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# **AIESEP Connect**

## Are active kids better learners? The impact of PA, exercise and sport on cognition

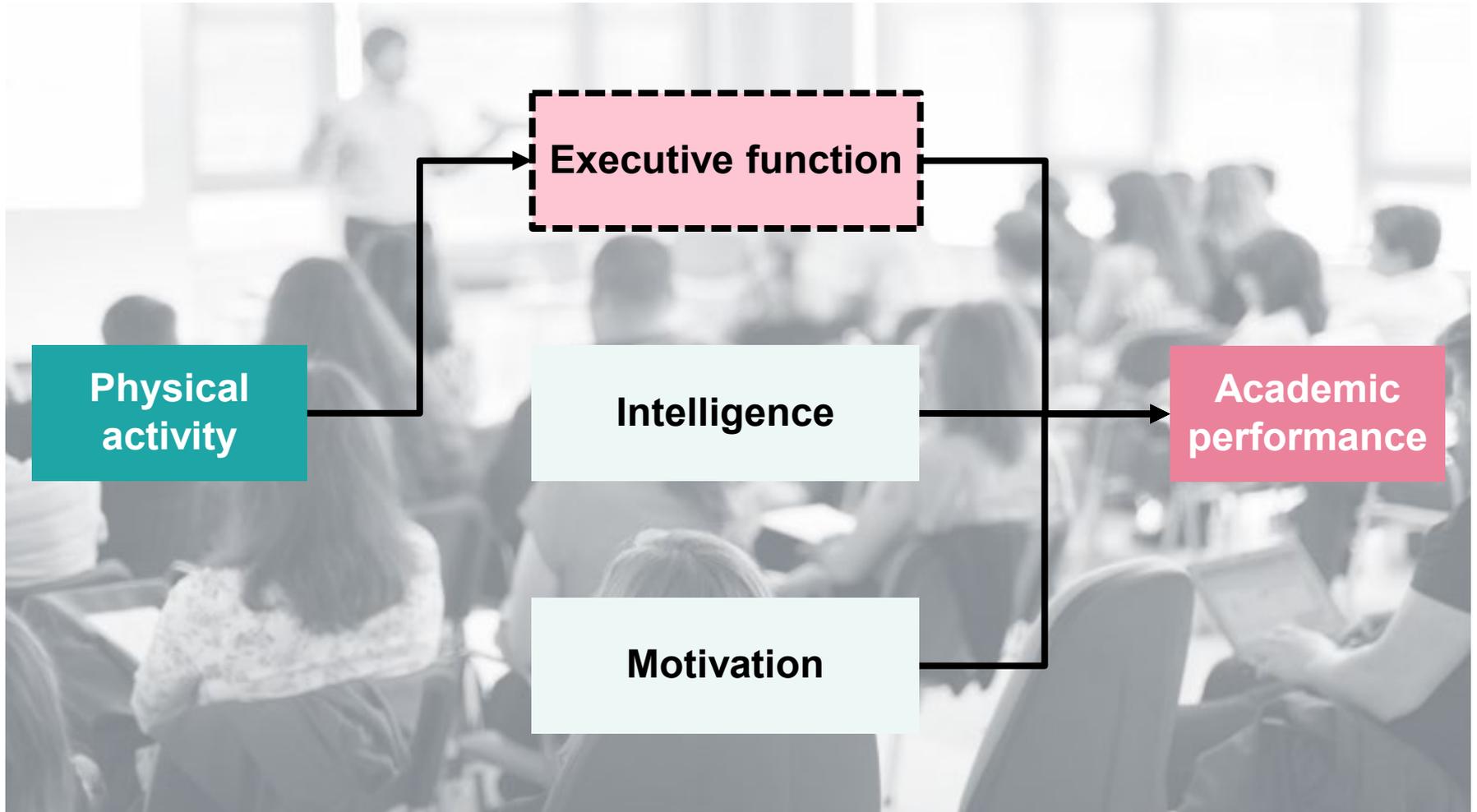
PD Dr. Sebastian Ludyga, 28.01.22

**Department of Sport,  
Exercise and Health**



# Are active kids better learners?

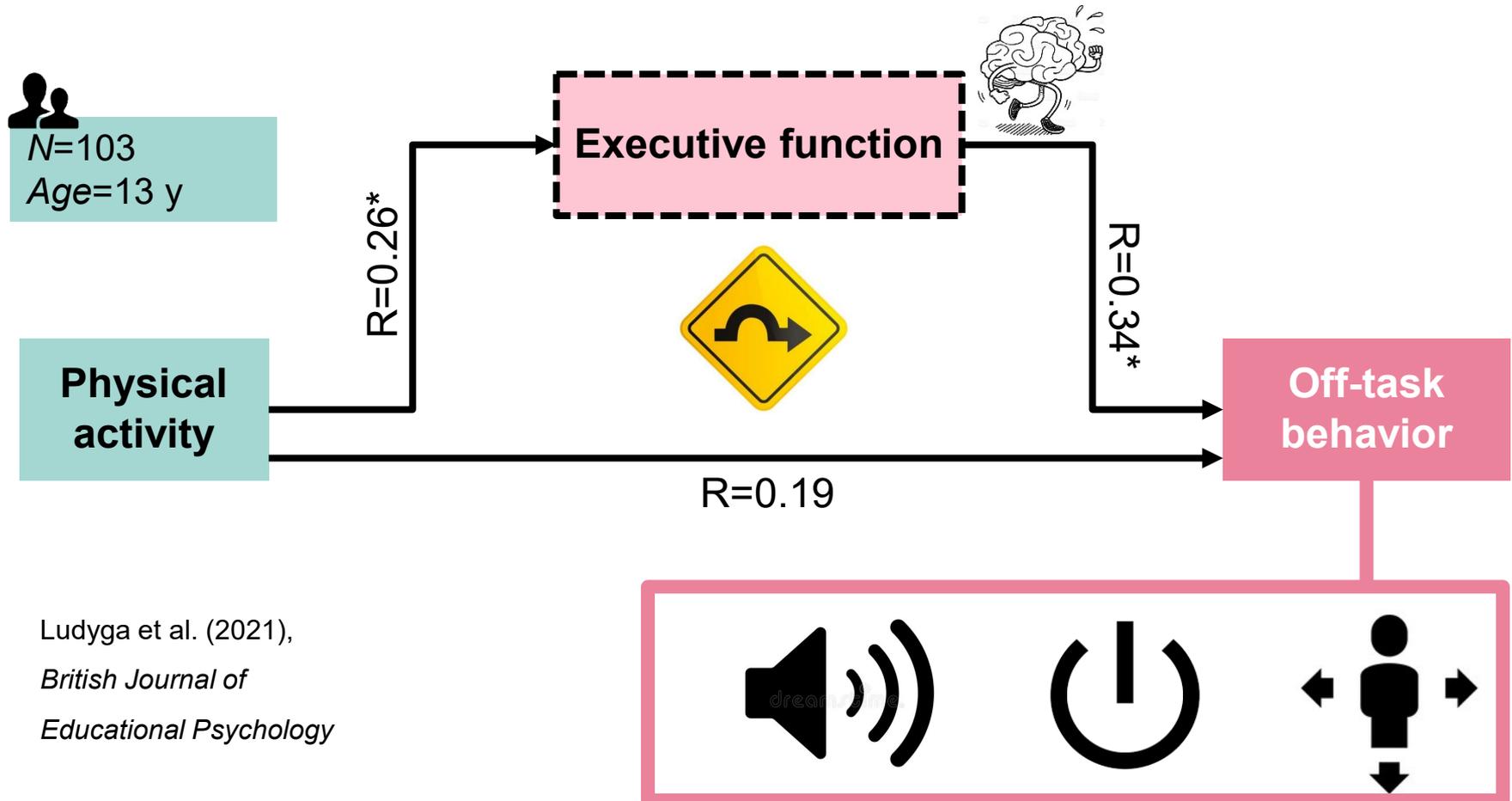
## Executive function and academic performance



# Are active kids better learners?

## Executive function and academic performance

### Observational study



Ludyga et al. (2021),  
*British Journal of  
Educational Psychology*

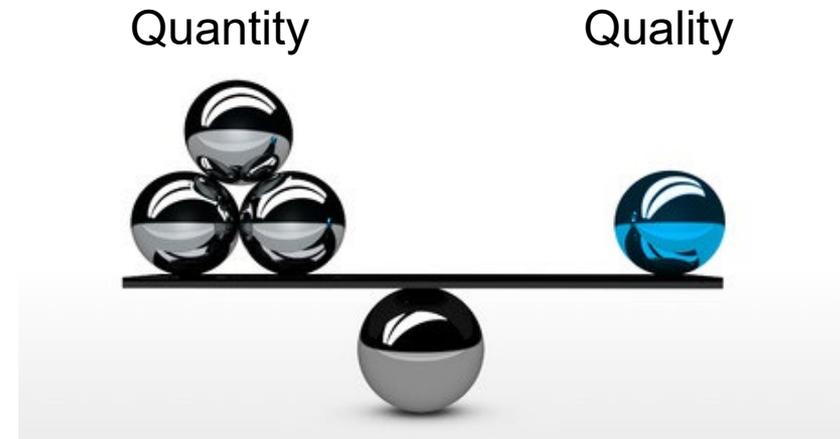
# Are active kids better learners?

## Exercise & executive function

Meta-regression (RCTs, all ages)



Covariate	Beta	P
% female participants	-0.090	<0.001
Year of publication	0.044	0.093
N per study group	-0.094	<0.001
N effects per outcome	-0.056	0.043
Intervention*session duration	0.053	0.029
Endurance exercise <sup>a</sup>	-0.050	0.450
Coordinative exercise <sup>a</sup>	0.241	0.028
Resistance exercise <sup>a</sup>	-0.083	0.290

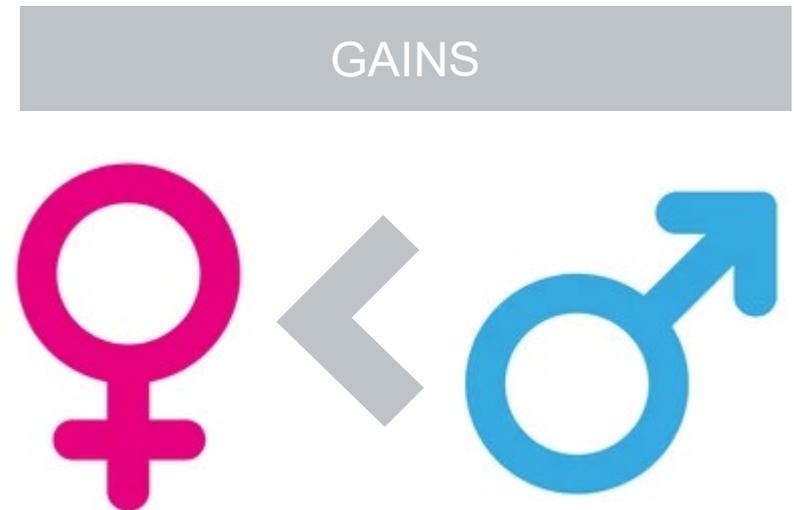
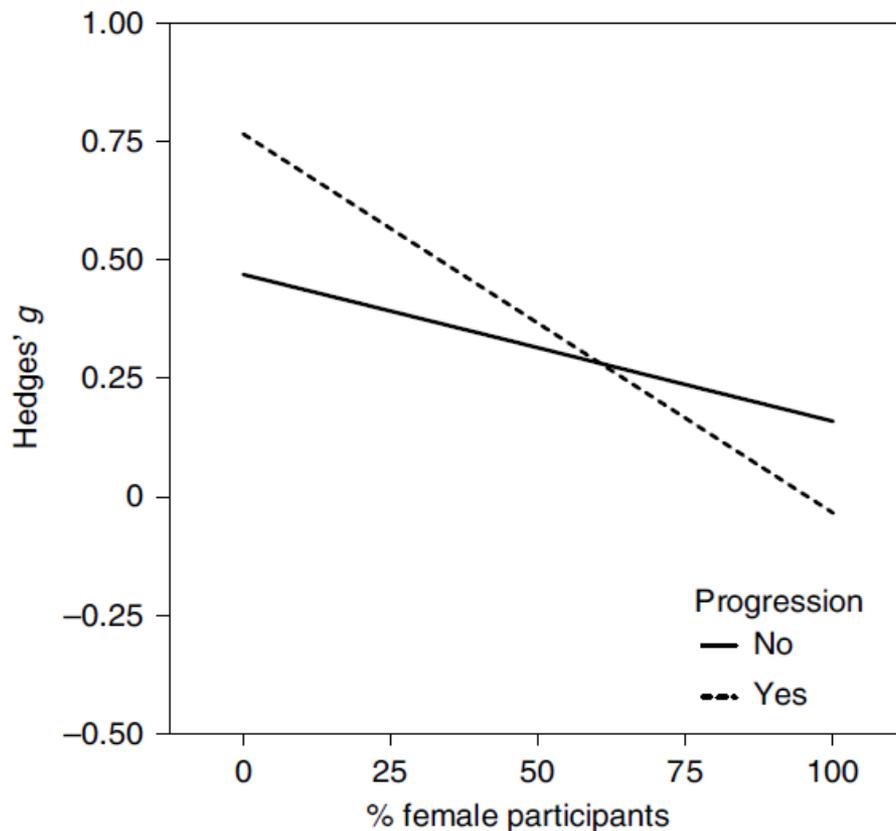


Ludyga et al. (2020), Nature  
Human Behaviour

# Are active kids better learners?

## Exercise & executive function

### Meta-regression (RCTs, all ages)

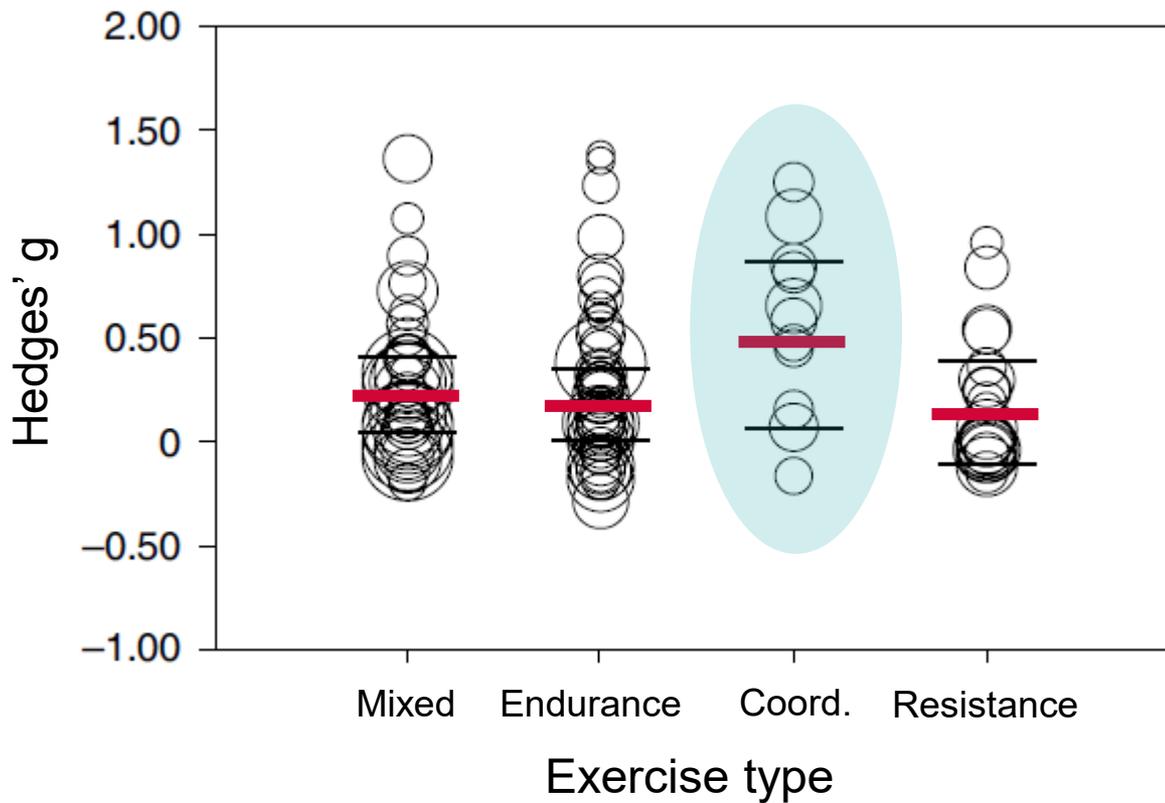


Ludyga et al. (2020), Nature  
Human Behaviour

# Are active kids better learners?

## Exercise & executive function

### Meta-regression (RCTs, all ages)

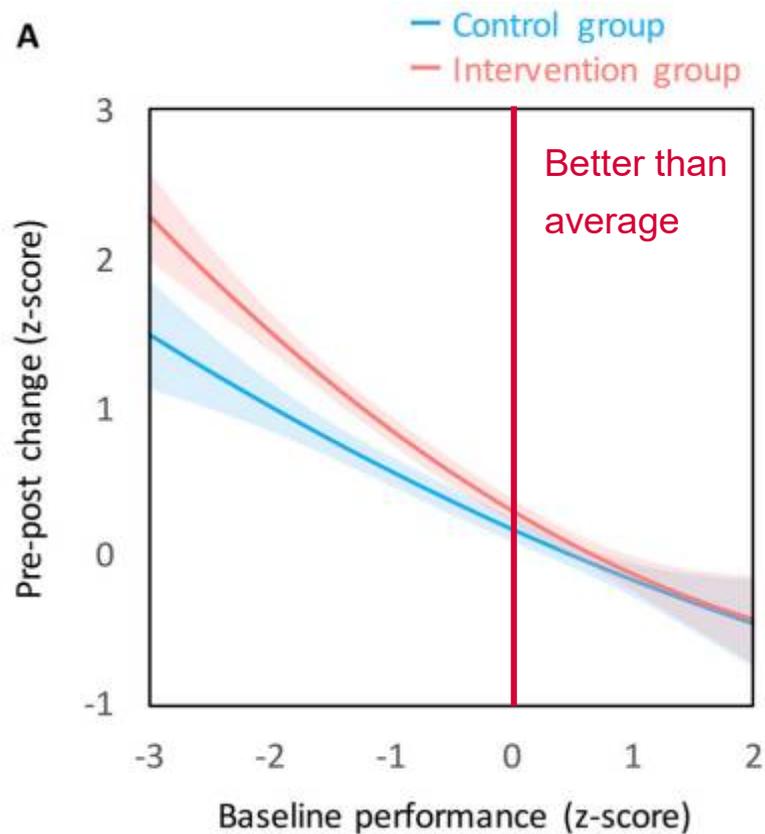


Ludyga et al. (2020), Nature  
Human Behaviour

# Are active kids better learners?

## Exercise & executive function

### Pooled analysis (3 RCTs, preadolescent children)



Normalization  
vs.  
Enhancement

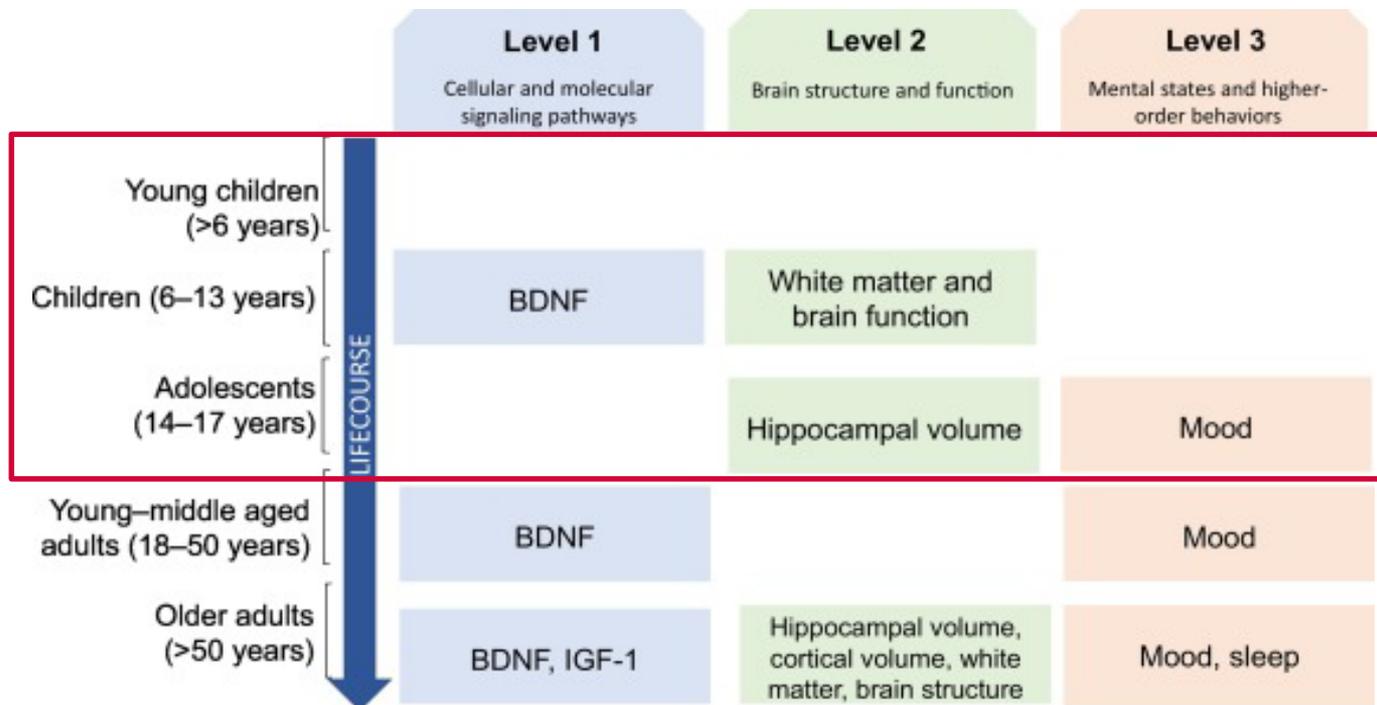


Ishihara, Drollette, Ludyga et al. (2020)

# Are active kids better learners?

## Underlying mechanisms

Is there a casual relation?

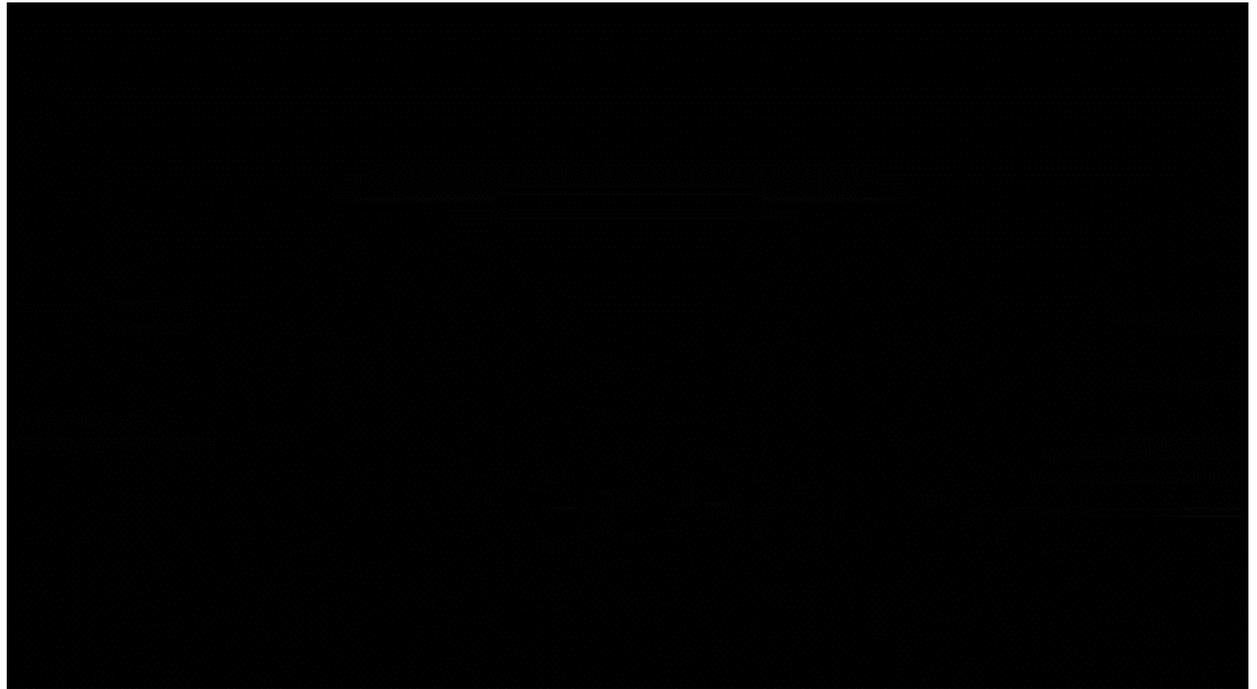


Stillman et al. (2020), *Trends in Neurosciences*

# Are active kids better learners?

## Underlying mechanisms

### Brain function

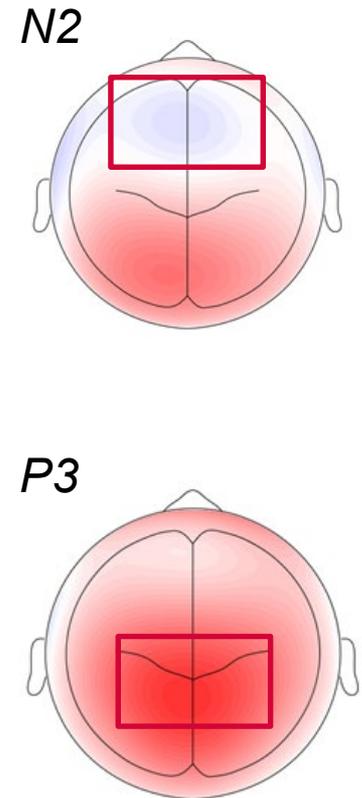
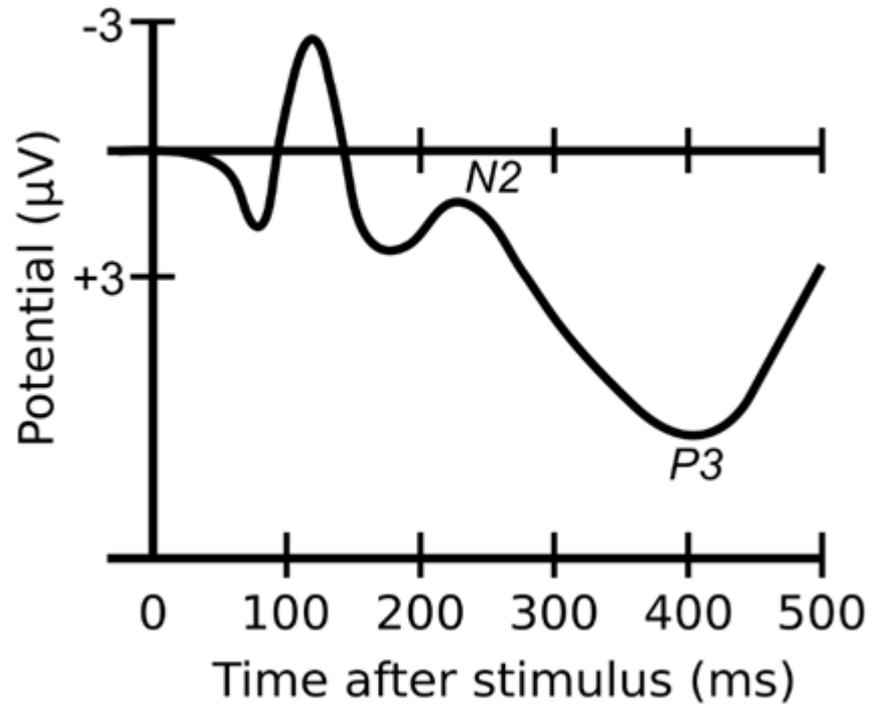


Flanker Task

# Are active kids better learners?

## Underlying mechanisms

### Brain function



# Are active kids better learners?

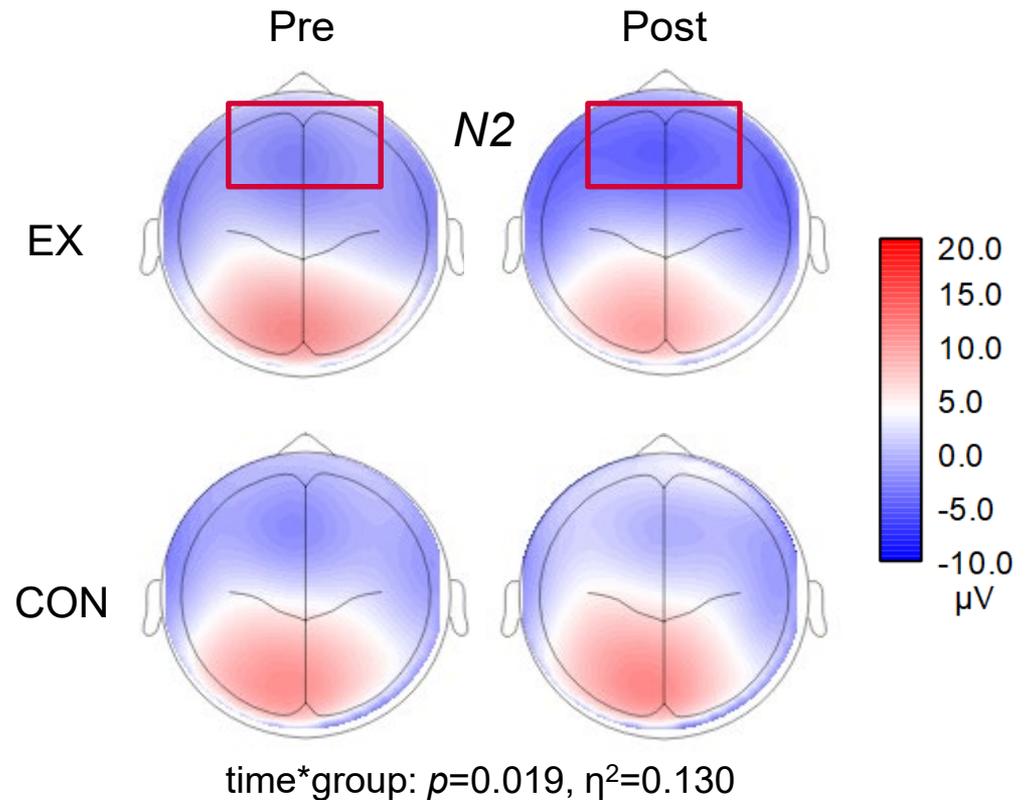
## Underlying mechanisms

### RCT on effects of martial arts



$N=42$

$M_{Age}=11\text{ y}$



Ludyga et al. (2021), *Medicine & Science in Sports & Exercise*

# Are active kids better learners?

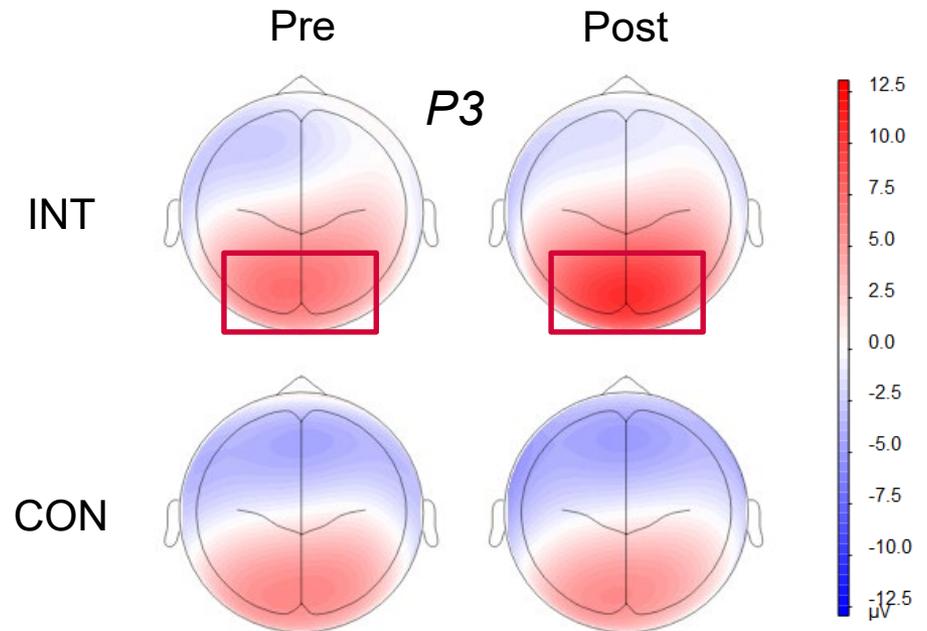
## Underlying mechanisms

### RCT on effects of combined aerobic and coordinative exercise



$N=36$

$M_{Age}=13\text{ y}$



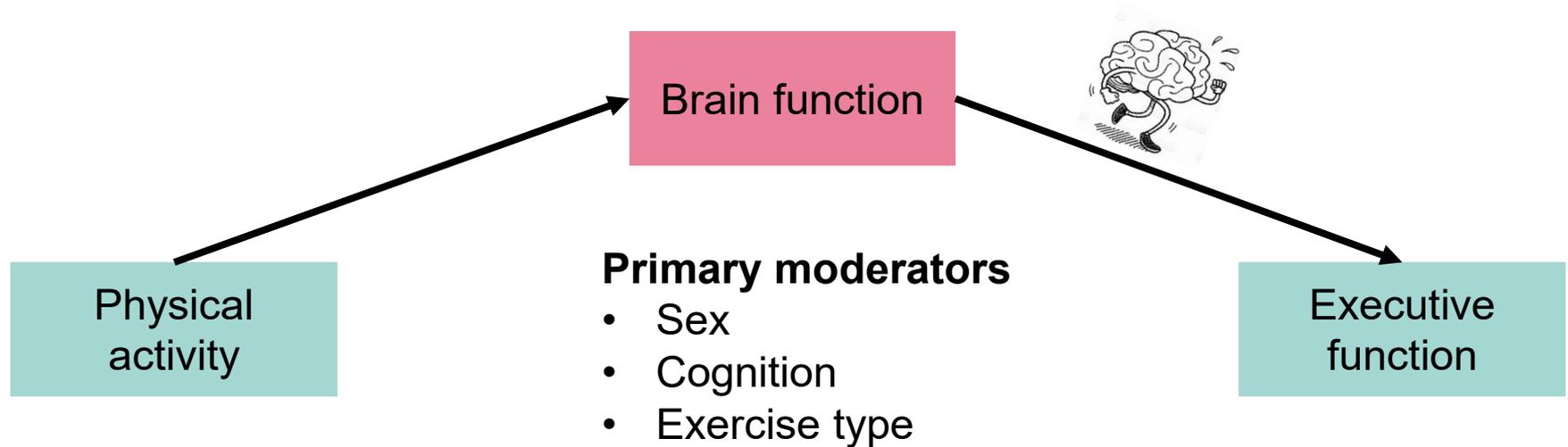
$\Delta: p=0.019, \text{cluster}=1464.2$

Ludyga et al. (2018), *Trends in Neuroscience & Education*

# Are active kids better learners?

## Underlying mechanisms

### Summary



...**executive function** predicts academic performance and learning  
...causal relation between **physical activity** and **executive function**  
...specific rather than general effects  
...exercise quality rather than quantity matters



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# Thank you for your attention

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