











Sablé-Meyer et al. (2022) found that adults' reaction times and error rates in match-to-sample tasks were **predicted by the minimum description length (MDL)** of the shape's LOT program

This **fuses two features of geometric shape representations** that are partly independent, format (LOT) and selection (MDL), and uses MDL data to argue for LOT—Highly indirect evidence

We report more **direct evidence for tree structure in geometric shape representations** from three online experiments with adults

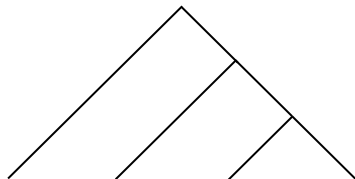
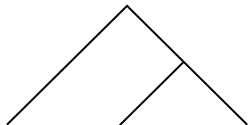
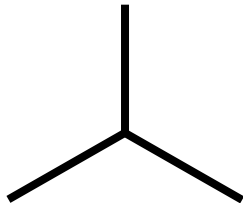
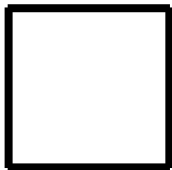
**Geometric shape representations in human adults  
have syntactic structure**

**Barbu Revençu and Stanislas Dehaene**

**NeuroSpin Cognitive Neuroimaging Unit | CEA | INSERM | Université Paris-Saclay**



**trace**  
segment



**repeat**  
4 times    **trace**  
segment    **turn**  
90°

**repeat**  
3 times    **execute**  
& **return**    **trace**  
segment    **turn**  
120°



Different structured representations can be induced for the same shape

# Samples

# Targets

Shape

Structure

Matches

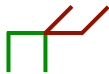
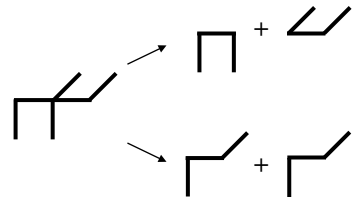
Deviants

Congruent

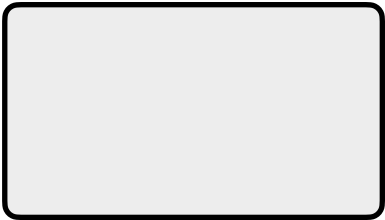
Incongruent

Modified  
congruent

Modified  
incongruent



# Experiment 1: Structural Ambiguity





# Background

We build on the recent proposal that **geometric shapes are represented in a language of thought (LOT) consisting of a handful of primitives that combine to recreate the encoded shape** (Sablé-Meyer et al. 2022)

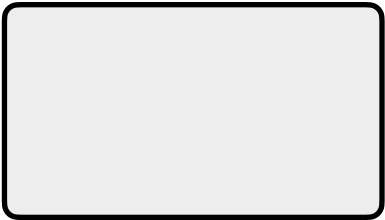


Subparts are easier to recognize when they belong to the same subtree

# Experiment 2: Subtree Facilitation

# Experiment 3: Movement Depth

Shapes are easier to reconfigure when they  
are split higher up in the tree



# Samples

# Targets

Shape

Structure

Overlap

Matches

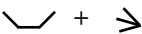
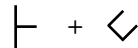
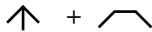
Deviants

Same  
subtree

Different  
subtrees

Rotated  
same

Rotated  
different











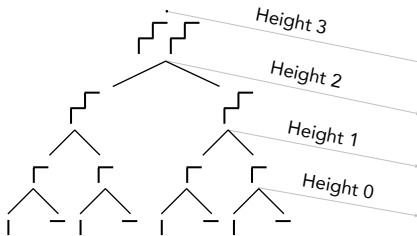


# Samples

Shape



Structure



# Targets

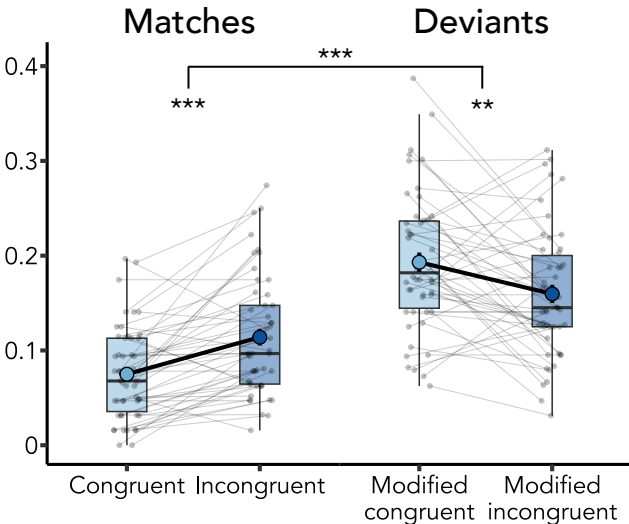
Matches

Tree preserved	Tree broken

Deviants

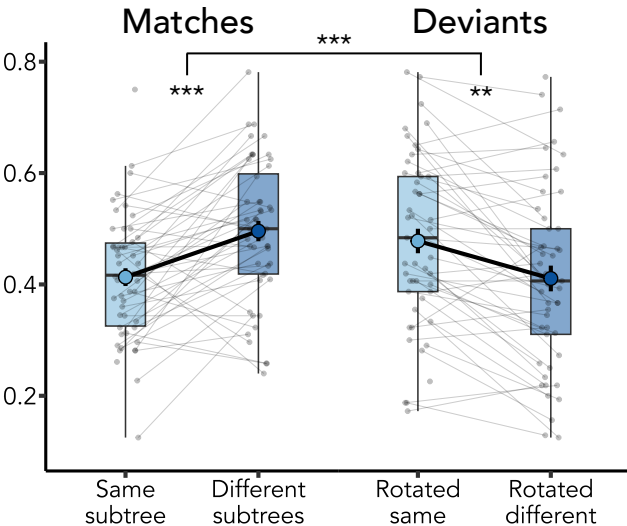
Tree preserved	Tree broken

# Error rates



50 subjects  
16 shapes  
256 trials  
Within-subjects

# Error rates

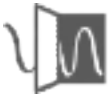


50 subjects

16 shapes

128 trials

Within-subjects



**NeuroSpin**

cea



**Insertm.**





**Fysssen**



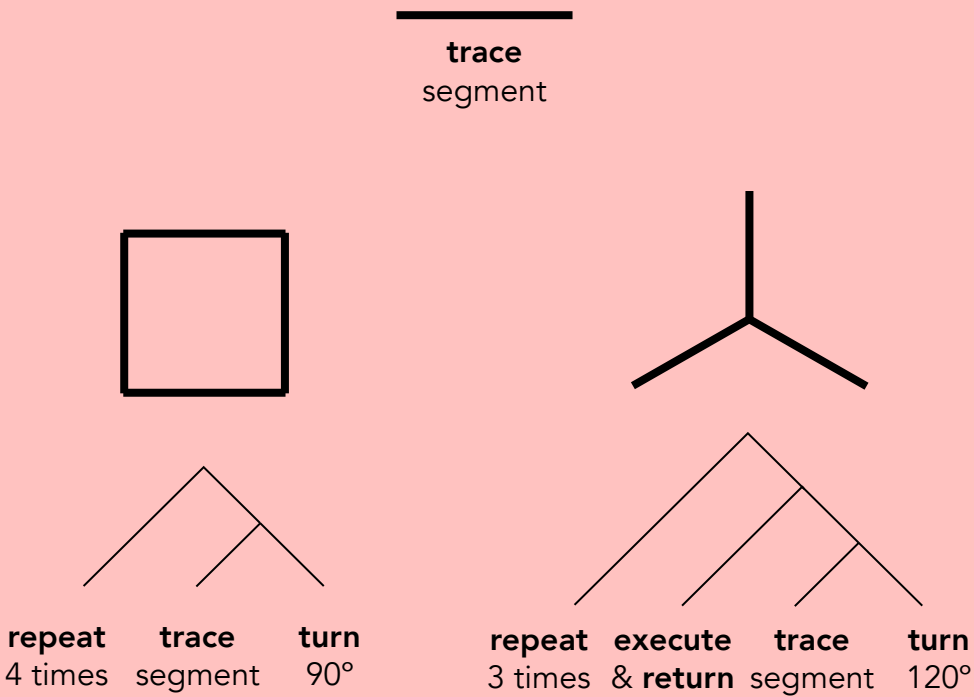


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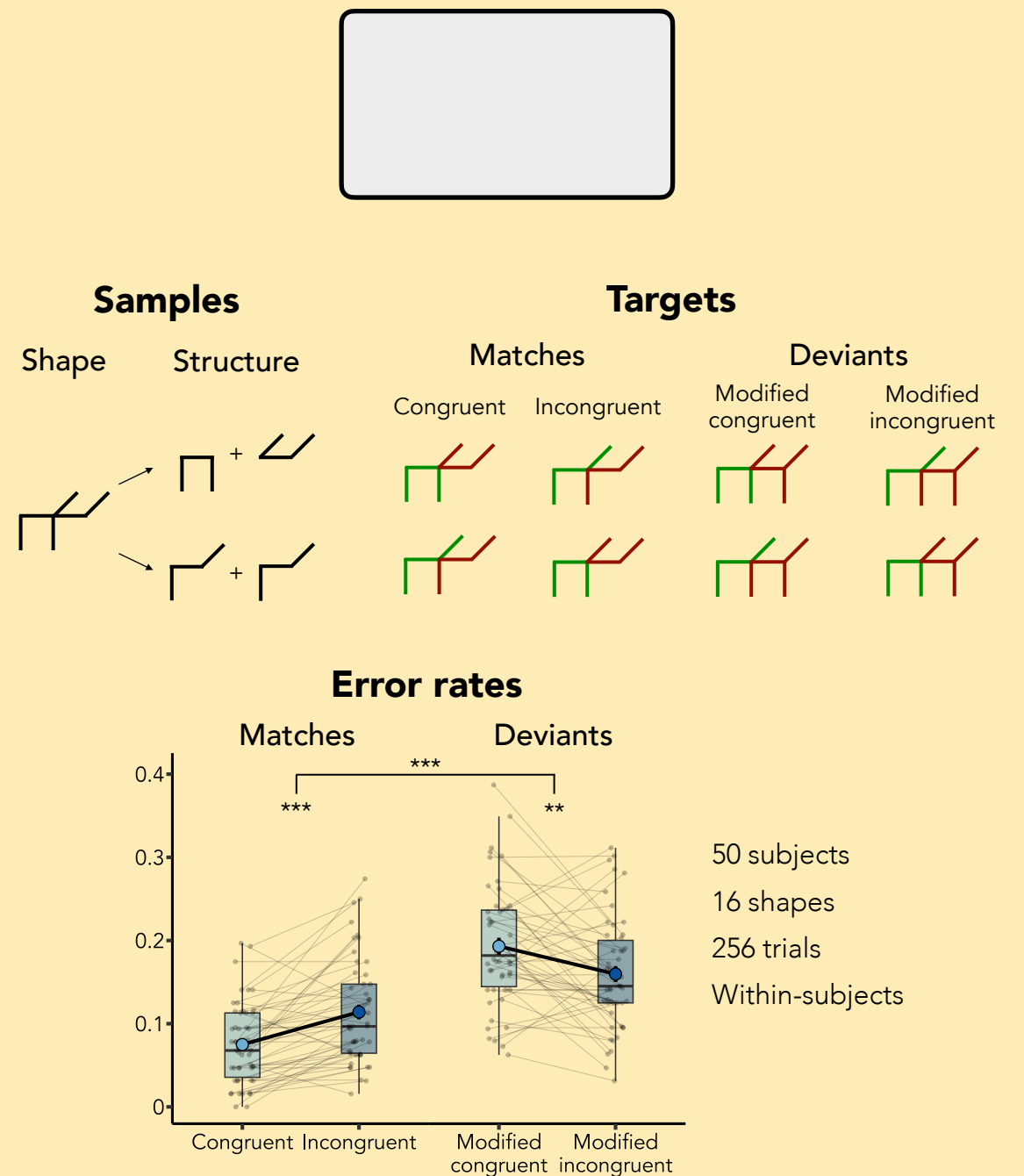
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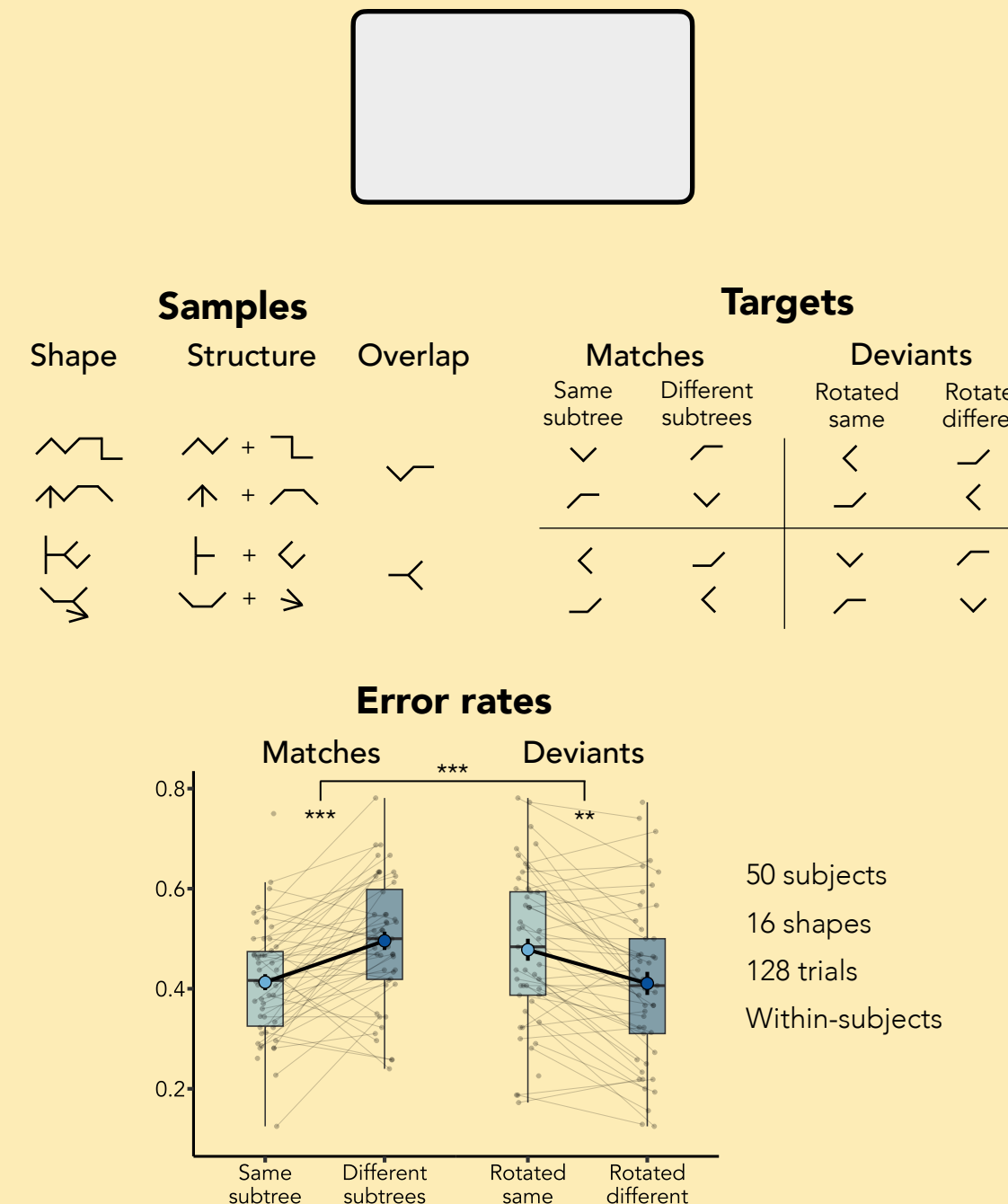
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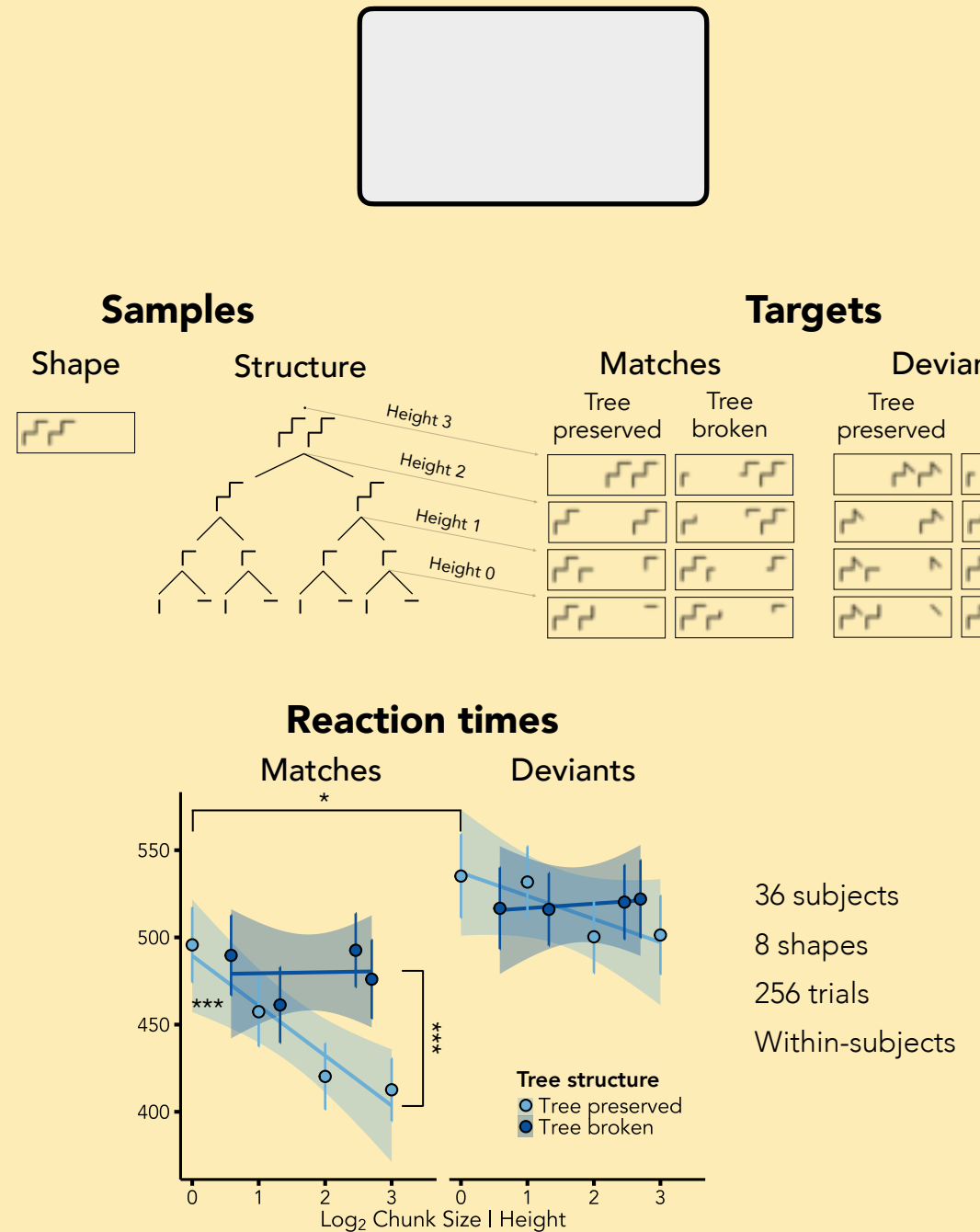
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Go back.