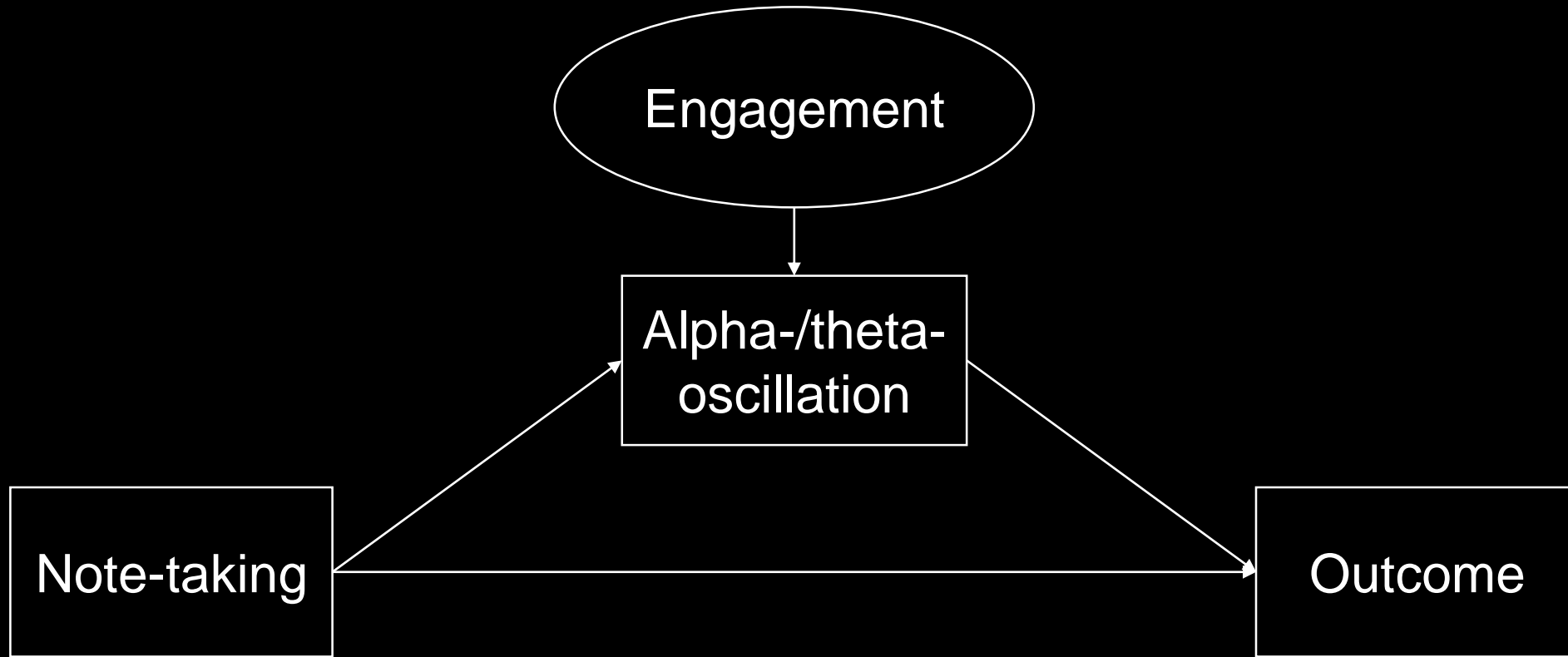# Physiological measures in research on higher education teaching and learning

An inspirational note by Peter Edelsbrunner

First of all, I would like to thank the organizers and presenters. The projects showcase the excellent theoretical and empirical level of HE research and they provide a coherent overview of the value of physiological measures in looking under the hood of learning processes.
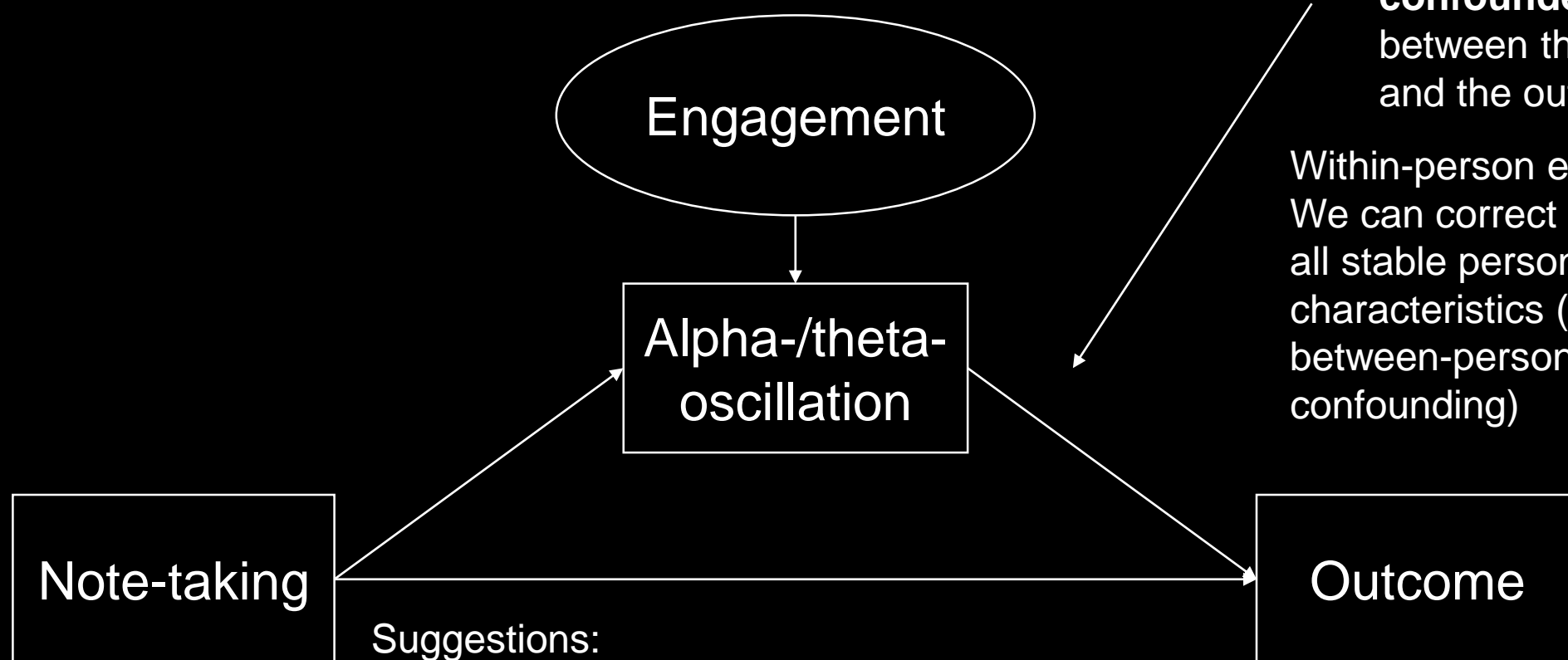
Gijsen et al.
Bayesian multilevel modeling in *brms*
*The power of the **within-person experiment***

Gijsen et al.
Bayesian multilevel modeling in *brms*
*The power of the **within-person experiment***

Engagement

Alpha-/theta-oscillation

Note-taking
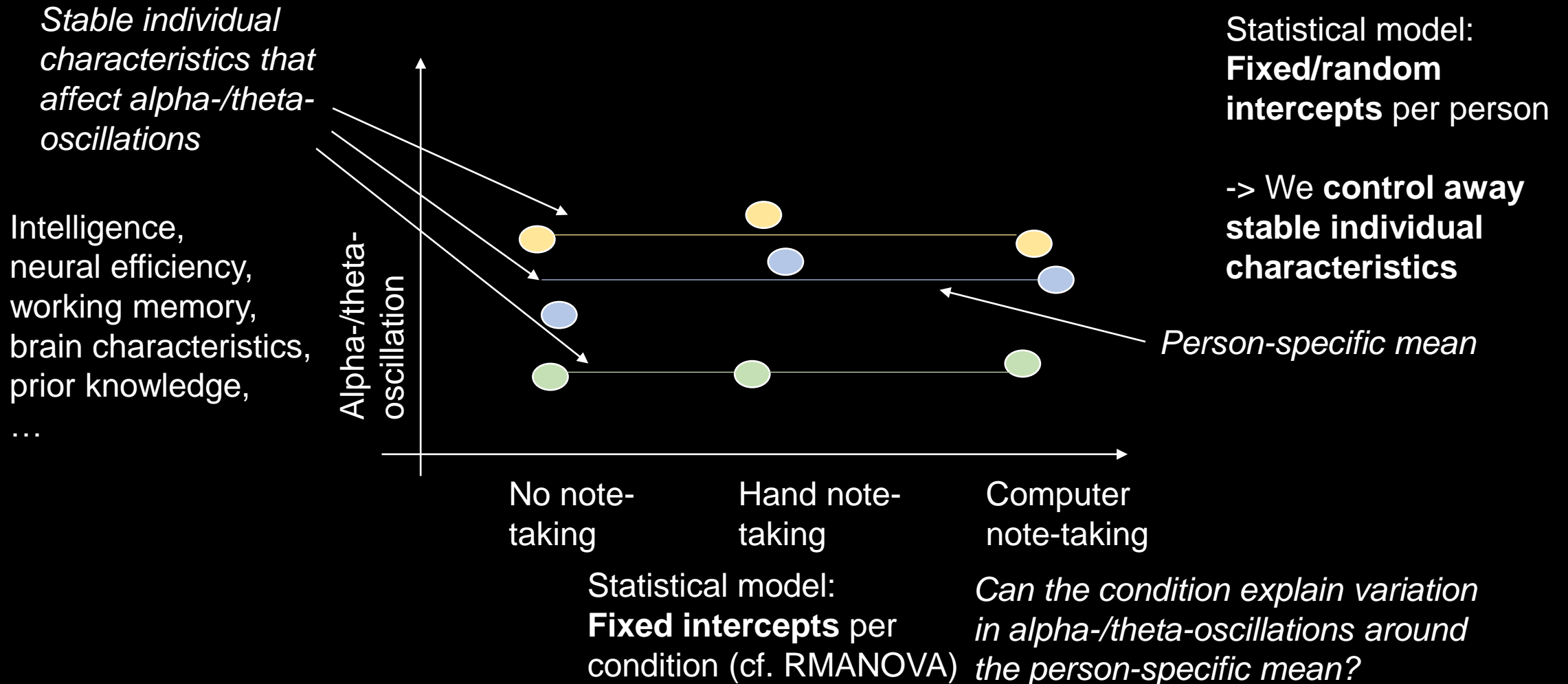
Outcome

Mediation model:
Typically, we have a **confounded path** between the mediator and the outcome

Within-person experiment:
We can correct this path for all stable person characteristics (i.e., between-person confounding)

Suggestions:
Model alpha- and theta-mediation **concurrently**
Sample **more learners** (30-60)
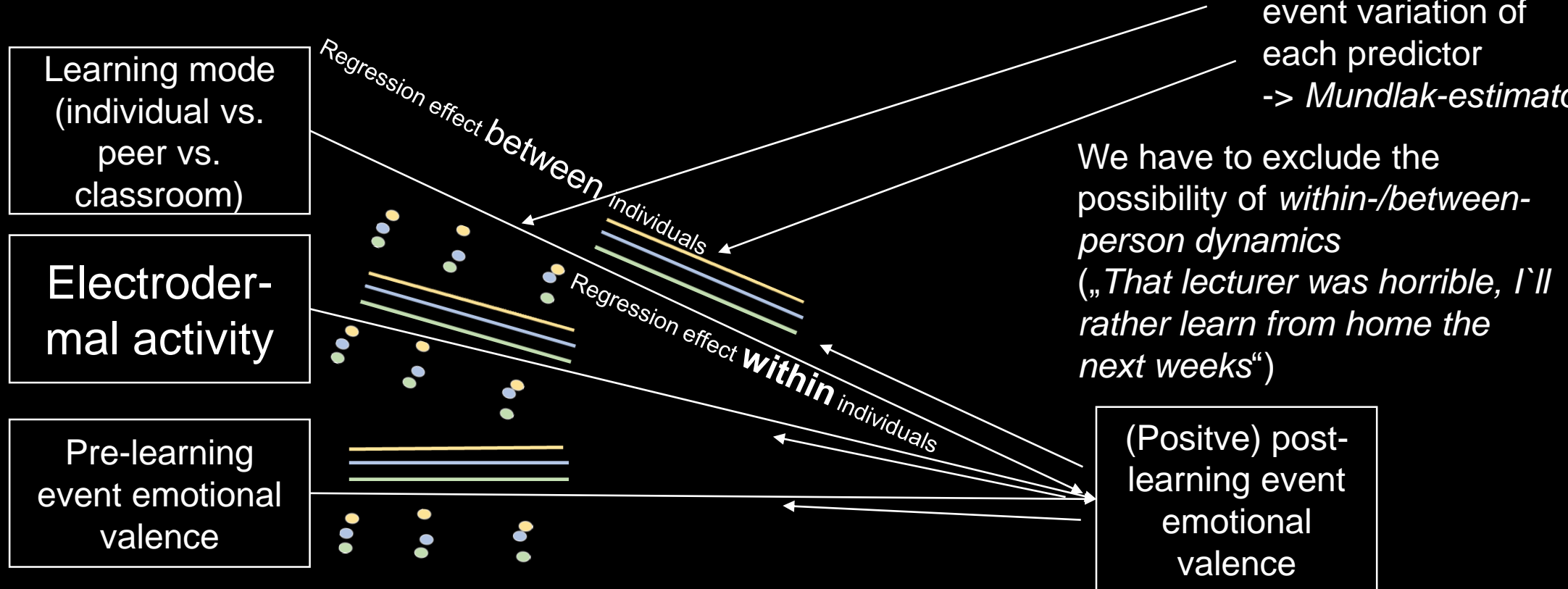**Control for non-engagement** alpha-/theta-oscillation in note-taking
Individual characteristics may **affect condition** effects (i.e., ATI effects)

Hartikainen et al.
Logstic multilevel modeling in *lme4*
*The power of **within-person intensive measurement***

Learning mode (individual vs. peer vs. classroom)

Electroder- mal activity

Pre-learning event emotional valence

Regression effect between individuals

Regression effect **within** individuals

Inclusion of person means and learning event variation of each predictor -> *Mundlak-estimator*

We have to exclude the possibility of *within-/between- person dynamics* („*That lecturer was horrible, I`ll rather learn from home the next weeks*")

(Positve) post- learning event emotional valence

Suggestions:
I am impressed by the thorough tests of model assumptions!
Theoretically evaluate **reciprocal effects;** include/evaluate autoregression
Build **latent factor/random variable** across three EDA phases (random predictor slope(s)s)
Further random effects (e.g., EDA effect, correlated random effects) varying across learners?

Van Tricht et al.
Comments by U. Dettweiler:

How might the interpretation of high arousal differ between teachers with varying levels of teaching experience or pedagogical training?
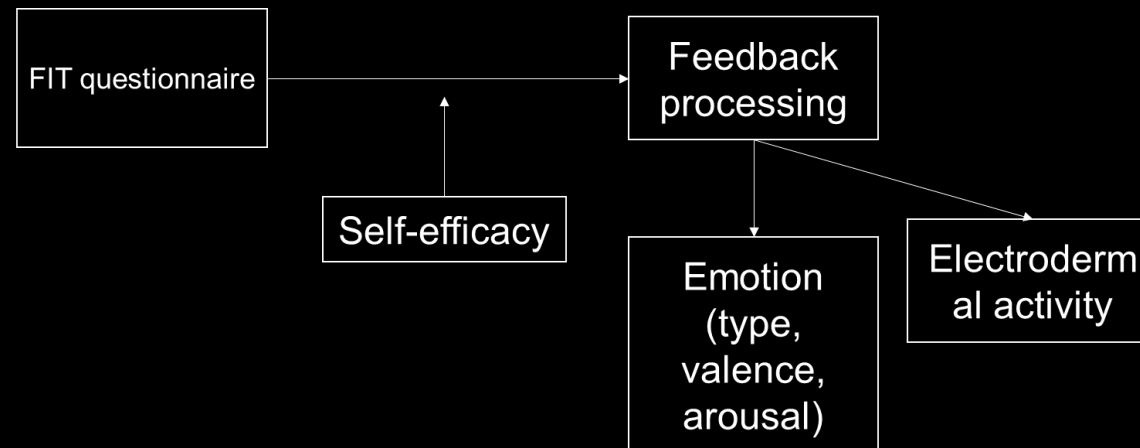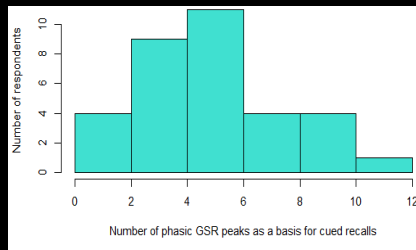→ This invites discussion on whether physiological arousal is **always a sign of stress** or could also **reflect engagement** or **flow** in expert teachers.

To what extent can guided reflection on arousal episodes be integrated into professional development programs for higher education teachers?
→ This opens a conversation about the **practical applications** of the method **beyond research**.

Figure 2
Histogram for the number of phasic GSR Peaks per respondent as a basis for cued recalls

Number of respondents (y-axis)
Number of phasic GSR peaks as a basis for cued recalls (x-axis)

FIT questionnaire → Feedback processing

Self-efficacy

Feedback processing → Emotion (type, valence, arousal)

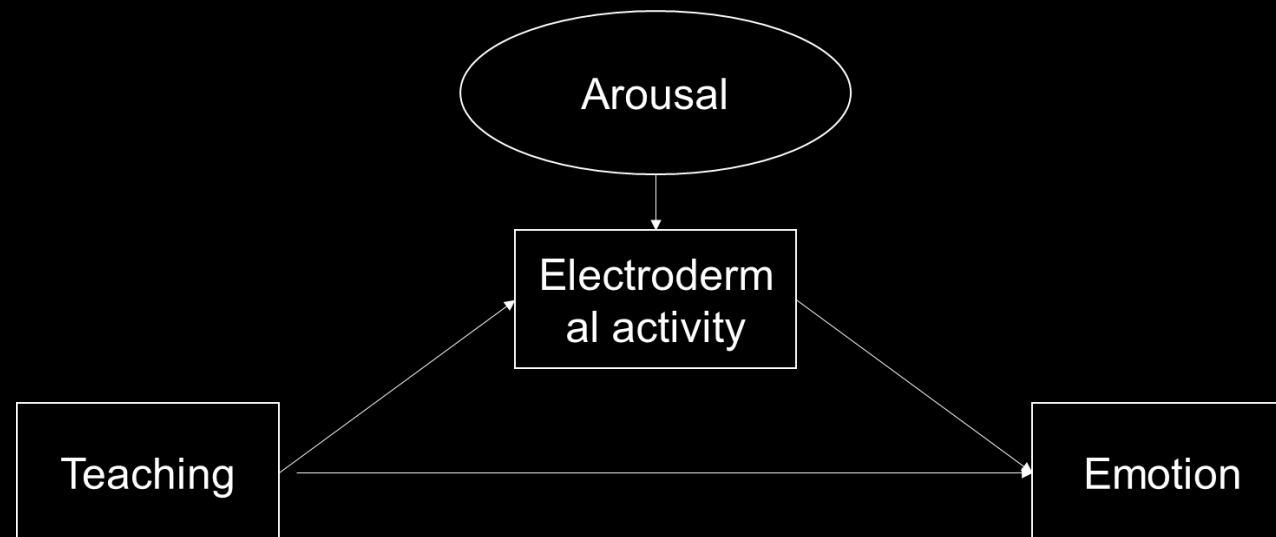Feedback processing → Electrodermal activity

Wallin et al.
Comments by U. Dettweiler

How does the self-assessment origin of the feedback (i.e., self-perception) influence the emotional validity of GSR peaks?
→ This question **challenges** the assumption that **feedback** is an **external stimulus** and probes the role of self-concept. -> Adapted theories of (internally gen.) feedback?

Could the emotional responses to feedback be used to personalize support systems in higher education, and if so, how?
→ This encourages thinking about adaptive learning environments and emotional analytics.

What do you think?

Are the interpretations of the physiological measures and their underlying psychological states – corroborated by retrospective interviews - valid and informative?
methodological critique, encourages transparency in mixed-methods design, and opens space for discussing alternative or complementary approaches (e.g., facial expression analysis, heart rate variability, real-time self-report, etc.).

What are the theoretical and practical implications of these measurement technologies for higher education research and practice?
Keywords: privacy, interpretation limits, and the potential for misuse or overreach in emotion-sensitive education technologies