Individual Differences and Specificity in Face Cognition Abilities across Childhood and Adolescence

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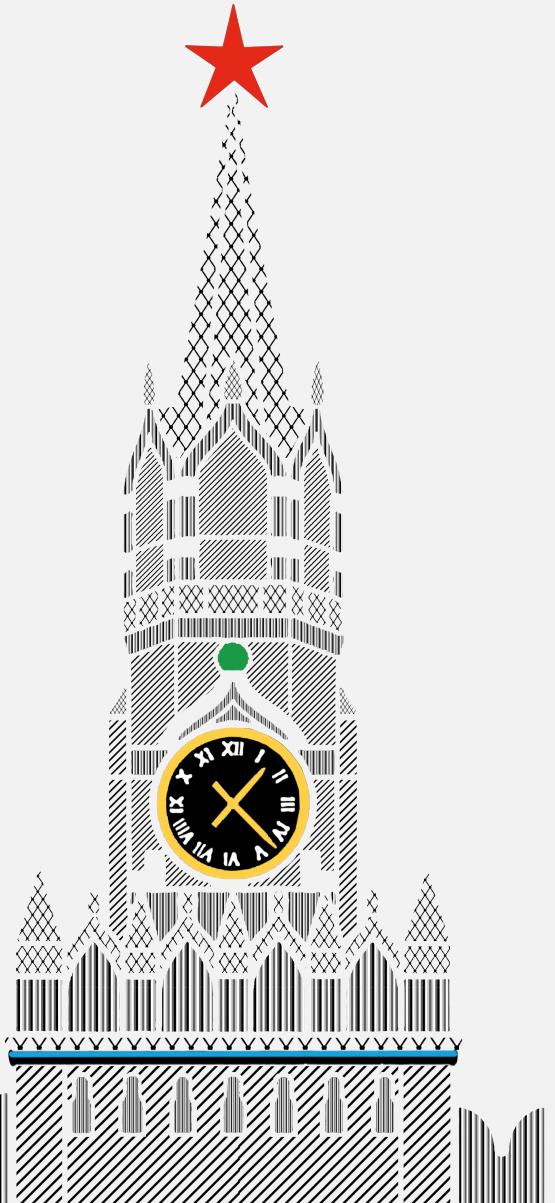

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JULY 2-5 2019 MOSCOW, RUSSIA

Outline:

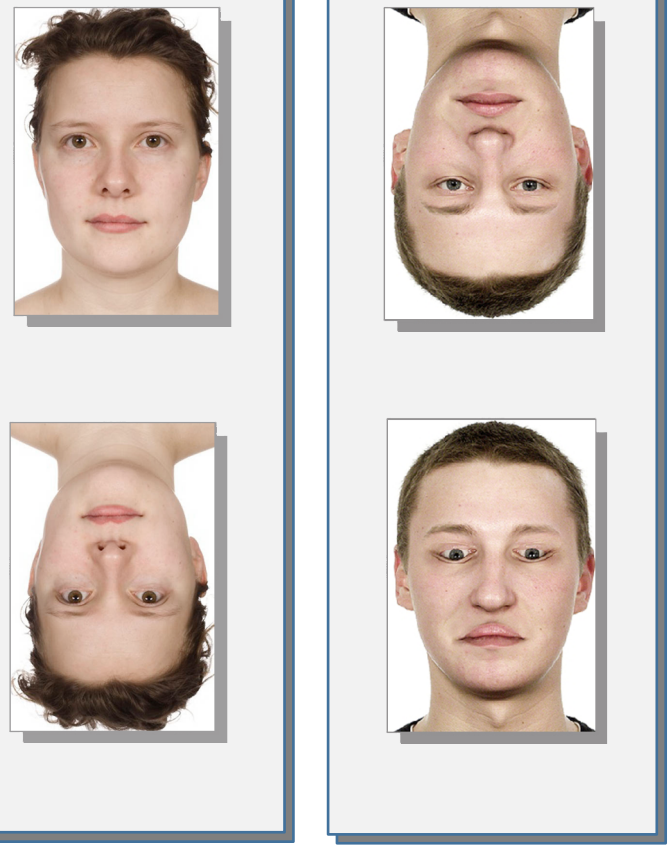
- Perspectives on the specificity of face cognition
- Controversy within developmental perspective:
  face-specific development theory vs. general cognitive development theory
- Cognitive differentiation/dedifferentiation
- Testing the differentiation hypothesis in respect to face cognition and general cognitive functioning as an opportunity to resolve controversy
- Method
- Results
- Conclusions

Experimental Perspective

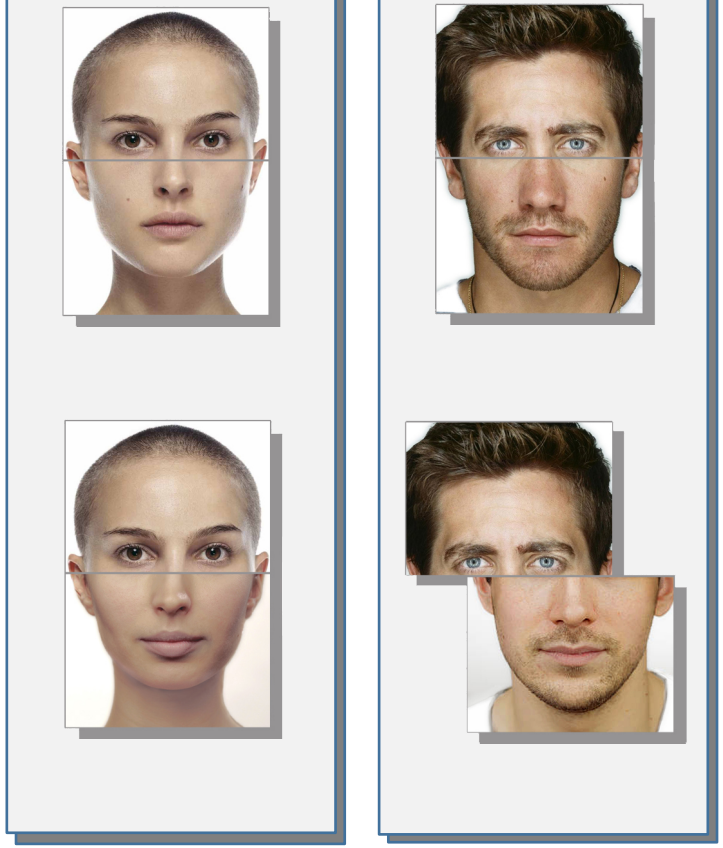
Holistic processing of faces as opposed to feature based processing of non-face stimuli

Three “gold standards”, paradigms demonstrating holistic face processing:

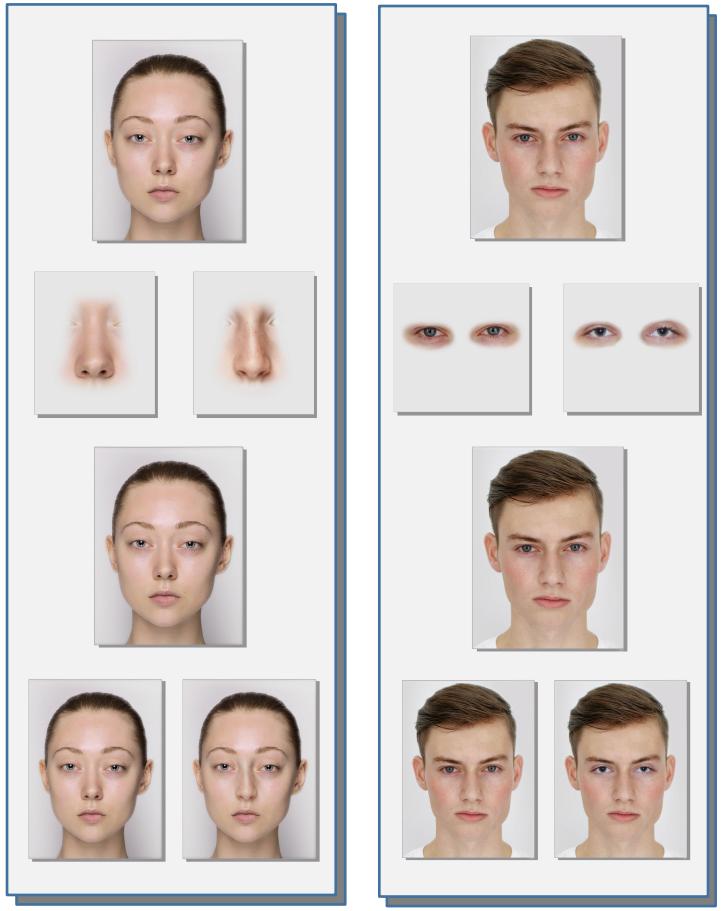
Inversion



Composite effect



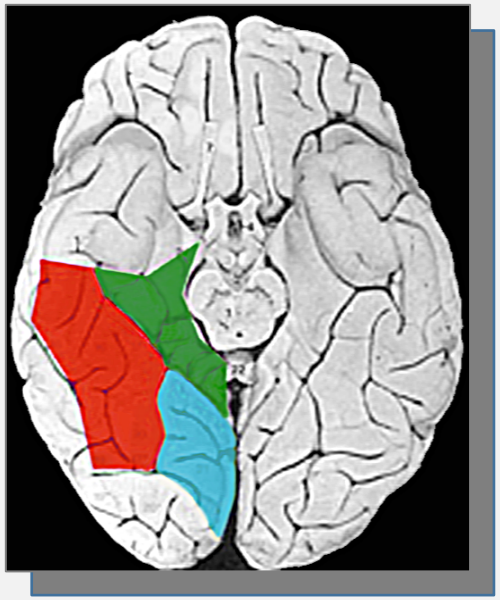
Part-whole recognition effect



Neurophysiological perspectives

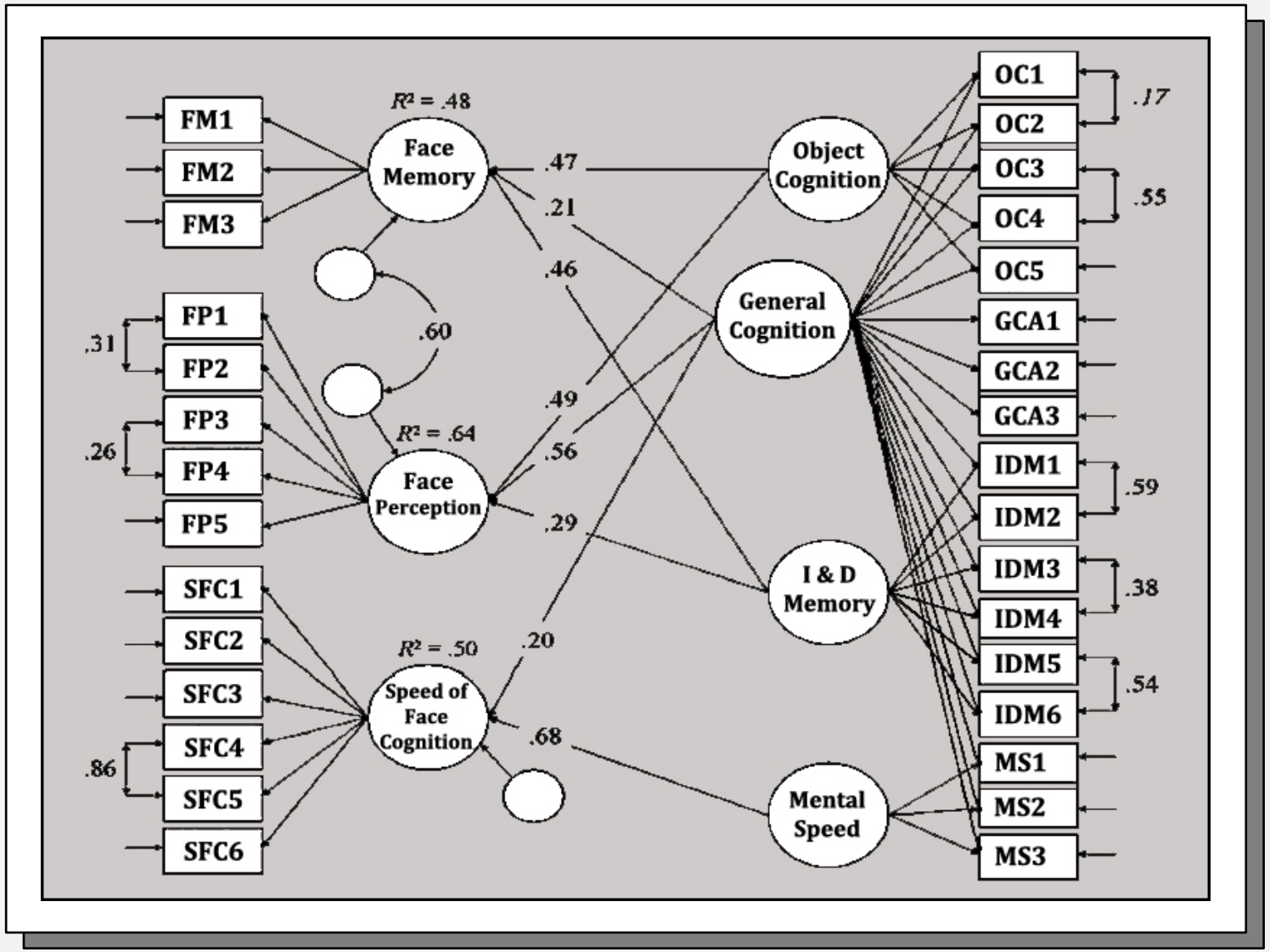
1. Stronger brain activation of the **fusiform face area** during the processing of faces compared to non-face stimuli

- View from below to the brain
- Gyrus Fusiformis (red) in the ventral visual cortex



2. Relative inability of prosopagnostic patients to recognize faces compared to other visual objects

Differential perspective



Controversy within developmental perspective

- **Early Preference** to face-like stimuli (from first minutes of the life)

- **Main views on trajectories** of maturation of face cognition abilities:

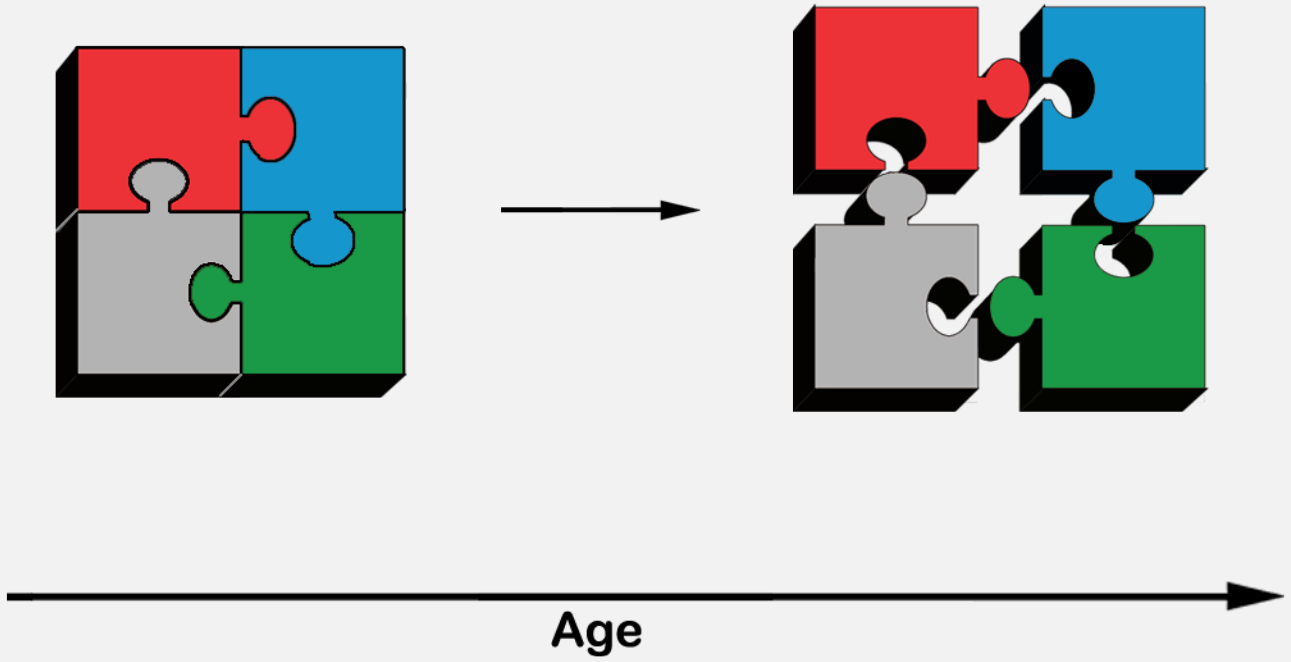
  - **face-specific development theory:** late maturity, raises by accumulation of social experience

  - **general cognitive development theory:** early maturity

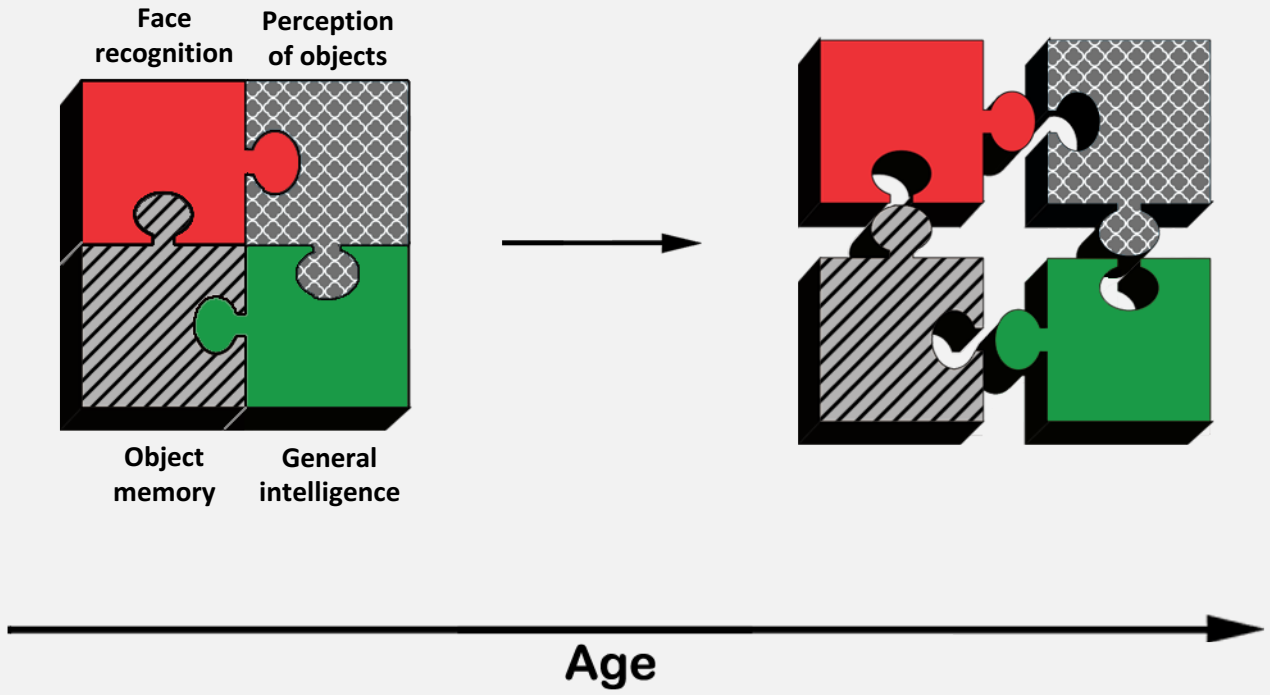
  - **attempt to combine these views: early maturity of face perception, late maturity of face memory**

- Need for research on **individual differences** in face cognition abilities

Cognitive differentiation



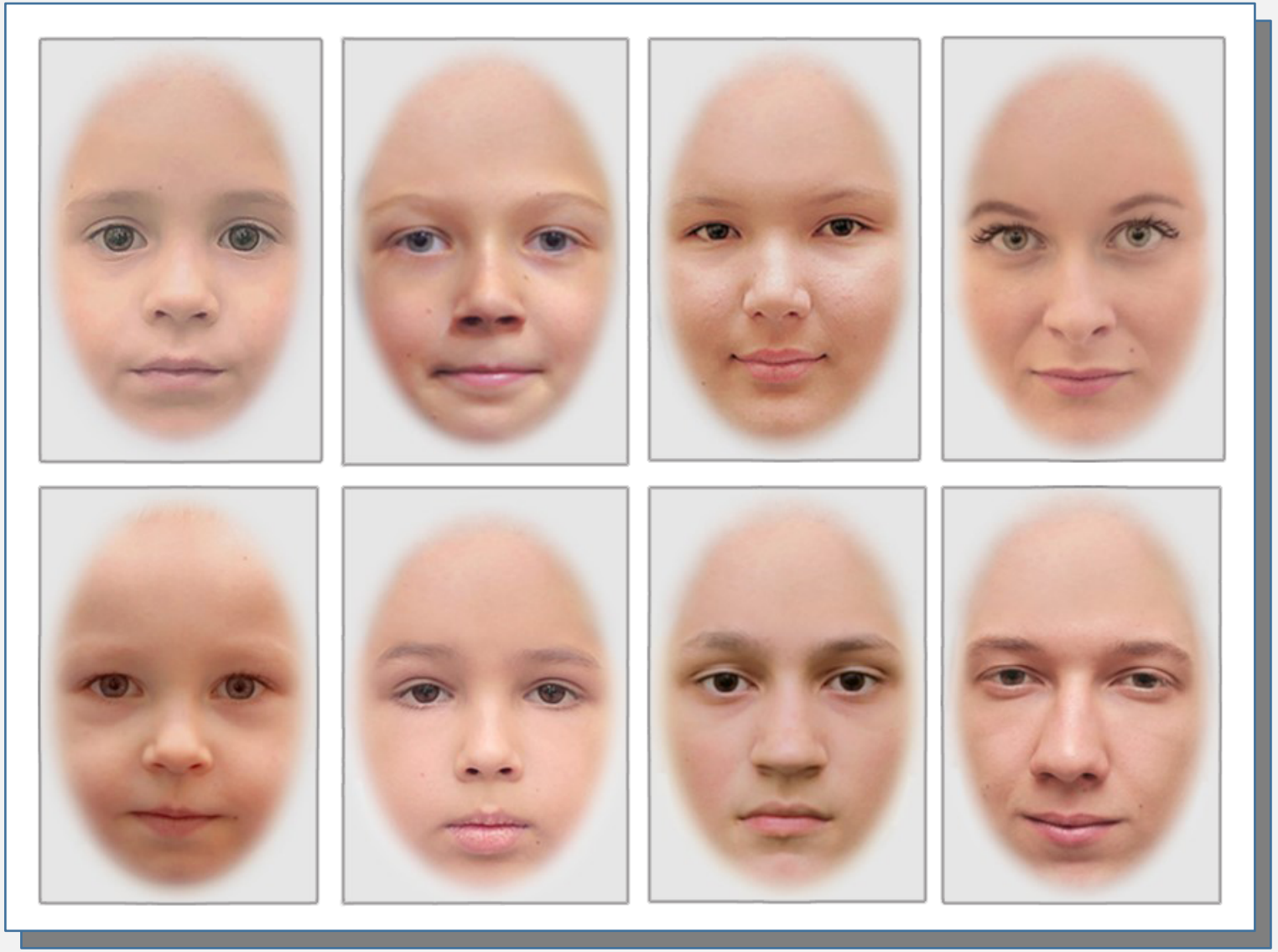
Testing the differentiation hypothesis in respect to face cognition and general cognitive functioning as an opportunity to resolve controversy within developmental perspective



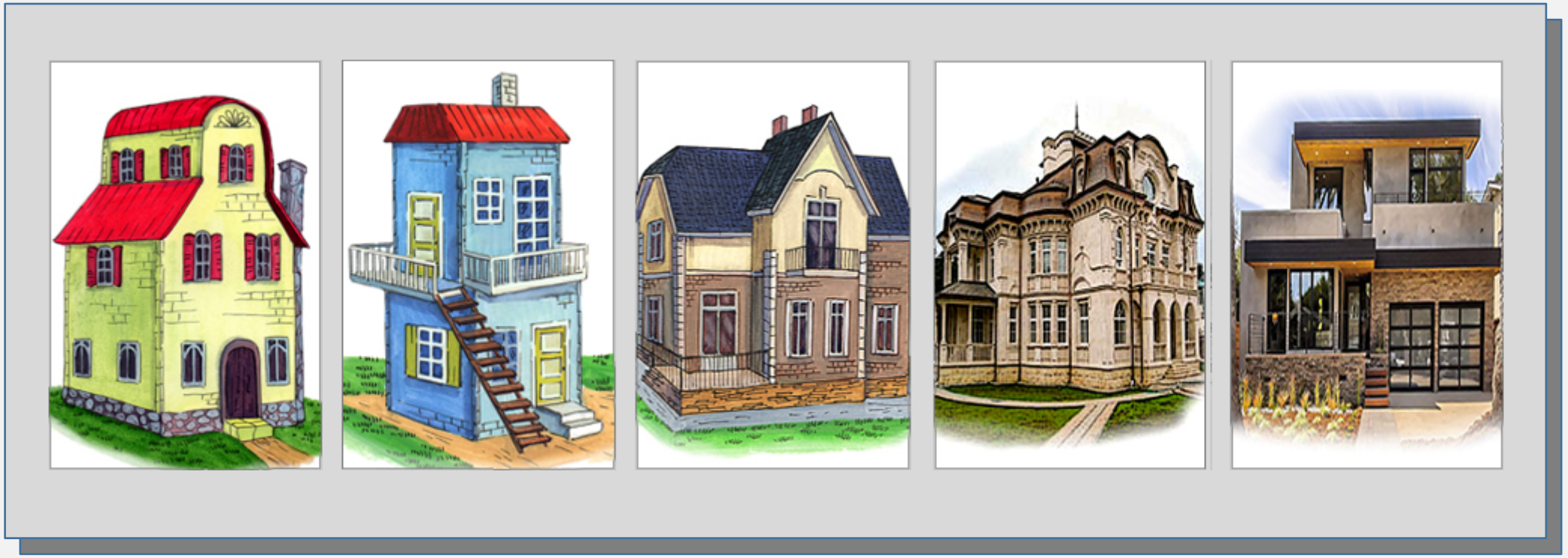
Participants

Age groups	Boys	Girls
6-7	9	14
8	11	13
9	8	15
10	26	8
11	21	22
12	13	10
13	5	17
14	13	16
15	12	9
16	18	8
17	15	16
18-26	12	18
Total	163	166

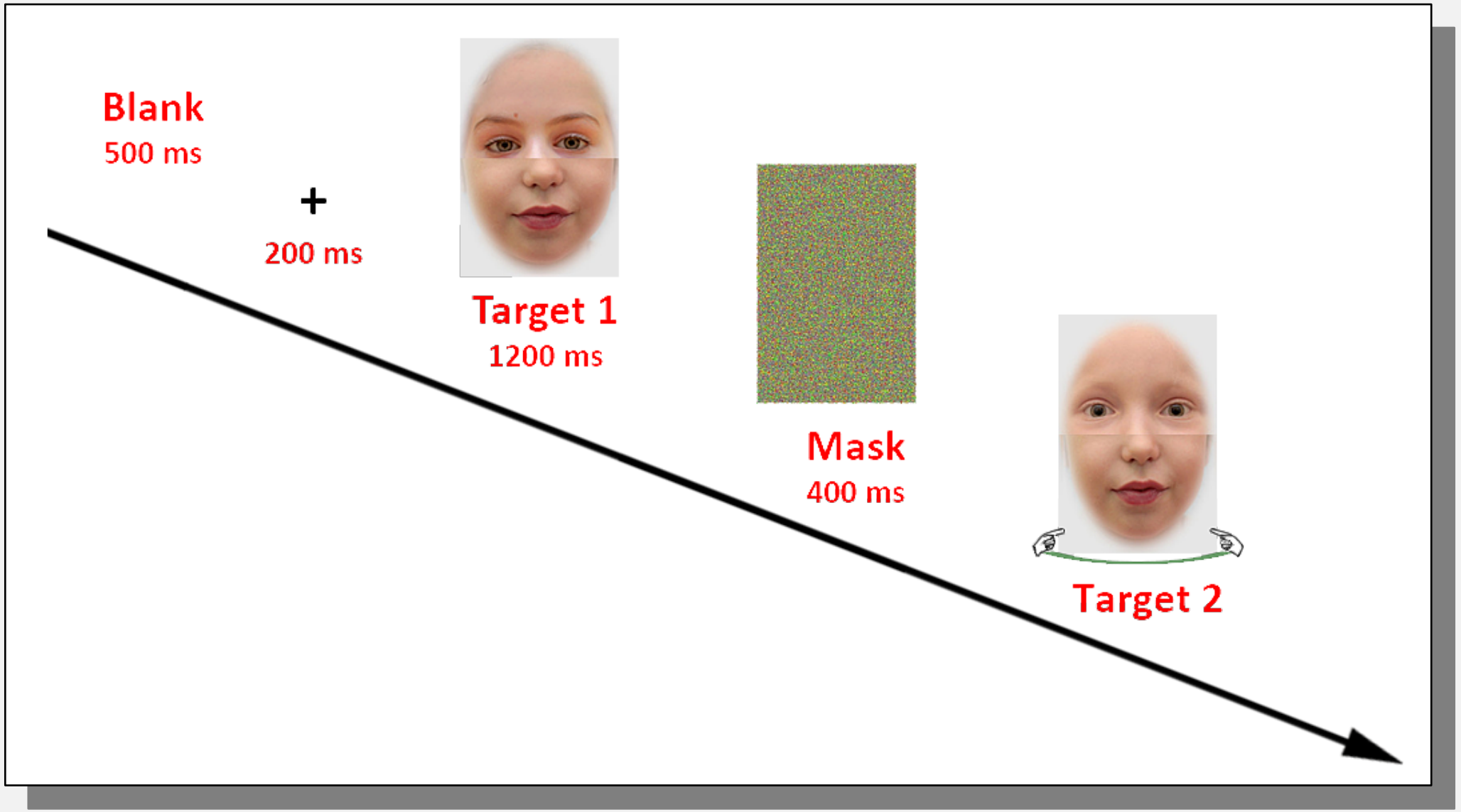
Stimuli



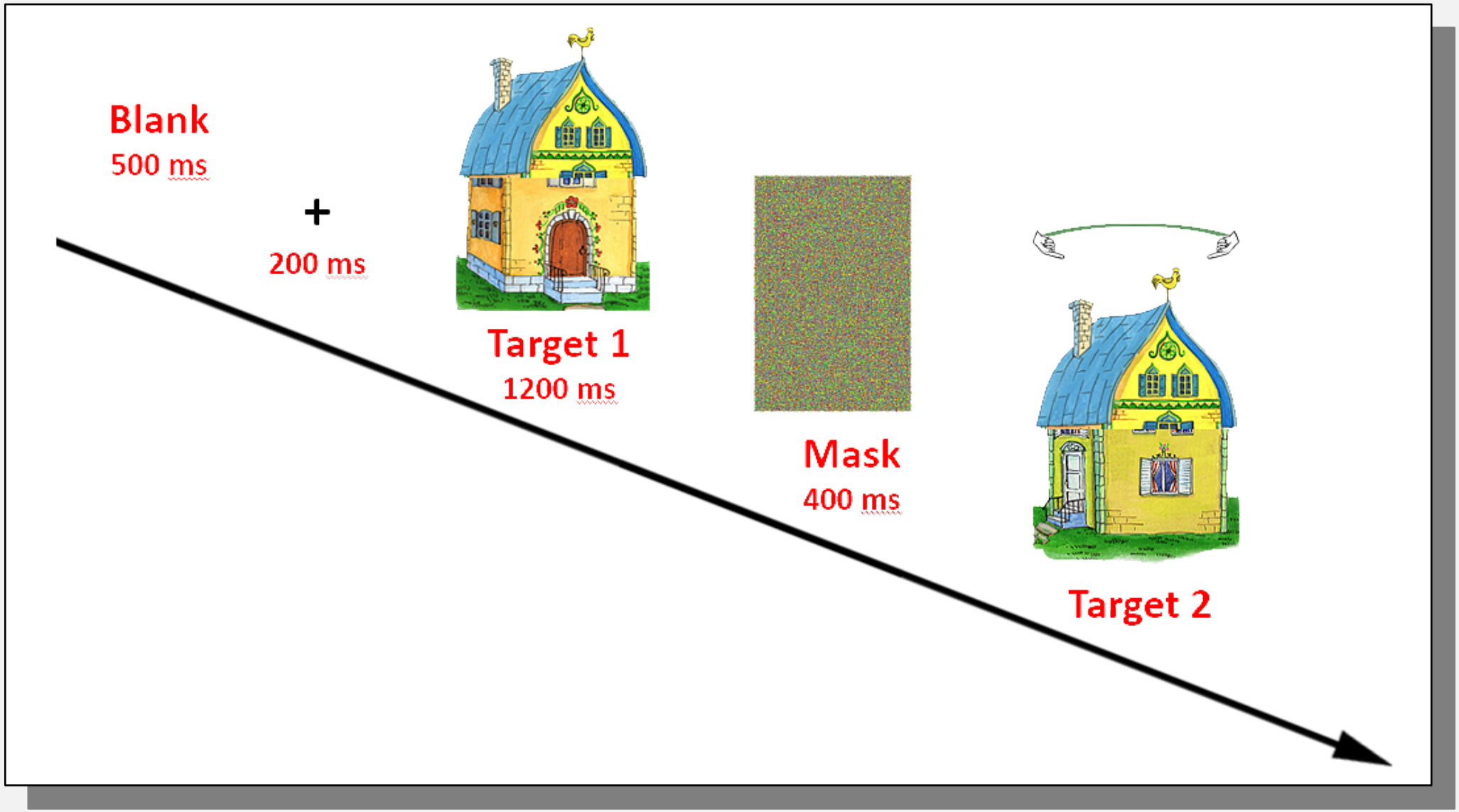
Stimuli



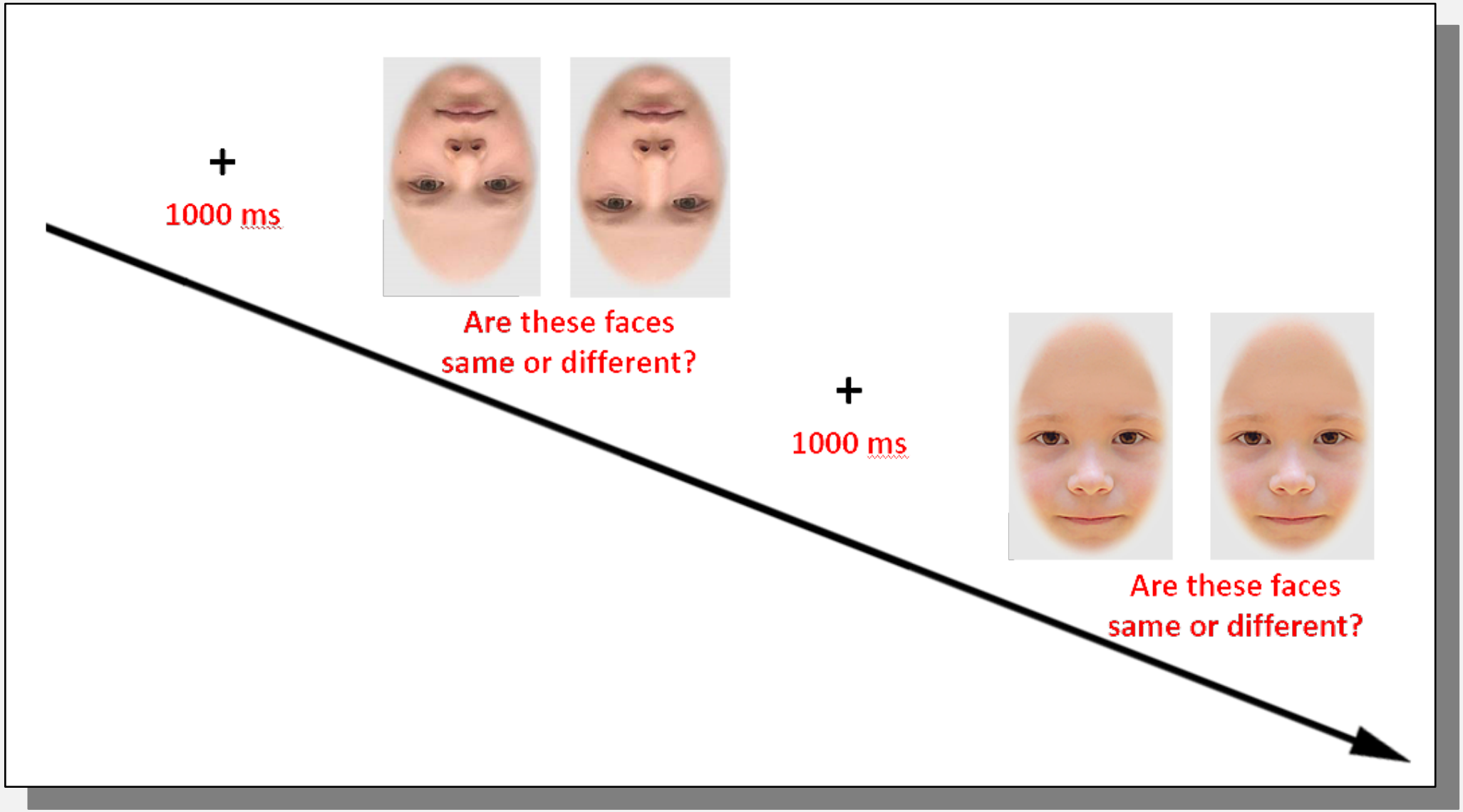
Composite Faces Task



Composite Houses Task

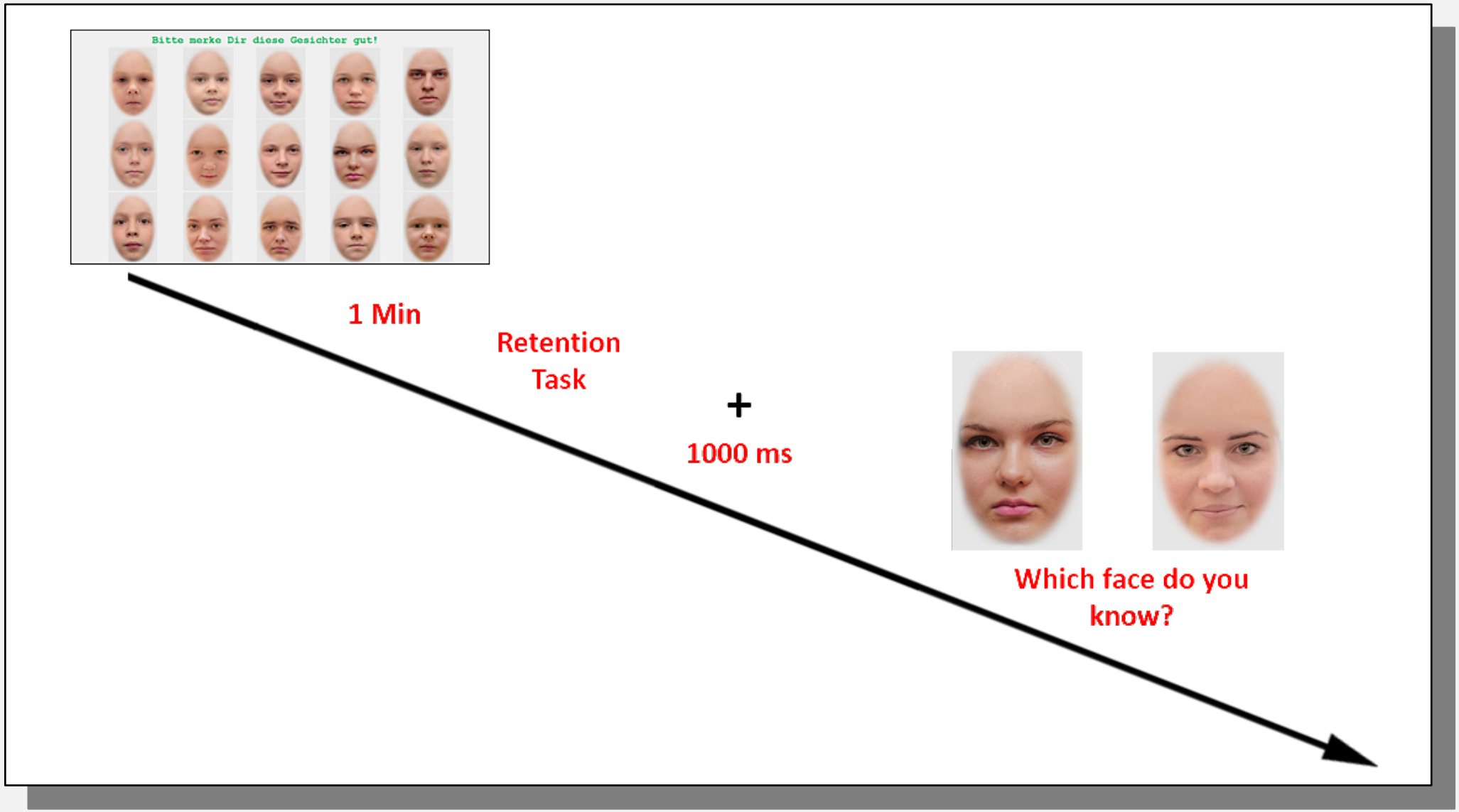


Simultaneous matching of spatially manipulated faces with conditions upright/inverted

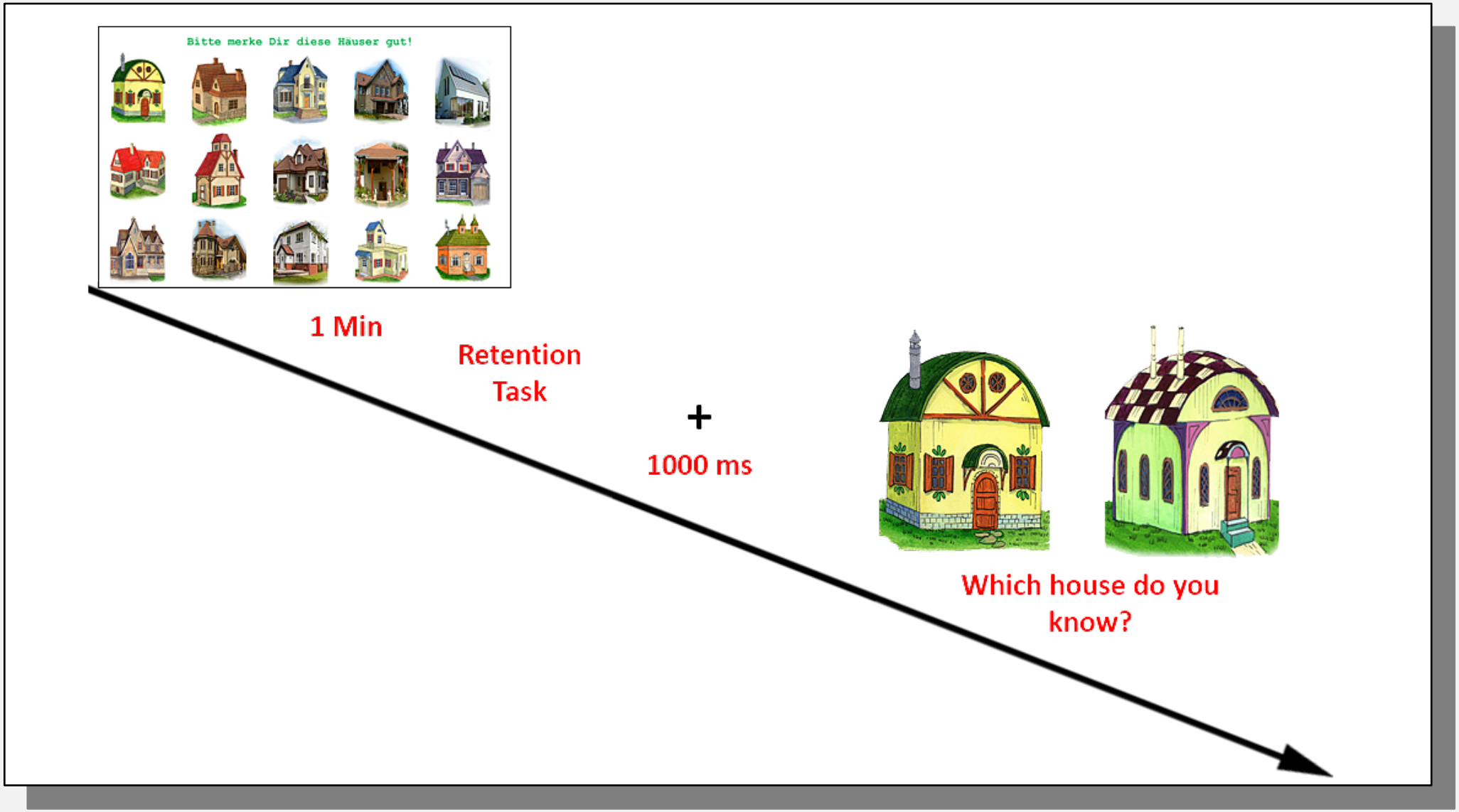


Simultaneous matching of spatially manipulated houses with conditions upright/inverted

Acquisition curve (faces)



Acquisition curve (houses)



Retention tasks

- Letters Comparison:

ajg **apg**

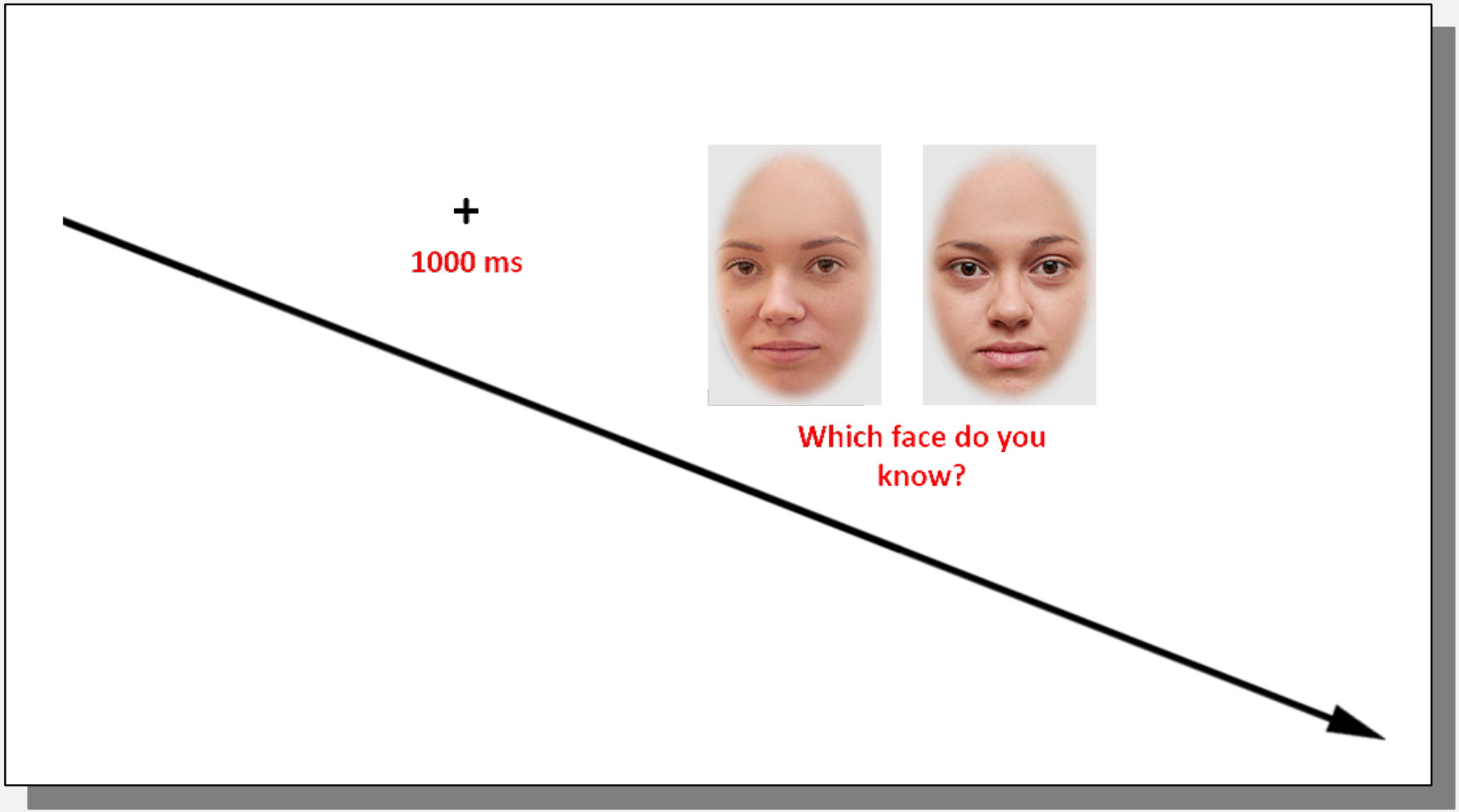
- Numbers Comparison

133 **133**

- Symbols Comparison

* Task is always to compare as correct and as quick as possible!

Decay Rate of learned faces



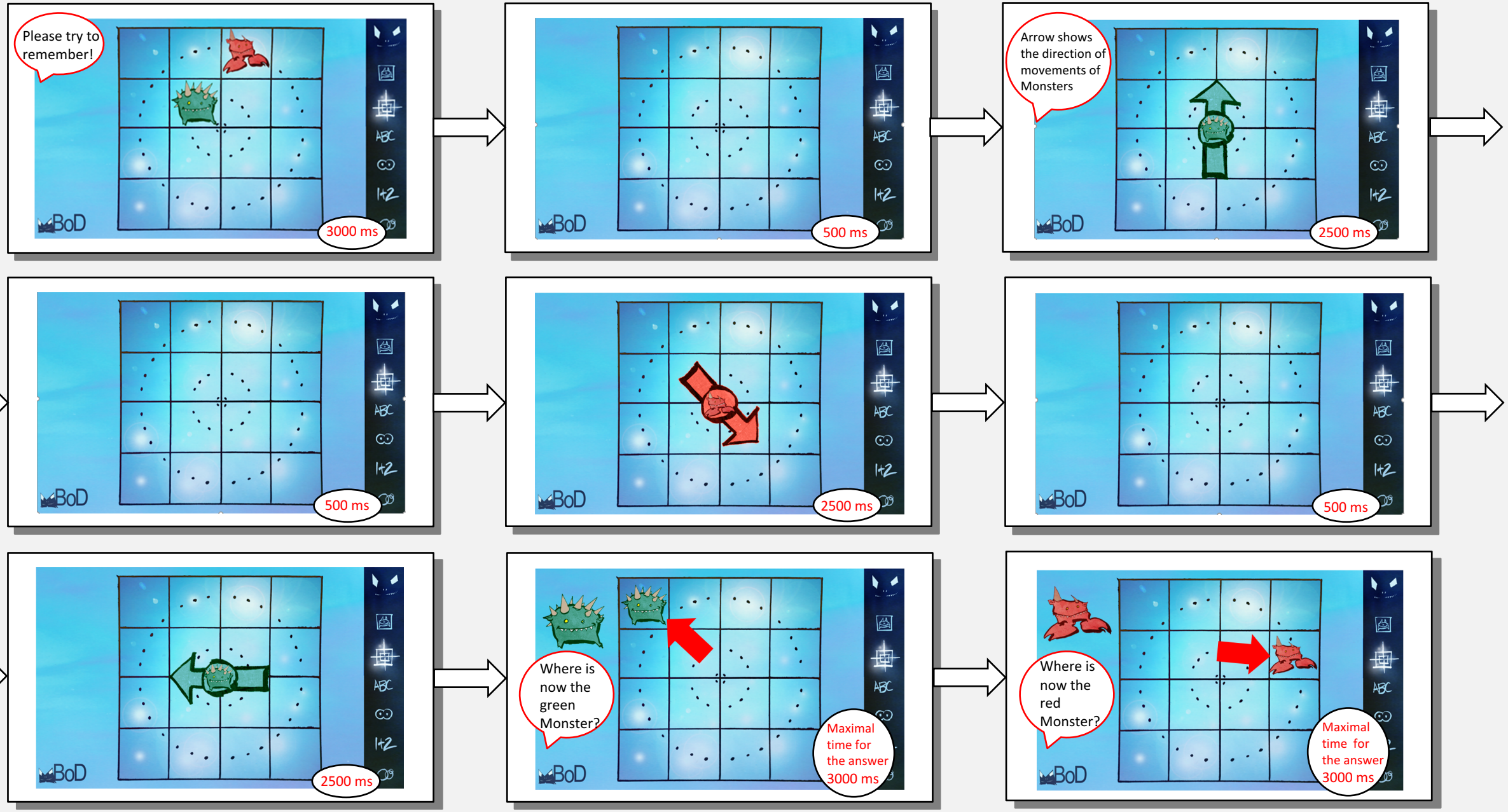
Decay Rate of learned houses

+

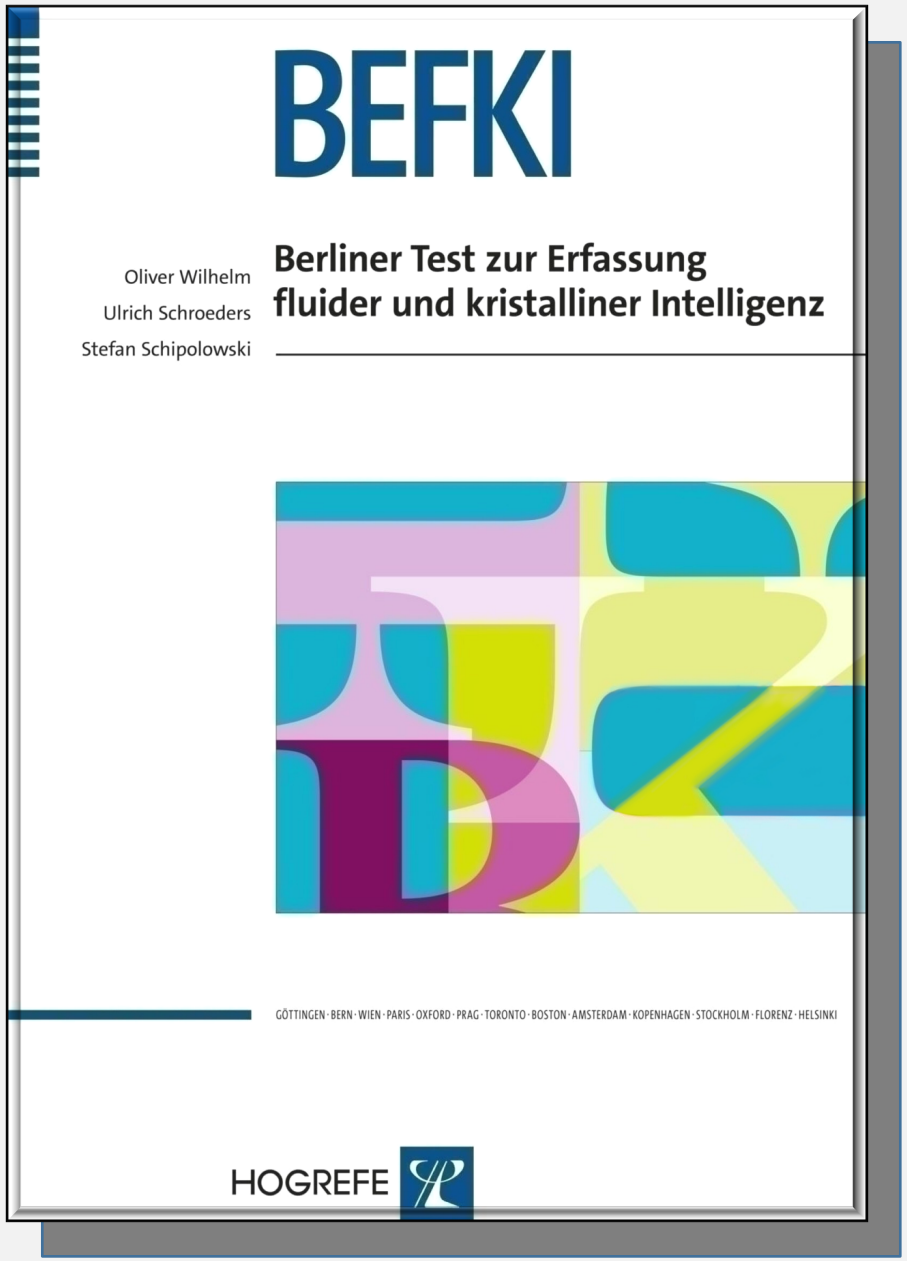
1000 ms

Which house do you know?

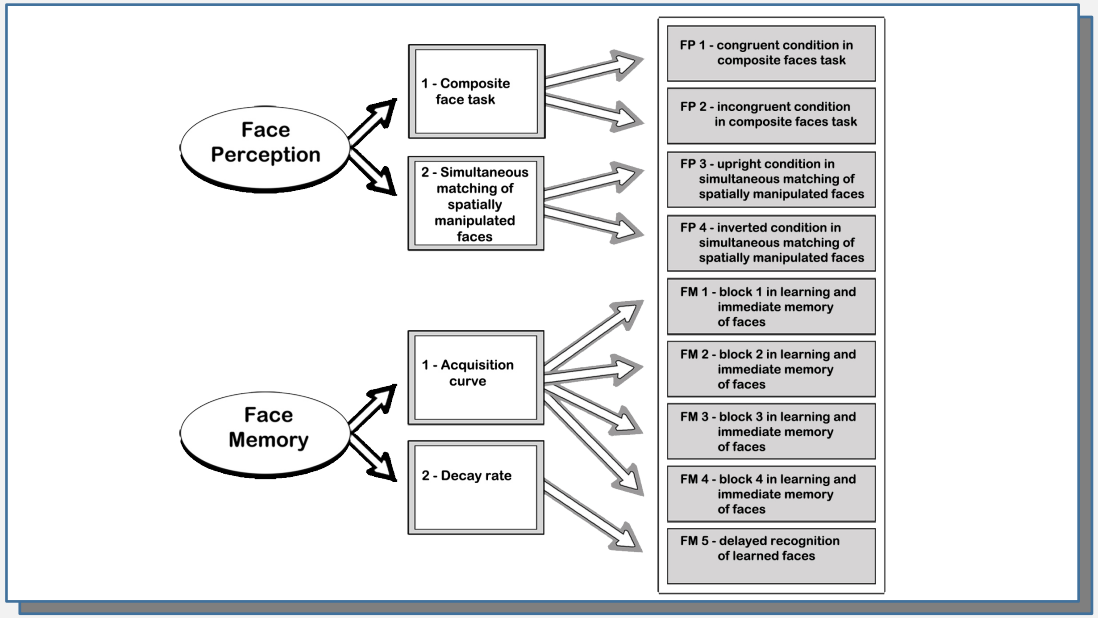
Working Memory Task “Murkse schnüffeln” (Dirk et al., 2015; Koenen et al., 2015)

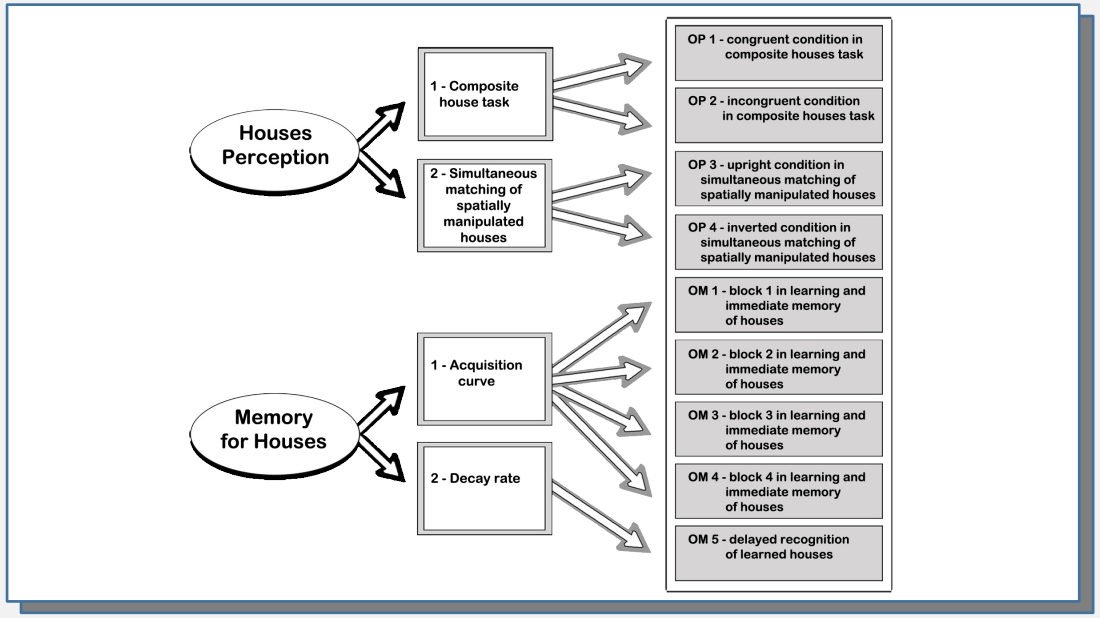


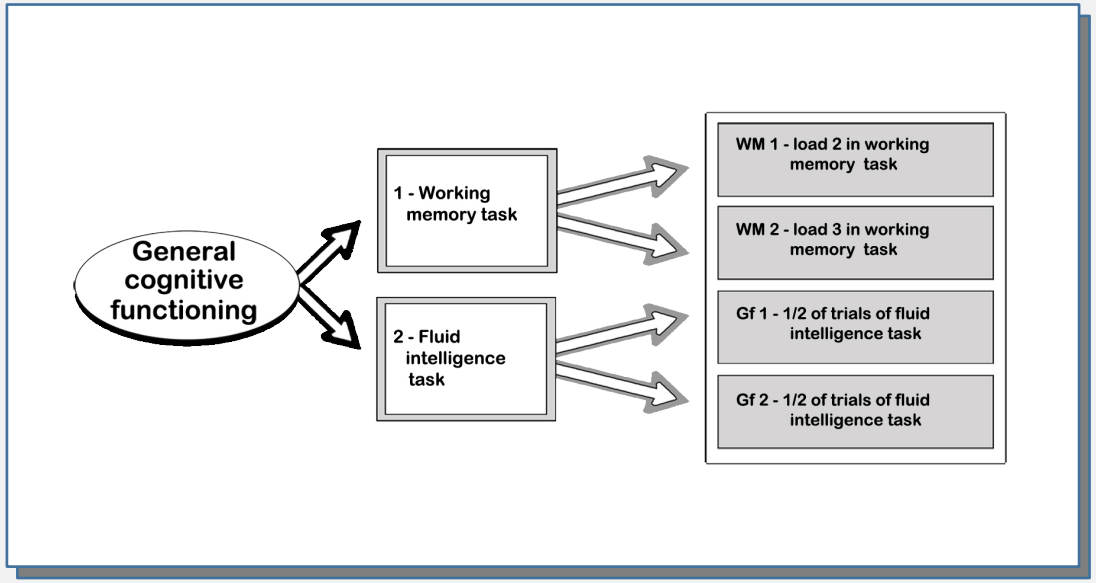
Assessment Test of fluid and crystallized intelligence (Wilhelm et al., 2014)



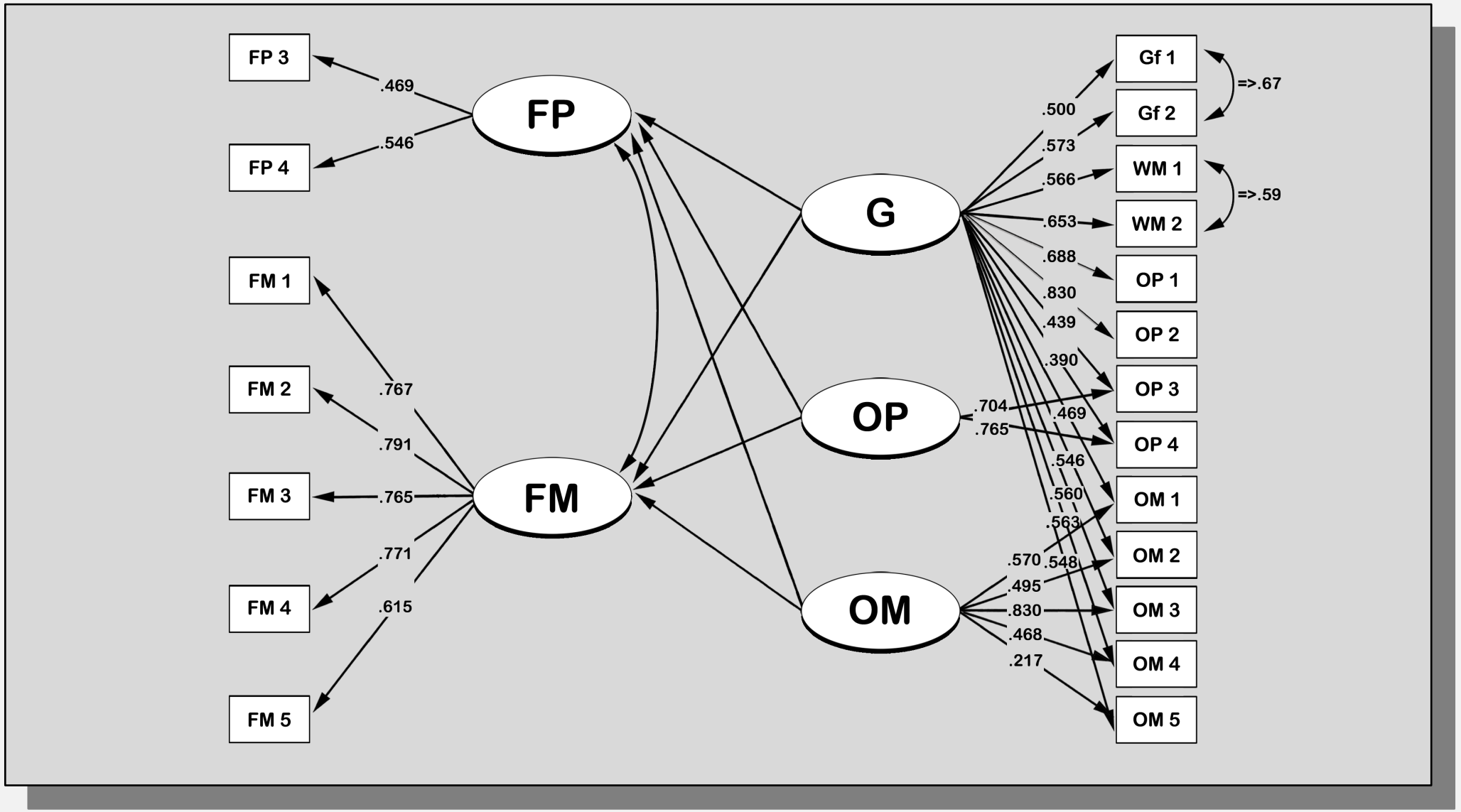
Indicators


Face Perception
1 - Composite face task
2 - Simultaneous matching of spatially manipulated faces
Face Memory
1 - Acquisition curve
2 - Decay rate
FP 1 - congruent condition in composite faces task
FP 2 - incongruent condition in composite faces task
FP 3 - upright condition in simultaneous matching of spatially manipulated faces
FP 4 - inverted condition in simultaneous matching of spatially manipulated faces
FM 1 - block 1 in learning and immediate memory of faces
FM 2 - block 2 in learning and immediate memory of faces
FM 3 - block 3 in learning and immediate memory of faces
FM 4 - block 4 in learning and immediate memory of faces
FM 5 - delayed recognition of learned faces


Houses Perception
1 - Composite house task
2 - Simultaneous matching of spatially manipulated houses
Memory for Houses
1 - Acquisition curve
2 - Decay rate
OP 1 - congruent condition in composite houses task
OP 2 - incongruent condition in composite houses task
OP 3 - upright condition in simultaneous matching of spatially manipulated houses
OP 4 - inverted condition in simultaneous matching of spatially manipulated houses
OM 1 - block 1 in learning and immediate memory of houses
OM 2 - block 2 in learning and immediate memory of houses
OM 3 - block 3 in learning and immediate memory of houses
OM 4 - block 4 in learning and immediate memory of houses
OM 5 - delayed recognition of learned houses

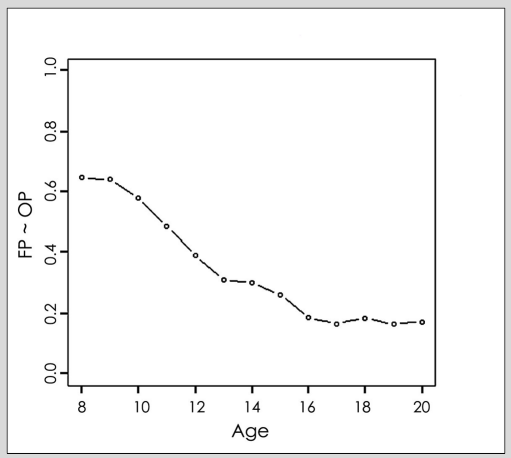

General cognitive functioning
1 - Working memory task
2 - Fluid intelligence task
WM 1 - load 2 in working memory task
WM 2 - load 3 in working memory task
Gf 1 - 1/2 of trials of fluid intelligence task
Gf 2 - 1/2 of trials of fluid intelligence task

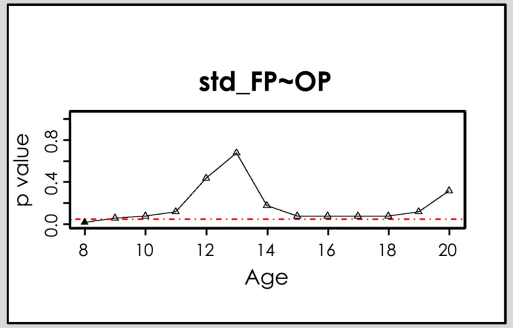
Specificity of Face Cognition

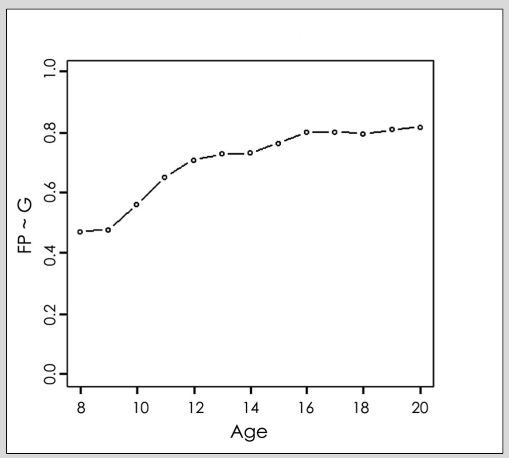


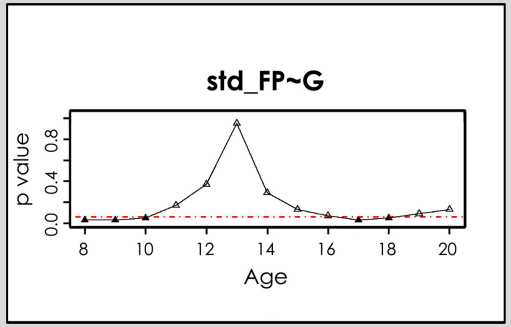
$\chi 2$ (155) = 402.763; CFI = .923; RMSEA = .075; SRMR = .064

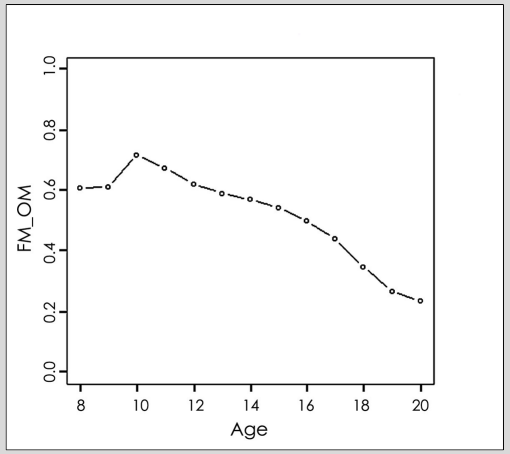
Testing Specificity of Face Cognition Abilities across Childhood and Adolescence

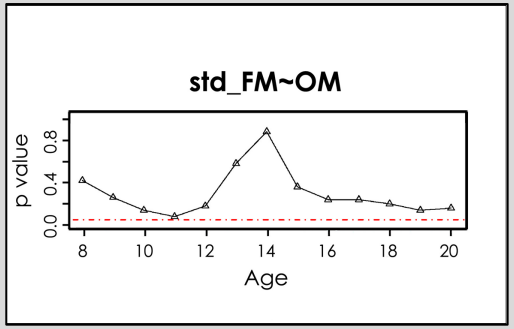


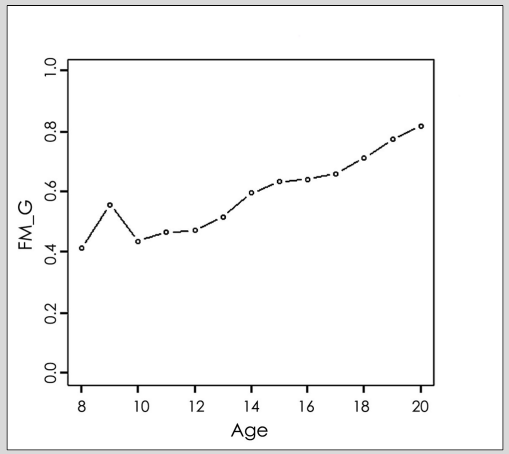


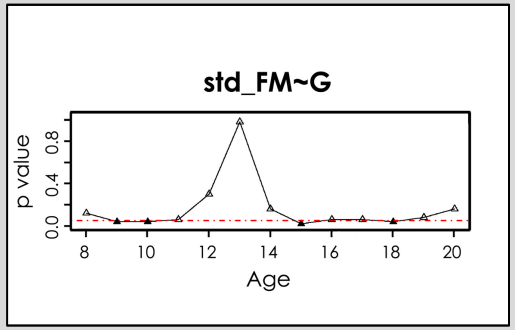












Age-Related Differences in Face-specific Performance

$\chi 2$ (182) = 447.462; CFI = .922; RMSEA = .072; SRMR = .054

Conclusion:

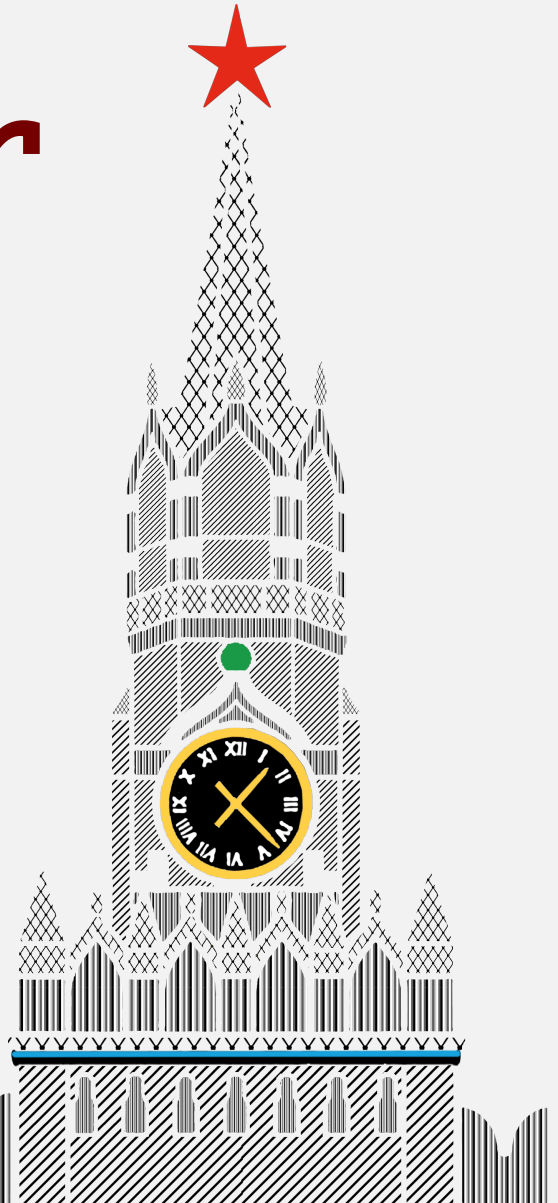
Generally, our findings integrate the two conflicting views on the specificity of face cognition abilities in early life periods:

- Already six-years old children may reach adult-like face cognition abilities: the level of the maturation of these abilities is highly related with general cognitive functioning (argument for the theory of general cognitive development).
- However, it is important to note, that faces are partly specific social stimuli and the maturation of face cognition abilities is also determined by the harmonious socialization of the child (argument for the theory of face-specific development).

Conclusion:

Despite successfully adaptation of our new developed tasks battery, we can conclude that new version of the composite task (so called “complete design”) should be interpreted carefully in the future research, because does not measure a specific holistic face processing ability

Thank you for your attention!



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