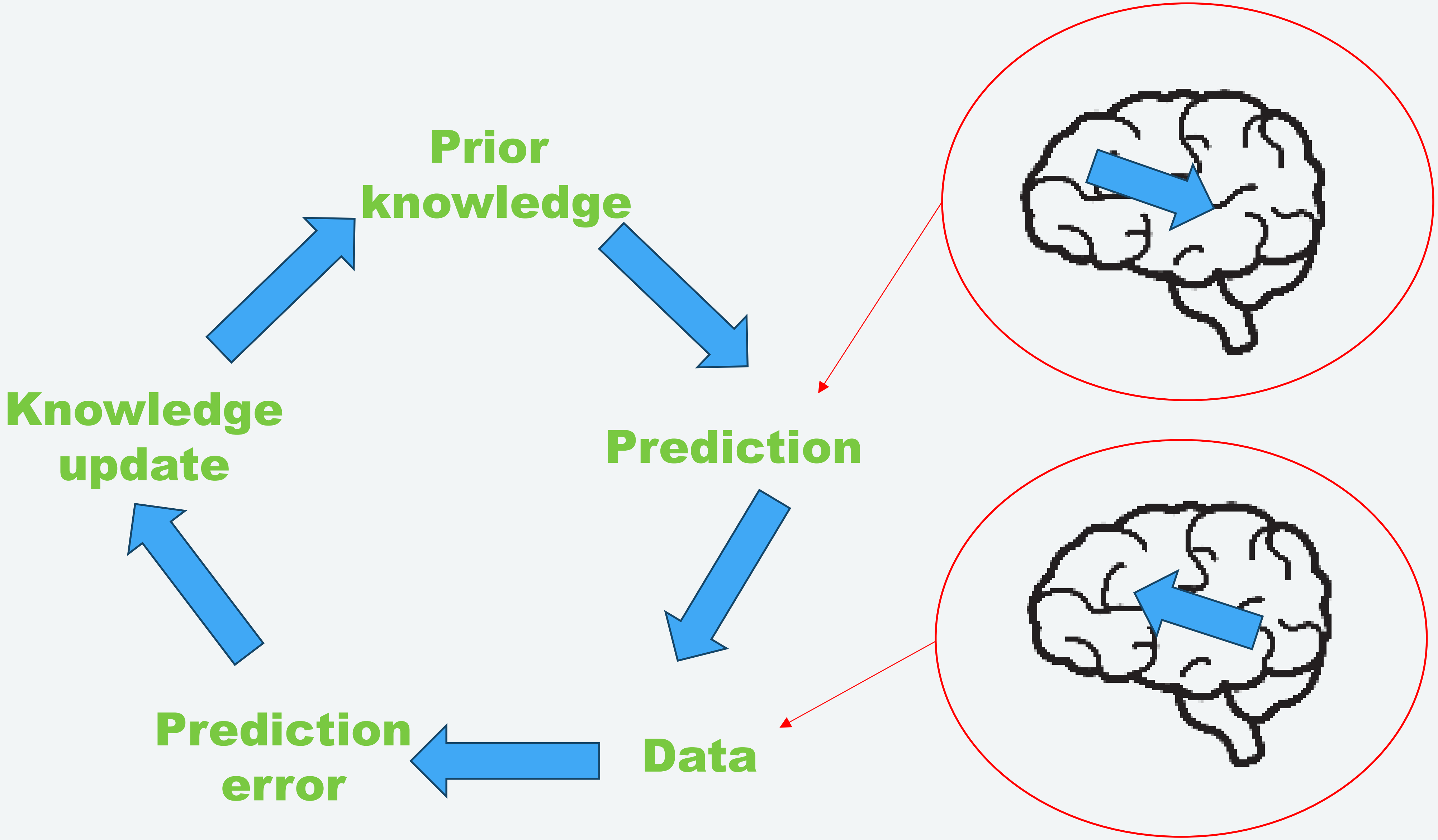
brainstorms in the brainstem

How all learning works

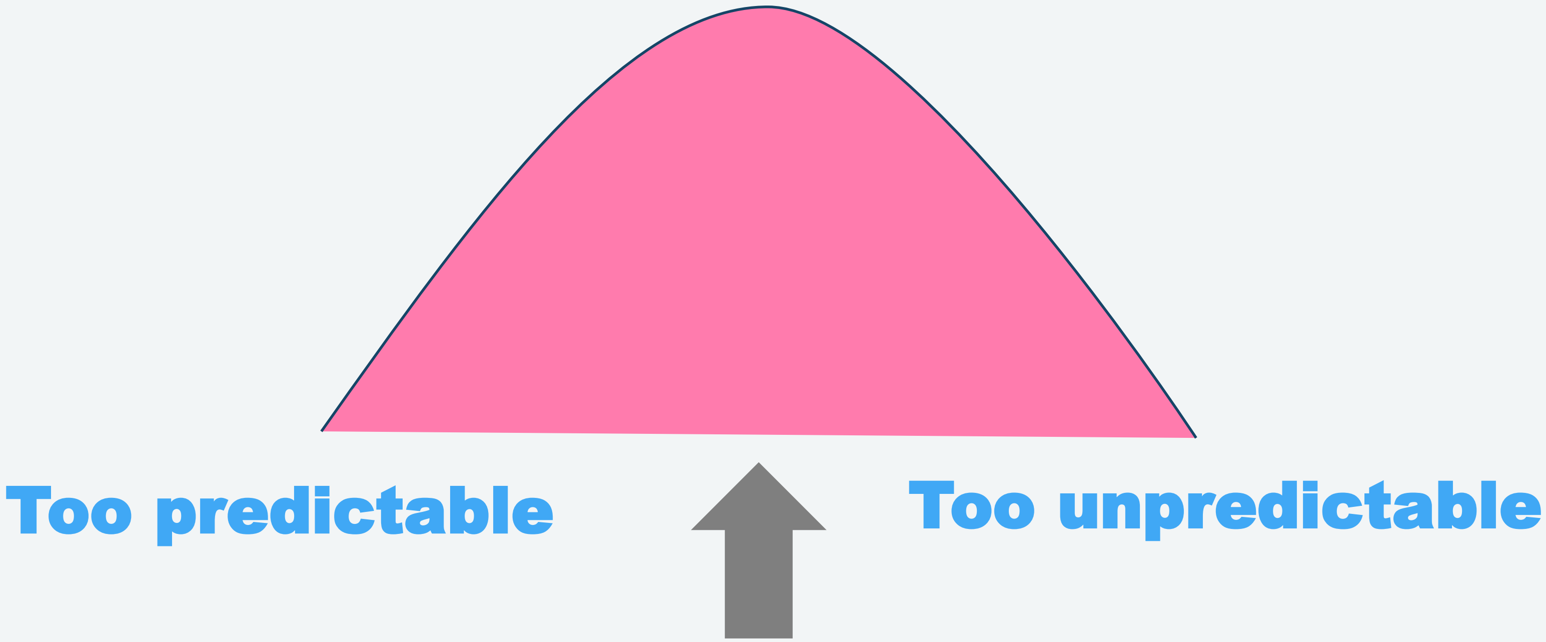




How all learning works



We learn best from situations where we can predict what will happen next **sometimes** but not **always**.



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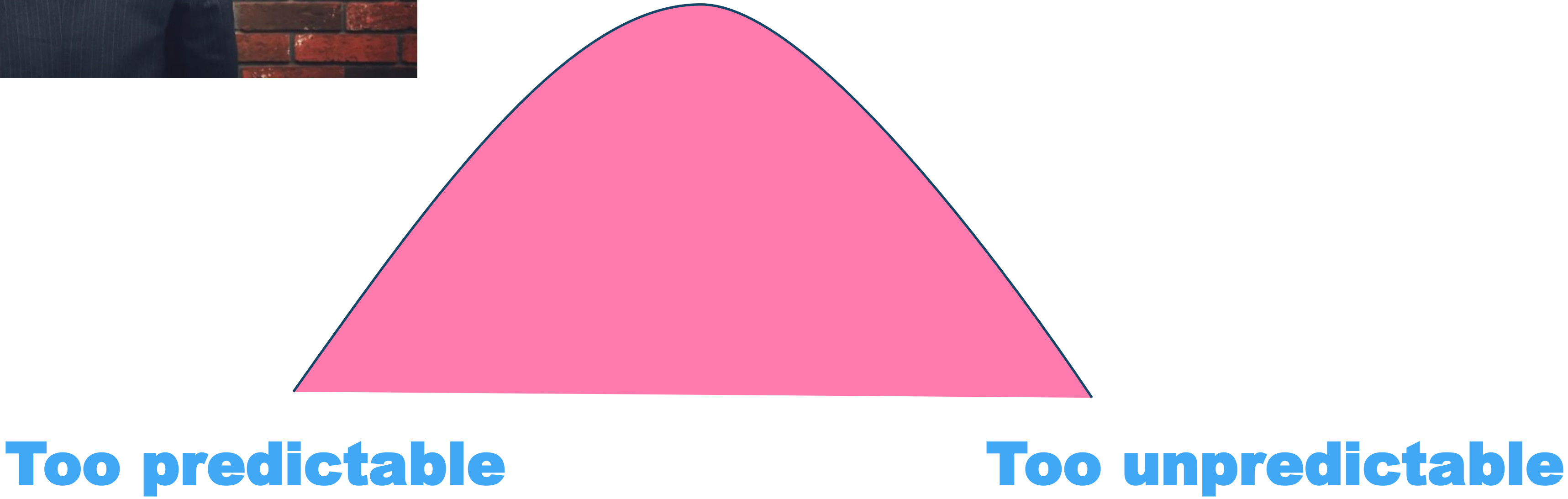
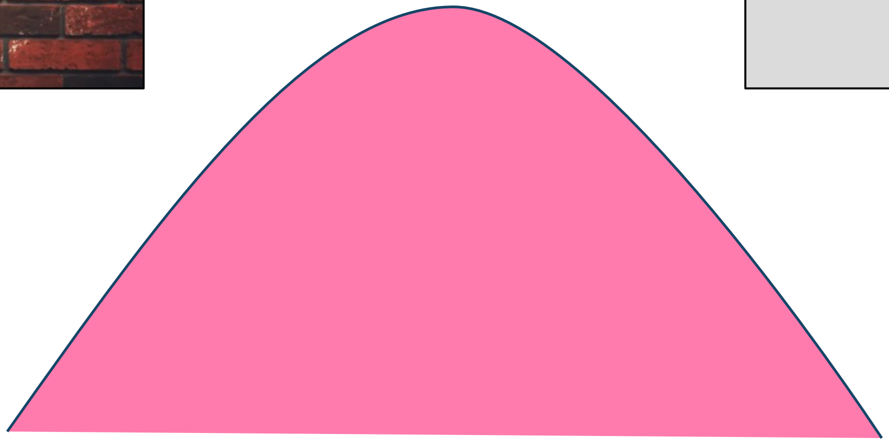


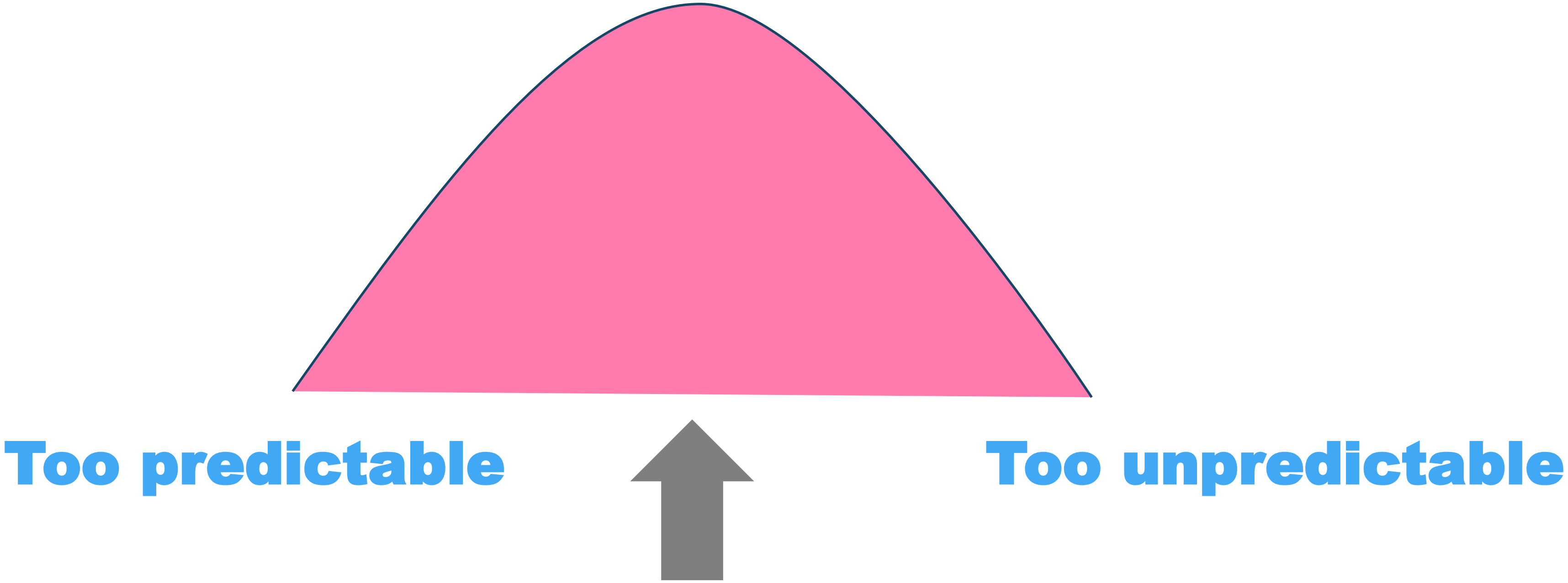
We learn best from situations where we can predict what will happen next sometimes but not always.

$$y = 1 - \frac{f^{n}\left[\frac{s \cdot l}{f} + \left(\frac{20}{f}\right)^{w}\right]}{20^{n}}$$

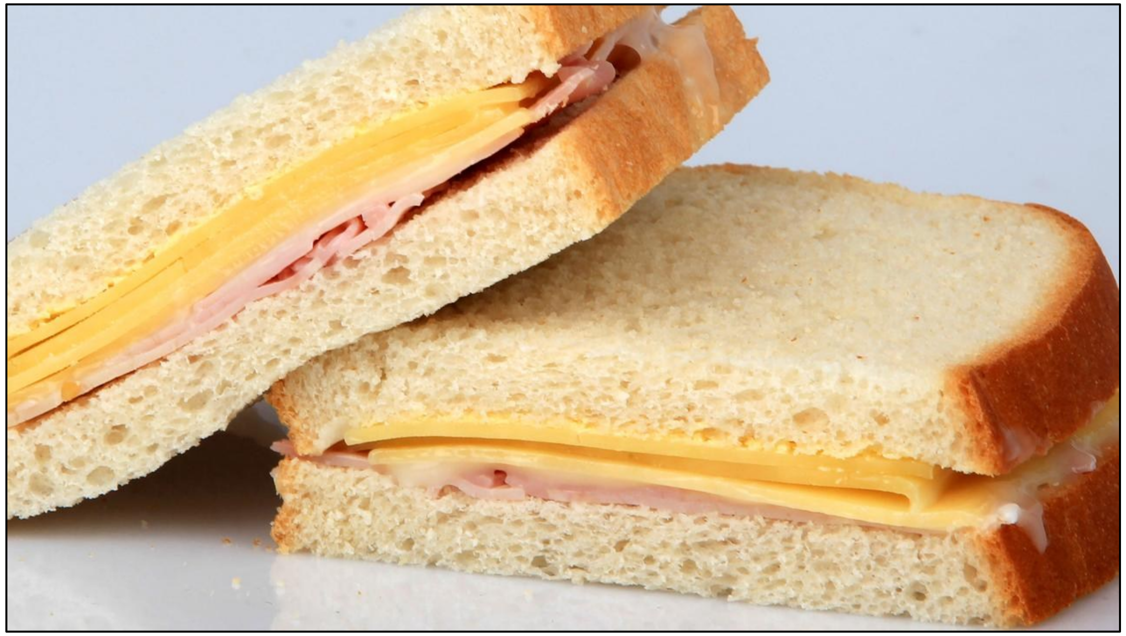


Too predictable **Too unpredictable**

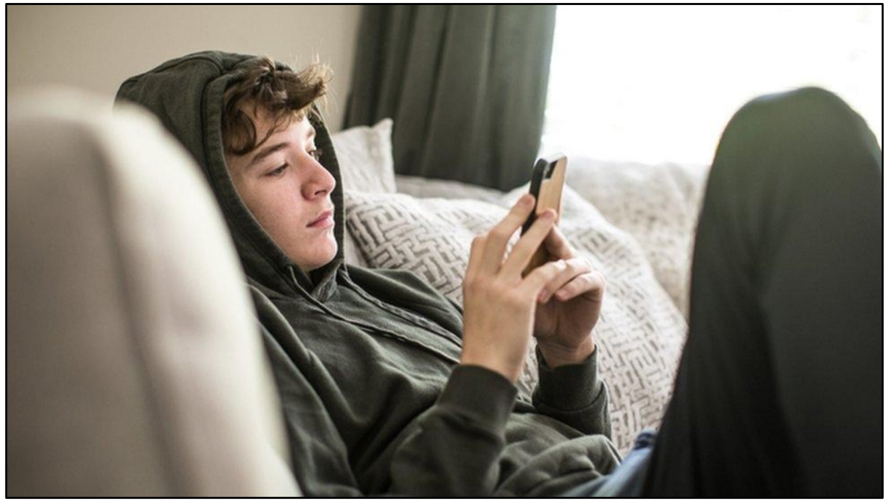
The Goldilocks zone



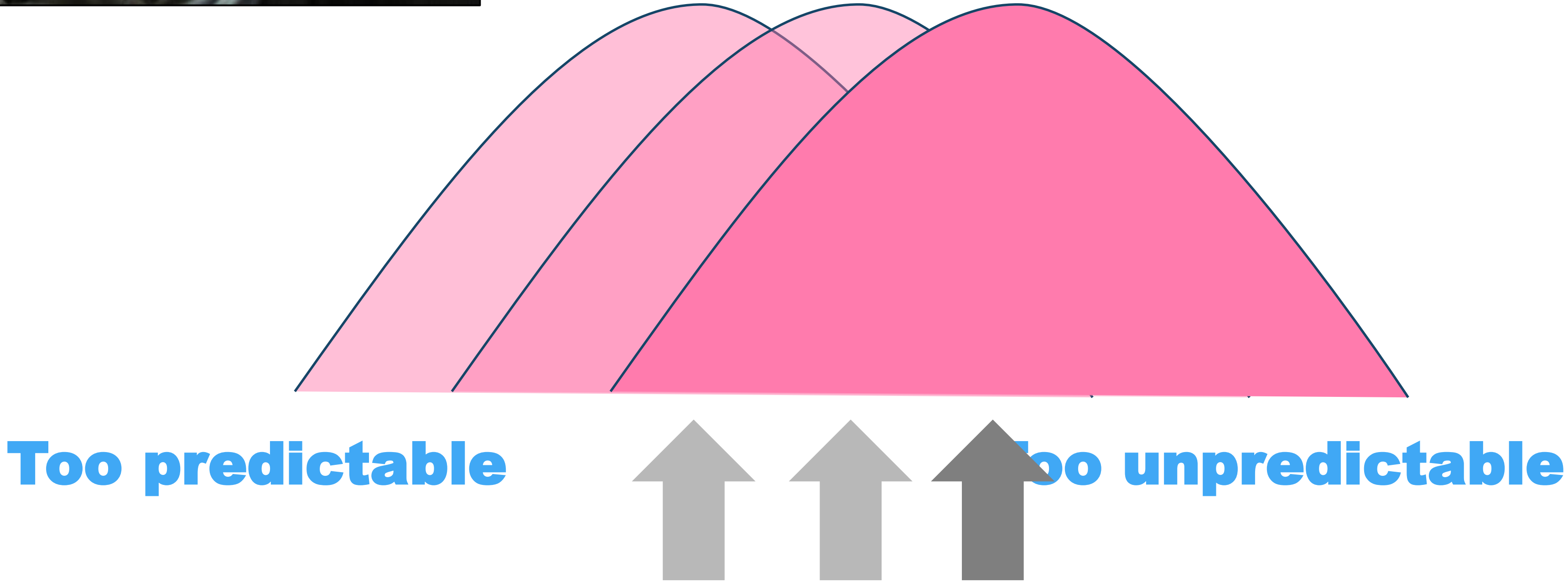
Young brains learn best from predictable experiences



Older brains learn best from unpredictability



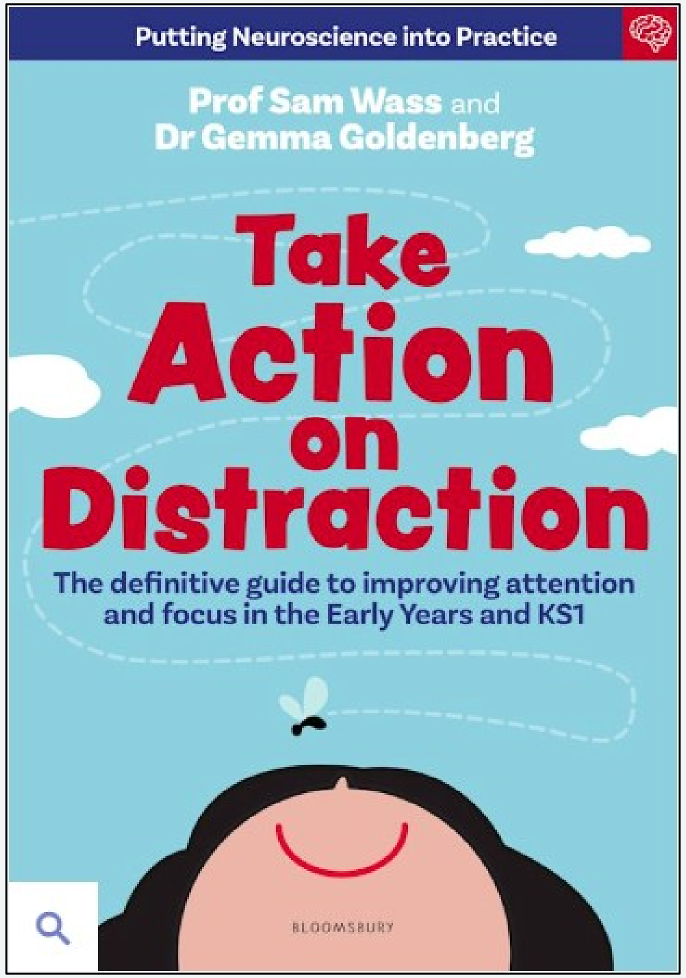
The Goldilocks zone keeps moving



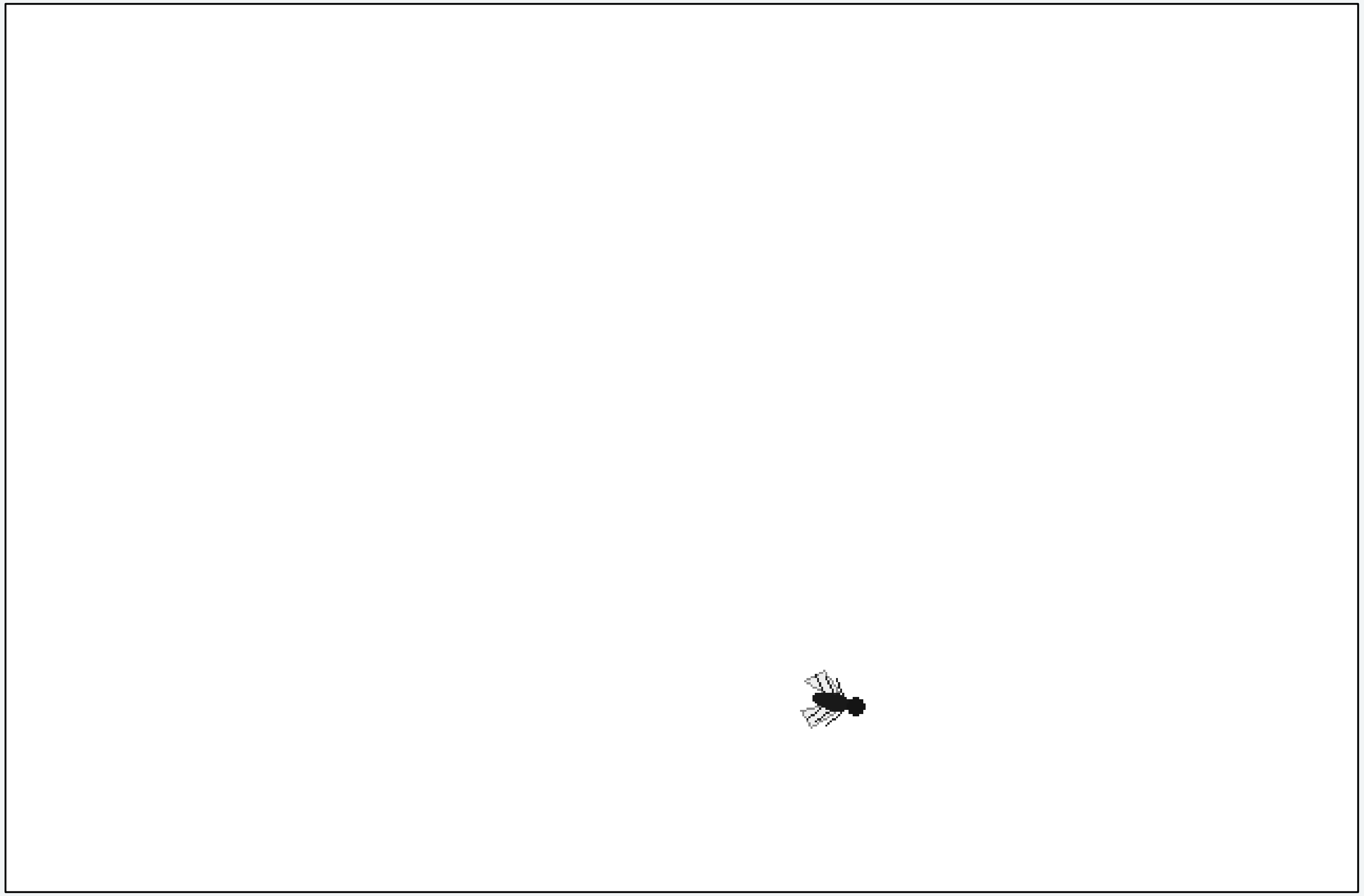
She didn’t understand what she was seeing, so why did she keep watching?

Why did it make her ratty afterwards?

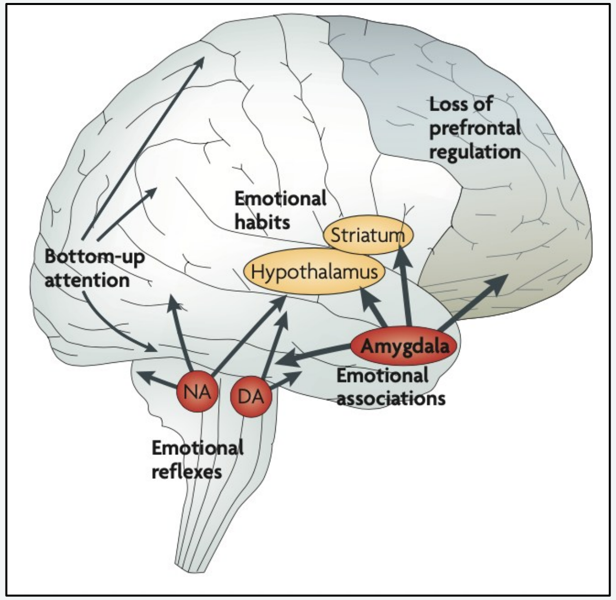
Attention capture

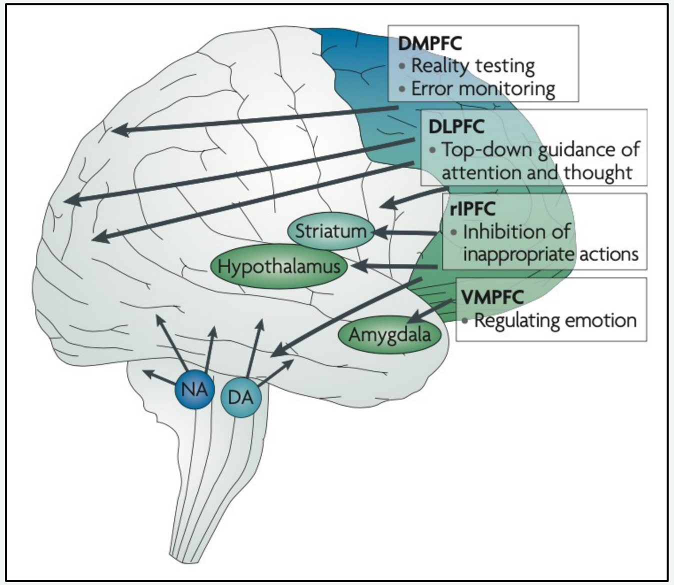


Attention capture



Attention capture





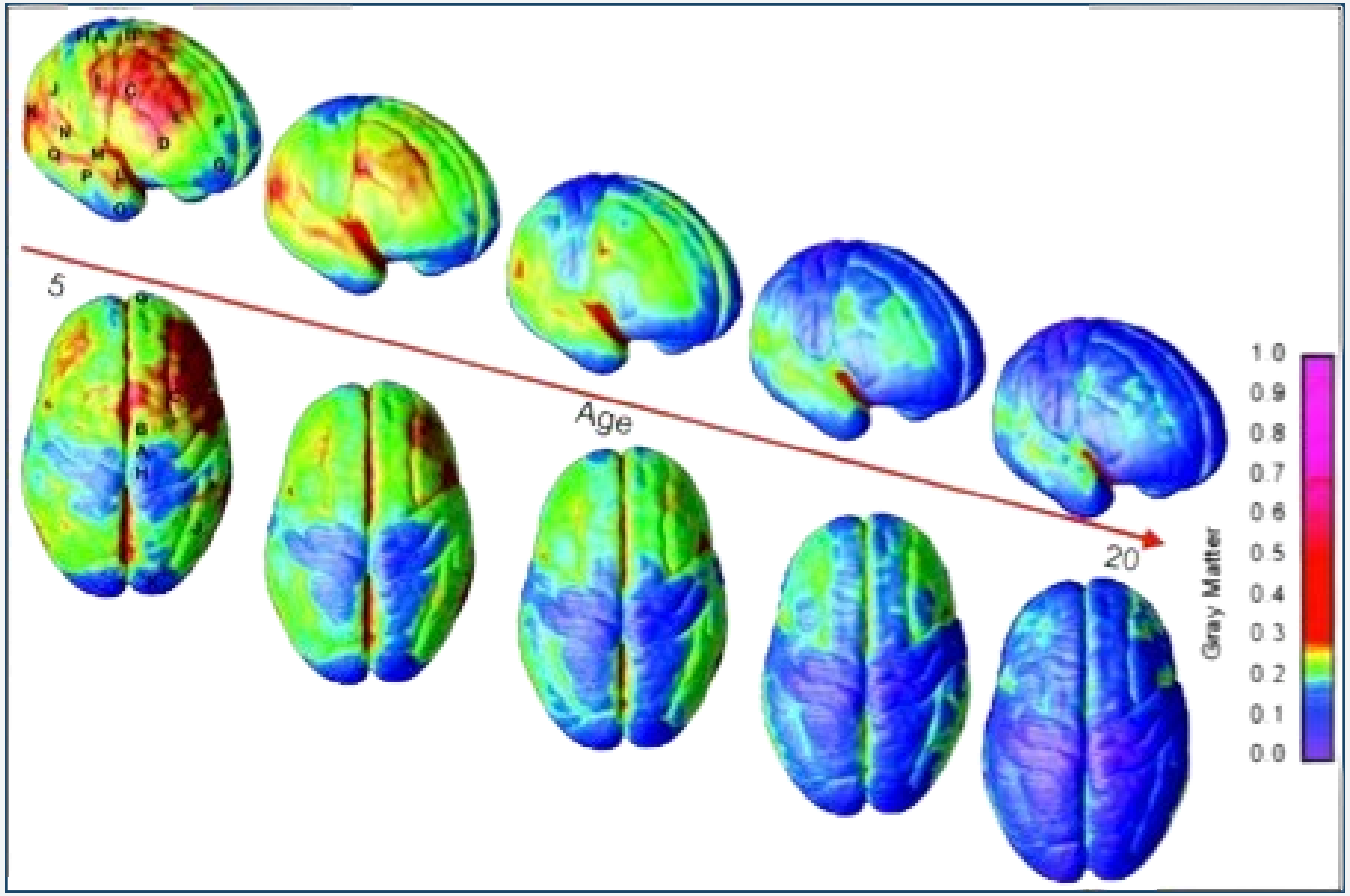
Attention capture

Attention control

Driven by what in the environment 'pulls our attention in'

Driven by what in the environment we want to pay attention to

Attention capture develops early



She didn’t understand what she was seeing, so why did she keep watching?

Why did it make her ratty afterwards?

When I can't predict what will happen next I go into high alert mode

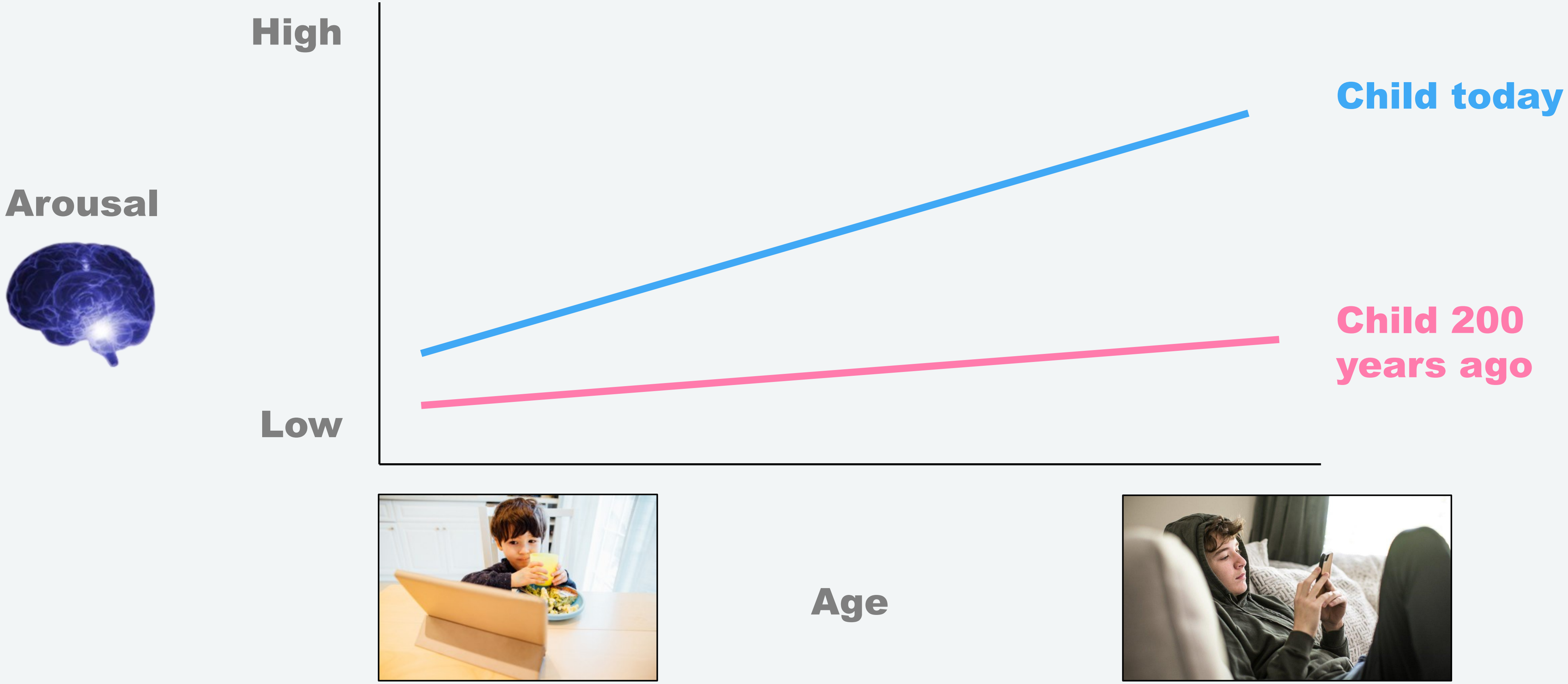
In high alert mode, attention capture increases

In high alert mode, attention capture increases

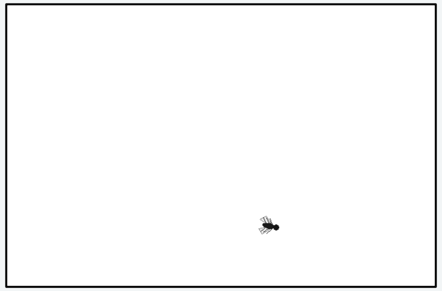
Drawn to movement/ complexity

High stimulation

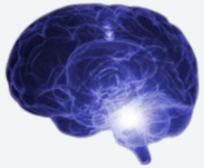
High arousal

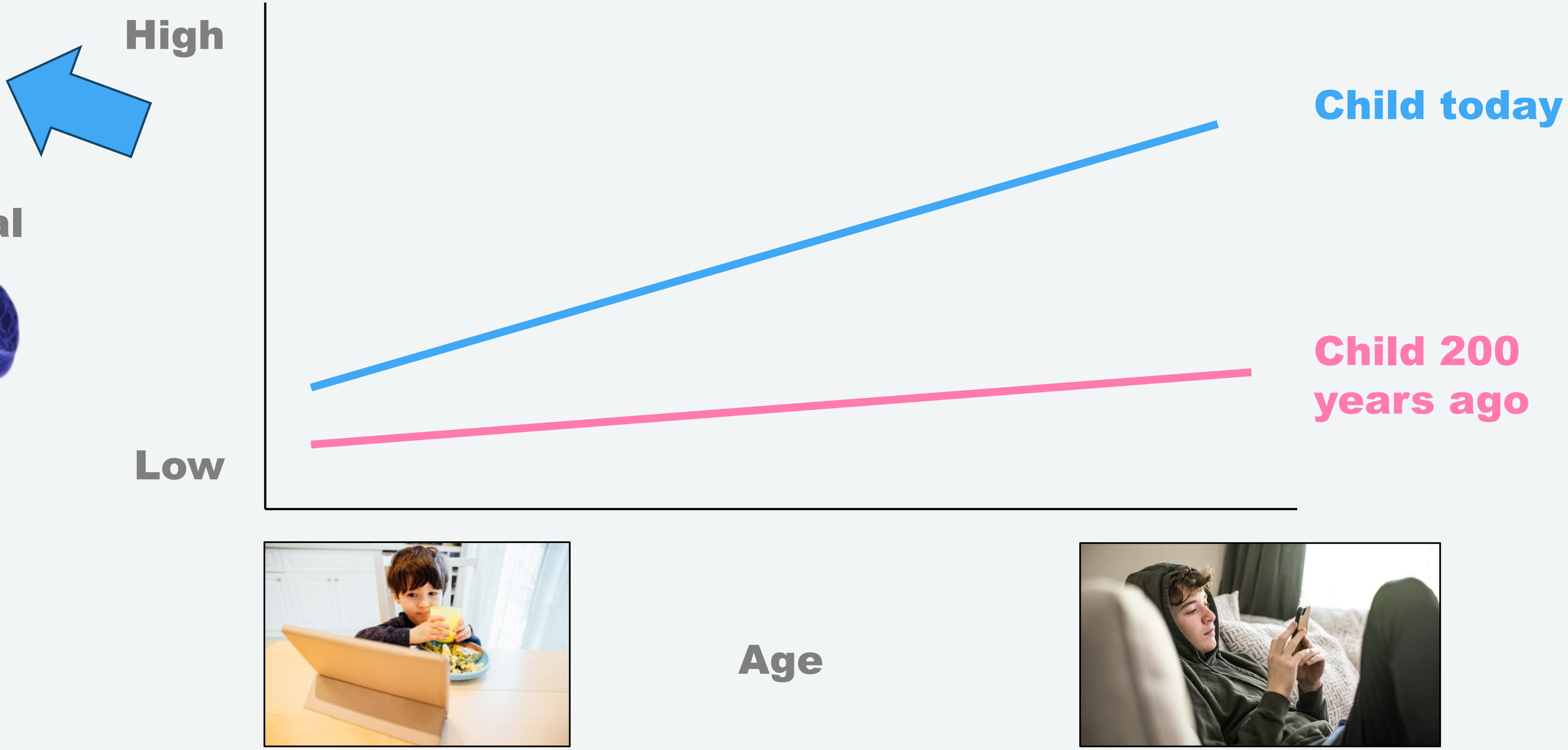

High
Child today
Arousal
Child 200 years ago
Low
Age

Attention capture



Arousal





What can we do to help?

Our brains are prediction machines

For everyone

Design environments that minimise attention capture

Visual noise

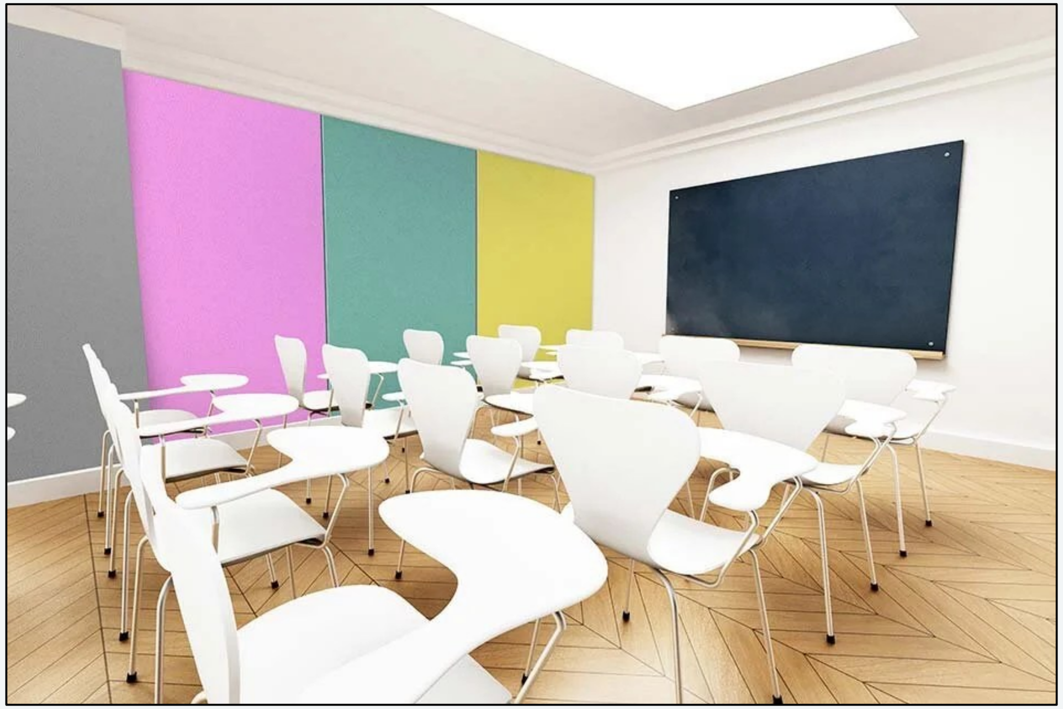
Not empty

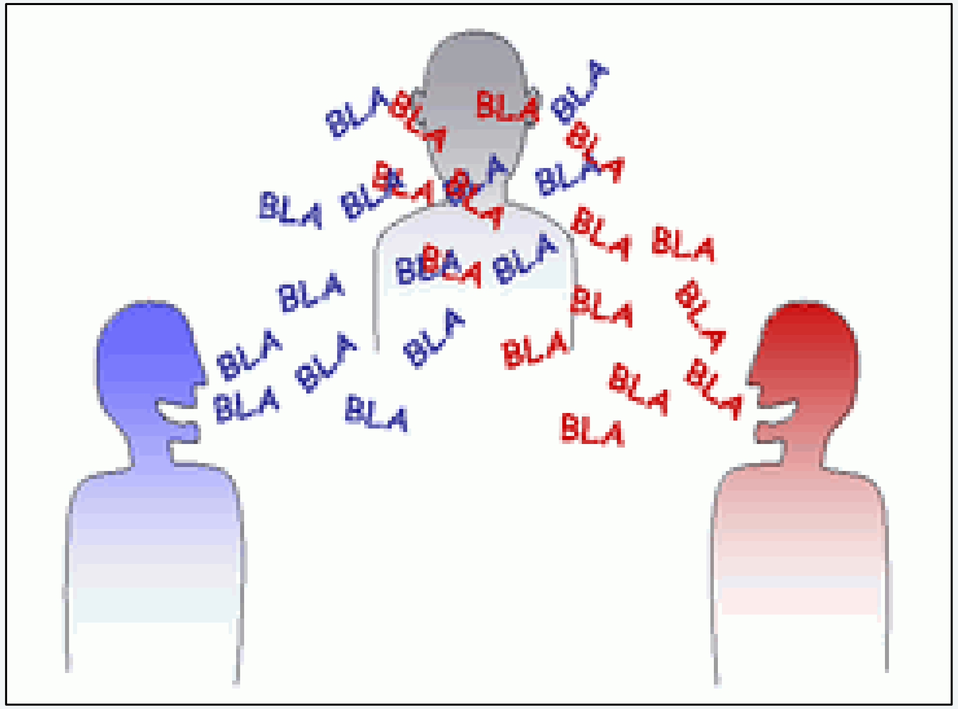
High signal to noise

For everyone

Design environments that minimise attention capture

Auditory noise





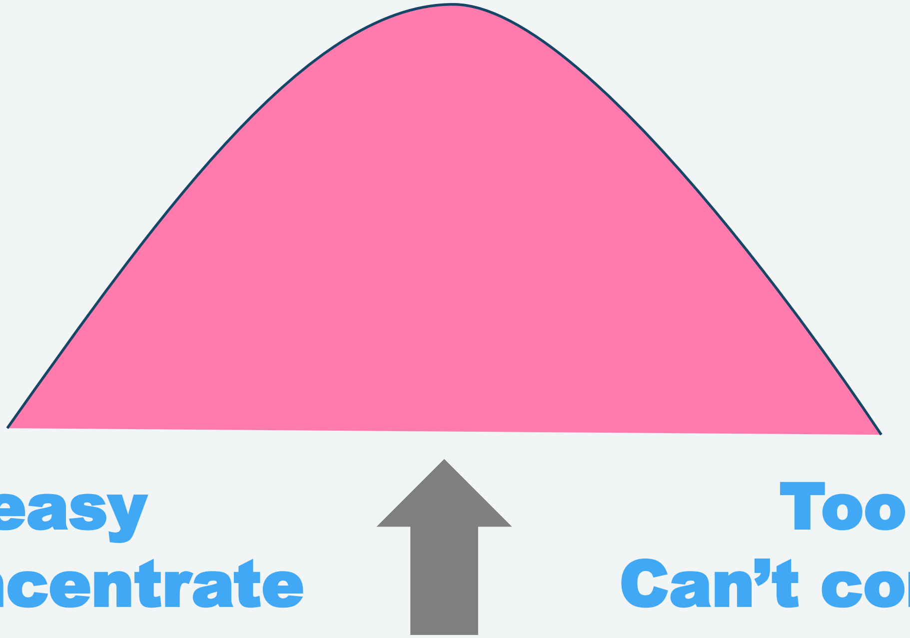
Not empty

High signal to noise

For everyone

Not too easy, not too hard

The Goldilocks zone

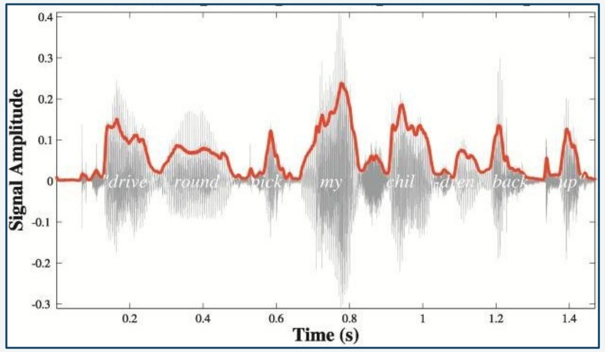


Too easy
Can't concentrate

Too hard
Can't concentrate

For young children

Repetition



Line 1

(u) u / u u / u u / / /

___ A mouse | took a stroll | through the deep | dark wood.

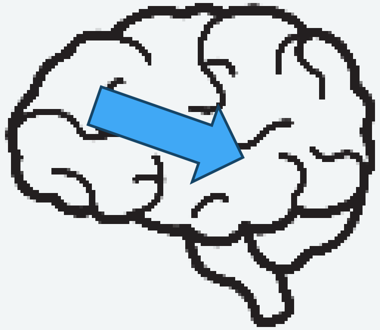
1 2 3 4

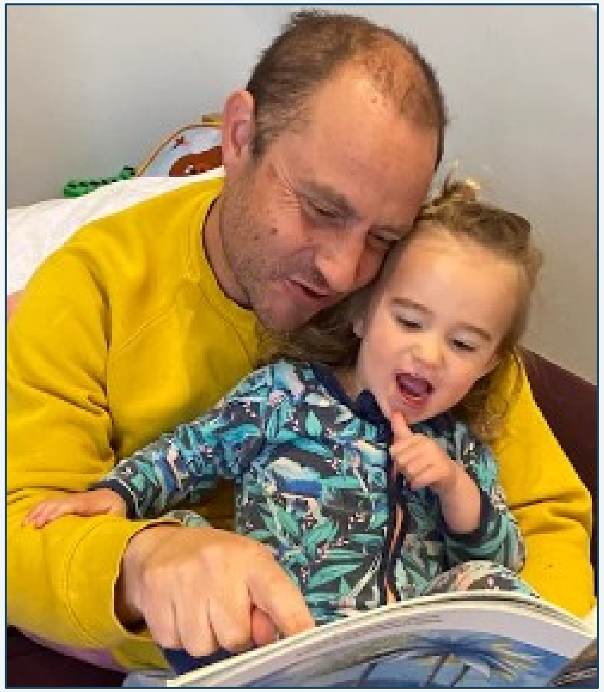
Line 2

(u) u / u u / u u / / /

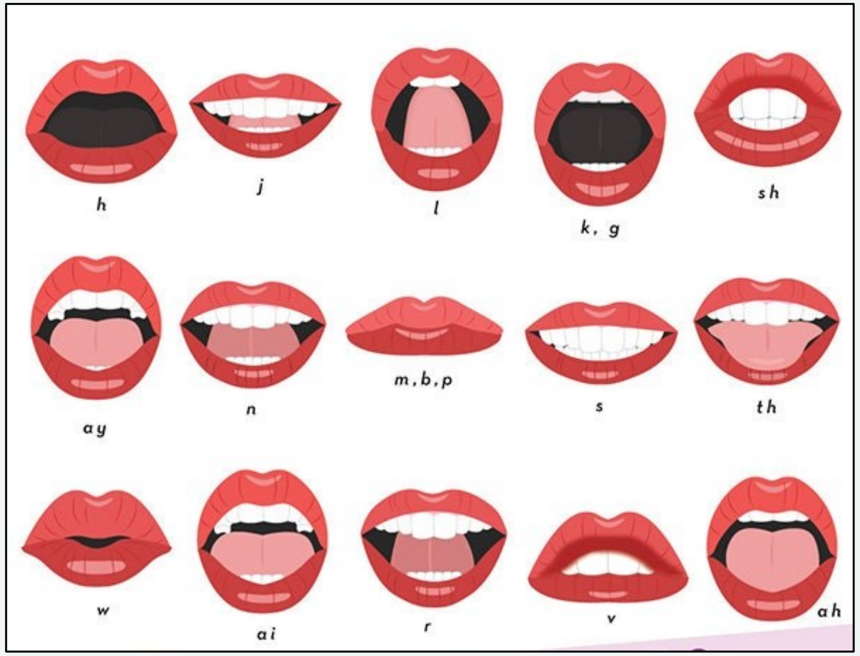
___ A fox | saw the mouse | and the mouse | looked good.

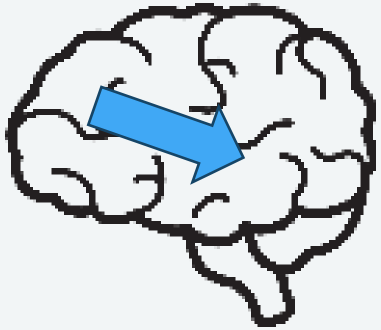
1 2 3 4





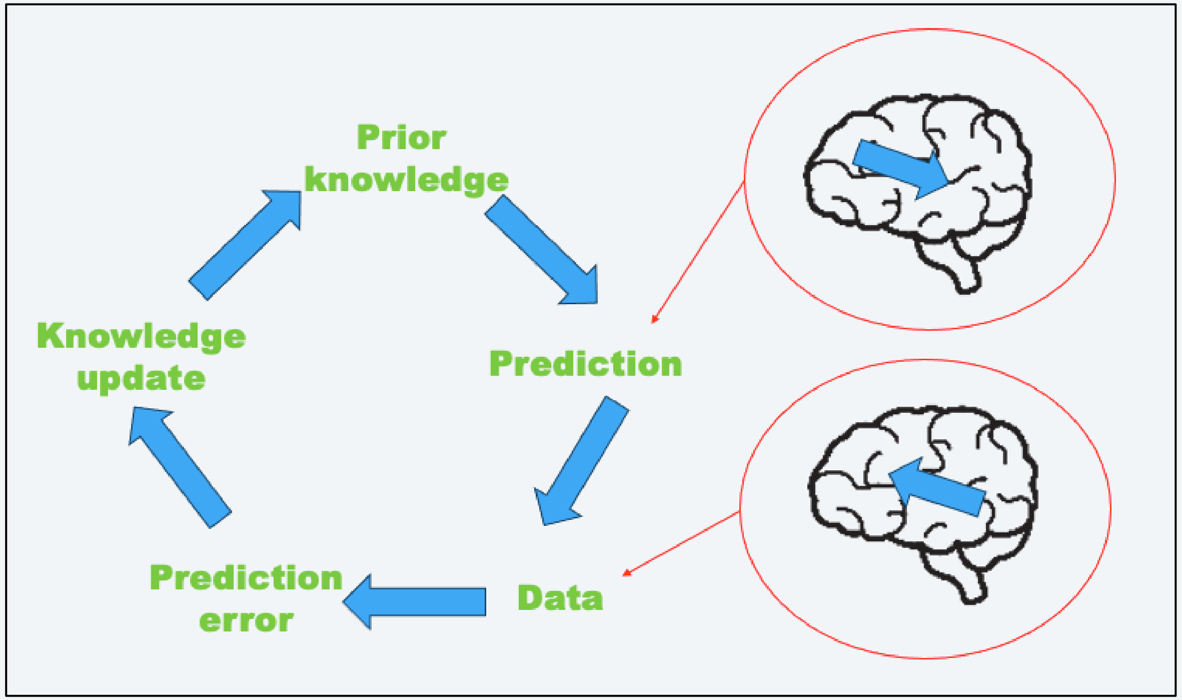
For young children
Be clear and predictable

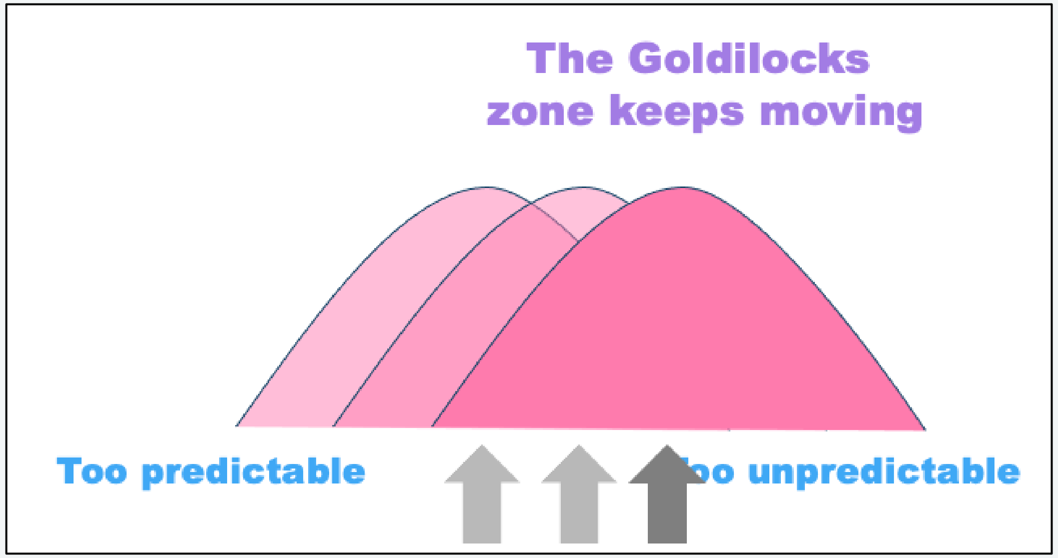




For older children

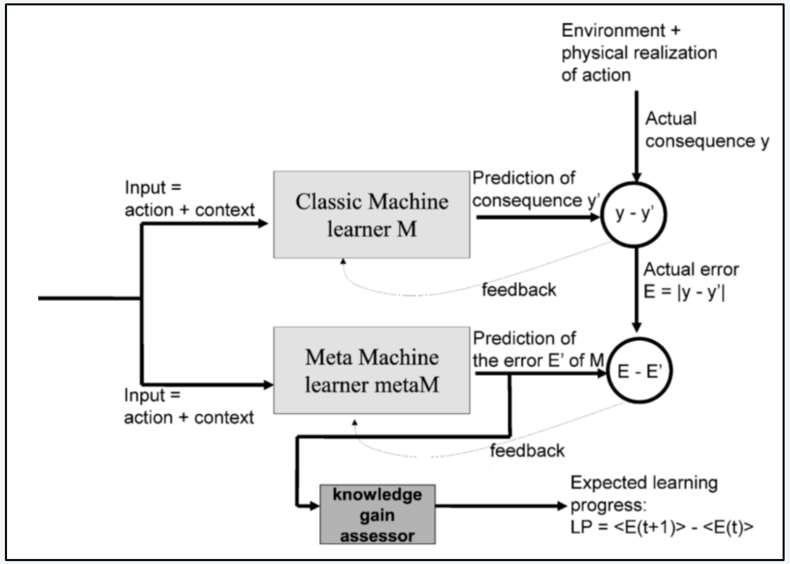
Encourage active, goal-directed media use





For older children

Encourage active, goal-directed media use



Intrinsic Motivation Systems for Autonomous Mental Development

Pierre-Yves Oudeyer, Frédéric Kaplan, and Verena V. Hafner

***Abstract*—Exploratory activities seem to be intrinsically rewarding for children and crucial for their cognitive development. Can a machine be endowed with such an intrinsic motivation system? This is the question we study in this paper, presenting a number of computational systems that try to capture this drive towards novel or curious situations. After discussing related research coming from developmental psychology, neuroscience, developmental robotics, and active learning, this paper presents the mechanism of Intelligent Adaptive Curiosity, an intrinsic motivation system which pushes a robot towards situations in which it maximizes its learning progress. This drive makes the robot focus on situations which are neither too predictable nor too unpredictable, thus permitting autonomous mental development. The complexity of the robot's activities autonomously increases and complex developmental sequences self-organize without being constructed in a supervised manner. Two experiments are presented illustrating the stage-like organization emerging with this mechanism. In one of them, a physical robot is placed on a baby play mat with objects that it can learn to manipulate. Experimental results show that the robot first spends time in situations which are easy to learn, then shifts its attention progressively to situations of increasing difficulty, avoiding situations in which nothing can be learned. Finally, these various results are discussed in relation to more complex forms of behavioral organization and data coming from developmental psychology.**

***Index Terms*—Active learning, autonomy, behavior, complexity, curiosity, development, developmental trajectory, epigenetic robotics, intrinsic motivation, learning, reinforcement learning, values.**

I. THE CHALLENGE OF AUTONOMOUS MENTAL DEVELOPMENT

ALL humans develop in an autonomous open-ended manner through lifelong learning. So far, no robot has this capacity. Building such a robot is one of the greatest challenges to robotics today, and is the long-term goal of the growing field of developmental robotics [1], [2]. This paper explores a possible route towards such a goal. Our approach is inspired by developmental psychology and our ambition is to build systems featuring some of the fundamental aspects of an infant's development. More precisely, two remarkable properties of human infant development inspire us.

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Color versions of one or more of the figures in this paper are available online at http://ieeexplore.ieee.org.

Digital Object Identifier 10.1109/TEVC.2006.890271

A. Development is Progressive and Incremental

First of all, development involves the progressive increase of the complexity of the activities of children with an associated increase of their capabilities. Moreover, infants' activities always have a complexity which is well-fitted to their current capabilities. Children undergo a developmental sequence during which each new skill is acquired only when associated cognitive and morphological structures are ready. For example, children first learn to roll over, then to crawl and sit, and only when these skills are operational, they begin to learn how to stand. Development is progressive and incremental. Taking inspiration from these observations, some roboticists argue that learning a given task could be made much easier for a robot if it followed a developmental sequence (e.g., "learning form easy mission" [3]). However, very often, the developmental sequence is crafted by hand: roboticists manually build simpler versions of a complex task and put the robot successively in versions of the task of increasing complexity. For example, if they want to teach a robot the grammar of a language, they first give it examples of very simple sentences with few words, and progressively they add new types of grammatical constructions and complications such as nested subordinates [4]. This technique is useful in many cases, but has shortcomings which limit our capacity to build robots that develop in an open-ended manner. Indeed, this is not practical. For each task that one wants the robot to learn, one has to design versions of this task of increasing complexity, and one also has to design manually a reward function dedicated to this particular task. This might be all right if one is interested in only one or two tasks, but a robot capable of lifelong learning should eventually be able to perform thousands of tasks, and even if one would engage in such a daunting task of manually designing thousands of specific reward functions, there is another limit. The robot is equipped with a learning machine whose learning biases are often not intuitive: this means that it is also conceptually difficult most of the time to think of simpler versions of a task that might help the robot. It is often the case that a task that one considers to be easier for a robot might turn out in fact to be more difficult.

B. Development is Autonomous and Active

This leads us to a second property of child development from which we should be inspired: it is autonomous and active. Of course, adults help by scaffolding children's environment, but this is just a help. Eventually, they decide by themselves what they do, what they are interested in, and what their learning situations are. They are not forced to learn the tasks suggested by adults, and they can invent their own. Thus, they construct by themselves their developmental sequence. Anyone who has ever played with an infant in its first year knows, for example, that it is extremely difficult to get the child to play with a toy that is

Dopamine-based, curiosity-driven learning

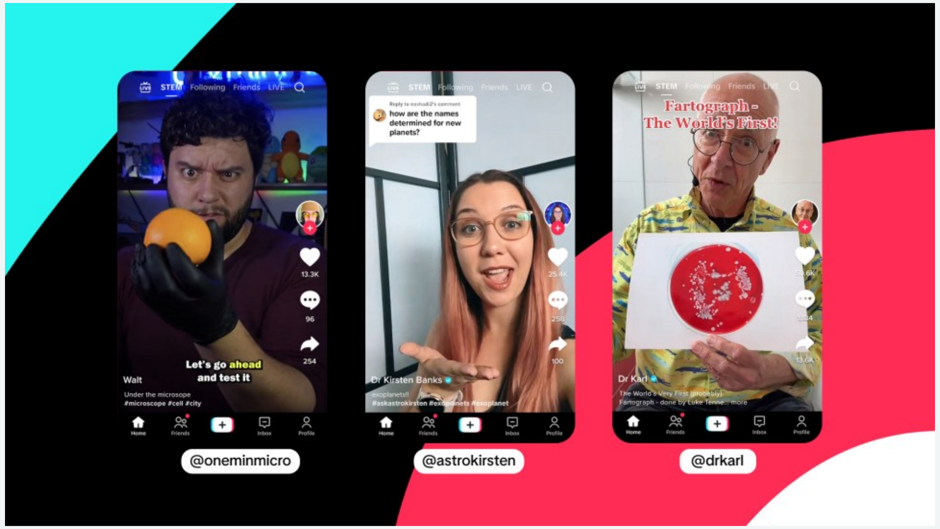
For older children

Encourage active, goal-directed media use

Useful for school

Builds on my knowledge of y

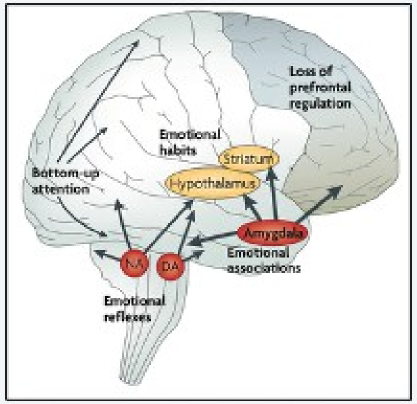
Builds on my knowledge of x

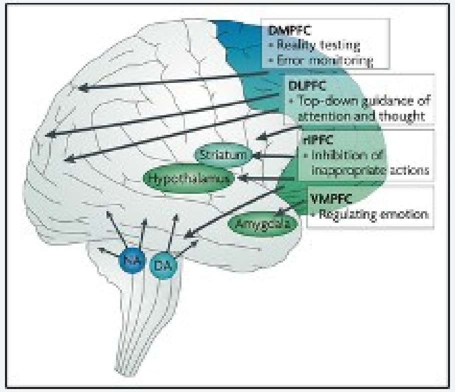


My friends might find funny

~~Dopamine-based, curiosity-driven learning~~

Too many decision criteria





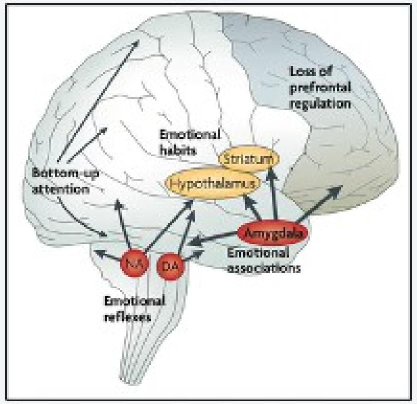
Attention capture

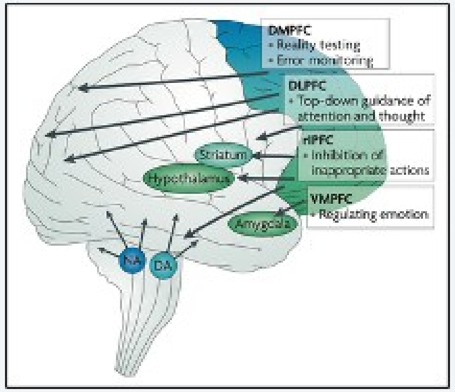
Attention control

Driven by what in the environment 'pulls our attention in'

Driven by what in the environment we want to pay attention to

Passive browsing
Driven by attention capture
No clear aims
Self-regulation through stimulation





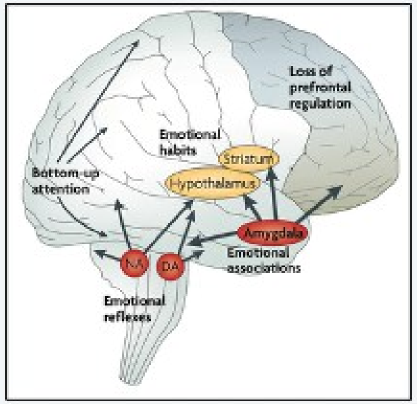
Attention capture

Driven by what in the environment 'pulls our attention in'

Attention control

Driven by what in the environment we want to pay attention to

Active
Curiosity-based learning
Long-term goal setting



Attention capture

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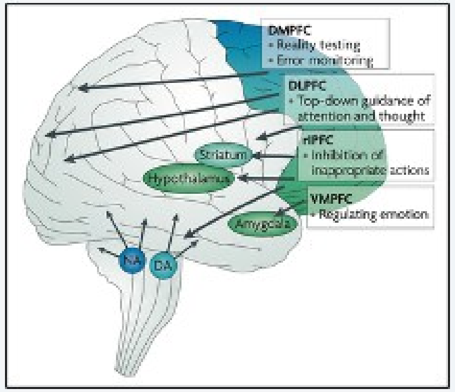
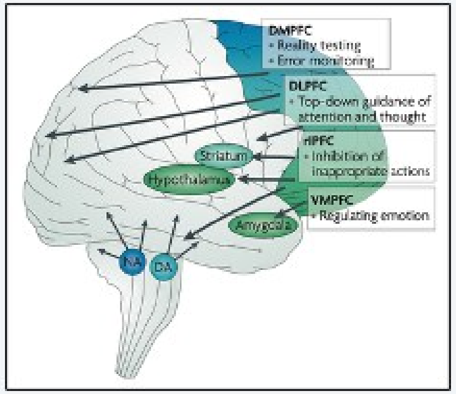


Attention control

Driven by what in the environment we want to pay attention to

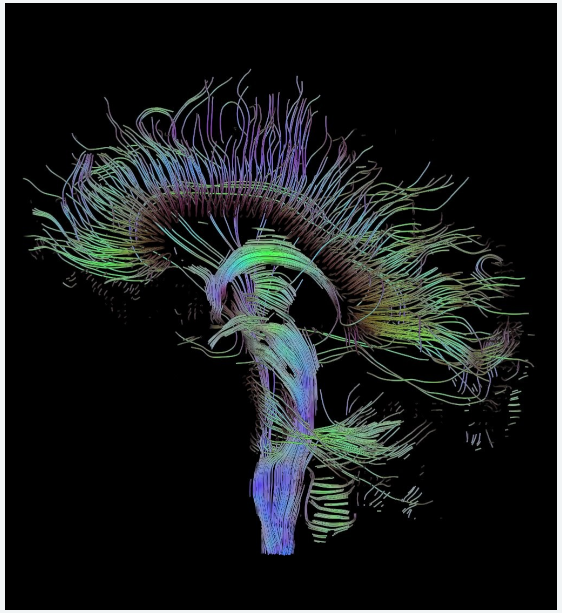
For older children
Encourage active, goal-directed media use

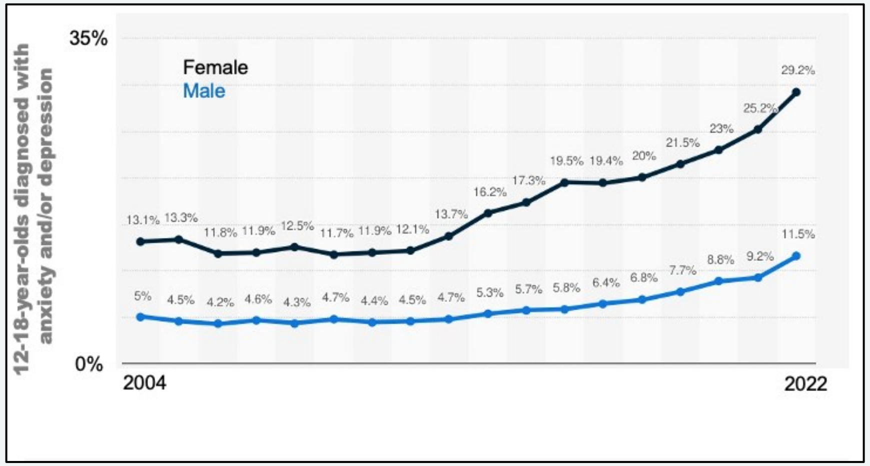


Students analyse a short video that makes a factual claim.
Watch 10 videos and classify each:

TikTok claim	What evidence would support it?	Best source to check
“Medieval people never drank water”	Historical records of diet, brewing, sanitation	Museum, historian, academic article
“This plant removes toxins from your room”	Controlled air-quality studies	Scientific review
“This study proves phones destroy attention”	Actual paper, sample size, measure, causal design	Journal article

Childhood is changing
Children are changing



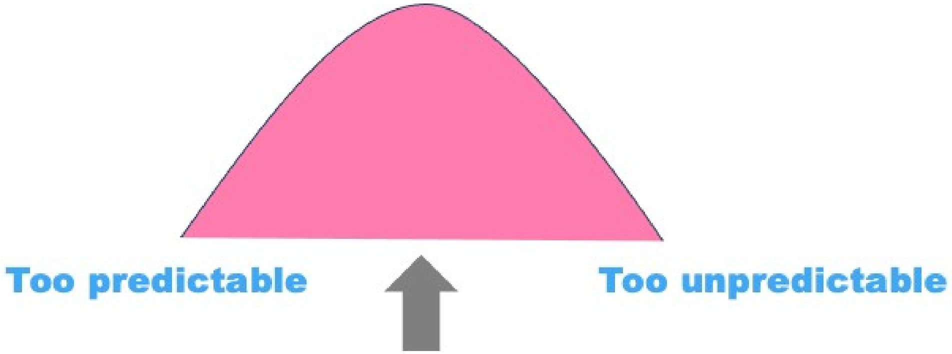


Everybody learns best when they can predict what will happen sometimes, but not always

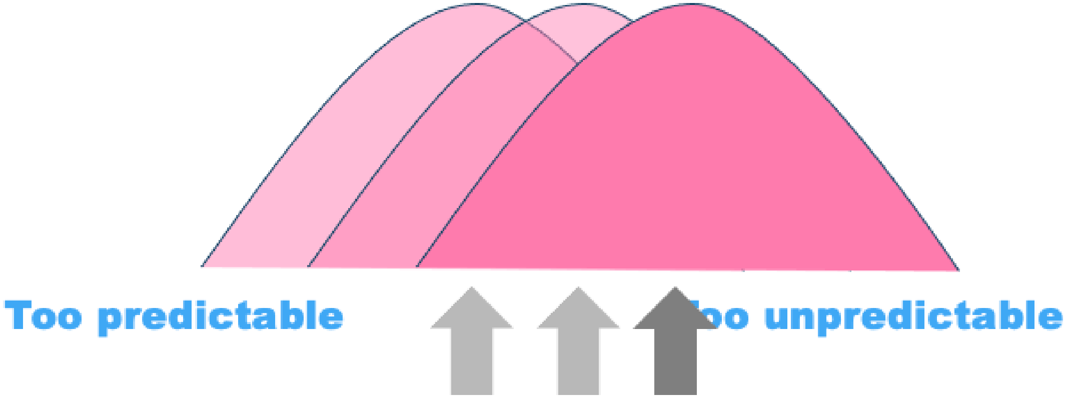
Young brains learn best from predictability

Older brains learn better from unpredictability

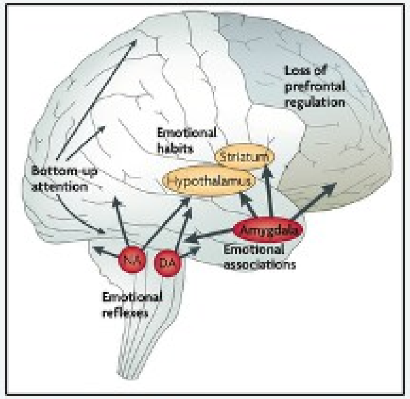
The Goldilocks zone



The Goldilocks zone keeps moving

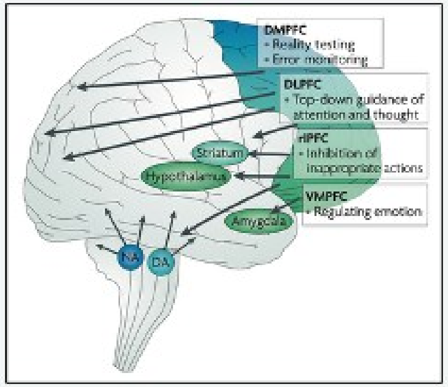


Screens capture attention through movement
Unpredictable movement increases arousal
High arousal increases attention capture



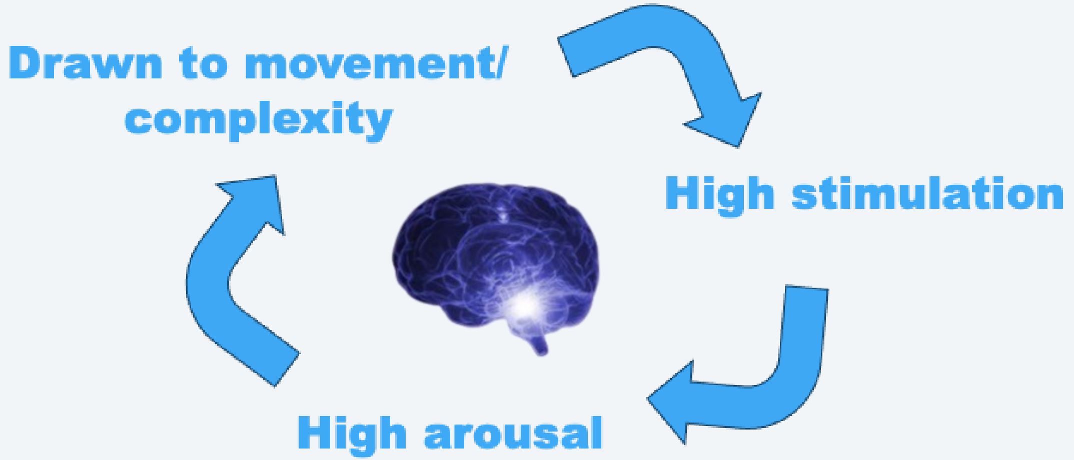
Attention capture

Driven by what in the environment 'pulls our attention in'



Attention control

Driven by what in the environment we want to pay attention to



What can we do to help?

For everyone

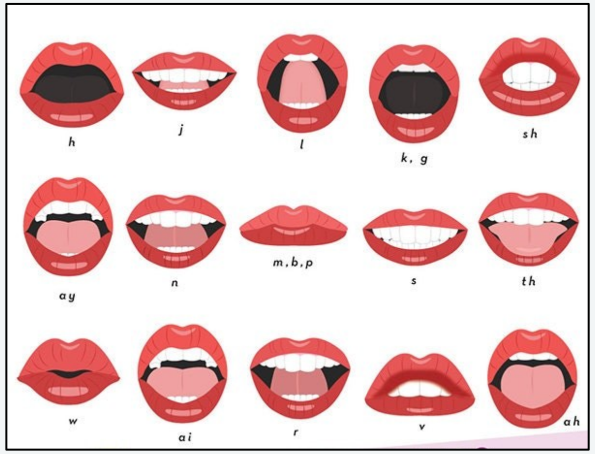
Design environments that minimise attention capture

Visual noise/Auditory noise

High signal to noise

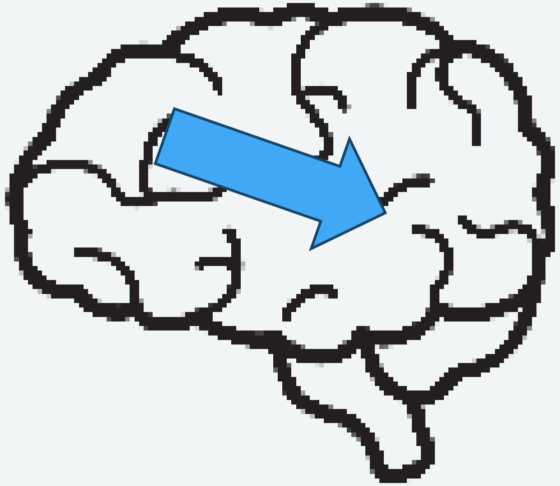
Not too easy, not too hard

For young children



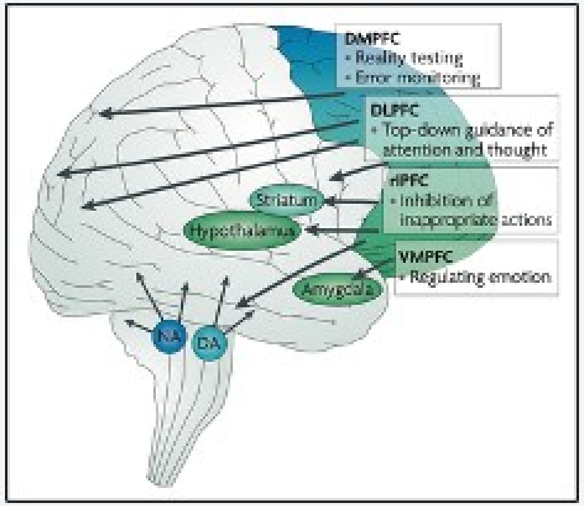
Repetition

Be clear and predictable



For older children

Encourage active, goal-directed media use



THANK YOU!

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