

## Introduction

- According to the classical “quite stance”-paradigm of research on postural control, quit stance without any sway is the optimal postural solution.
- However, to hold just a quit stance position is rather unusual in everyday life. Normally, some kind of superordinate task or goal has to be fulfilled.
- Stoffregen and his colleagues (Stoffregen et al., 2007) supposed from an ecological point of view that postural control is functionally integrated into a context of action, which is specified by a superordinate task.
- Stoffregen et al. (2007) established the term “suprapostural task” and differentiate between perceptual and cognitive tasks.
- From this point of view, postural performance should be superior (i.e., less sway) if a suprapostural task is given compared to a non-suprapostural task setting.
- We tested this assumption by using a meta-analytic approach.

## Objective & Hypotheses

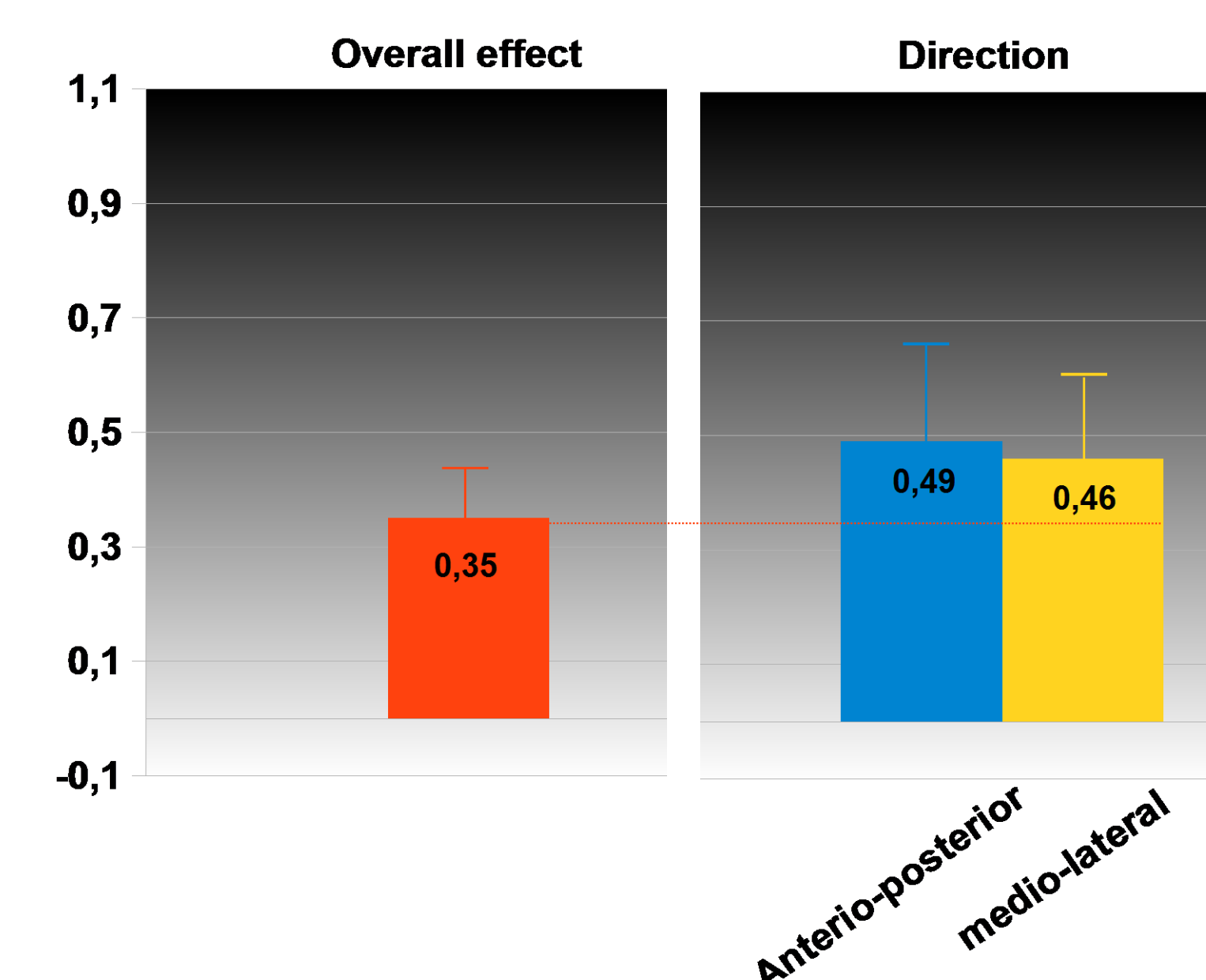
- The objective of this meta-analysis was to answer the following questions:
  - (A) Do suprapostural tasks affect the postural performance negatively or positively (and if so to what extent)? [⇒ Overall effect]
  - (B) Do the following variables moderate the effect of suprapostural tasks on postural performance (and if so to what extent): Type of suprapostural task, age of subjects, visual condition, and stance condition? [⇒ Subgroup analysis]
- We hypothesized that ...
  - (A) ... suprapostural tasks affect the postural performance positively (i.e., less sway).
  - (B) the variables moderate the effect of suprapostural tasks on postural performance significantly.

## Methods

- *Literatur search and inclusion criteria*  
A computer based search was carried out using bibliographic databases. As inclusion criteria were defined: (a) postural sway measurement with and without a suprapostural task; (b) crossover design; (c) publication in english or german after 1990; (d) adequate data to calculate effect sizes.
- *Data extraction and statistical analysis*  
A total of 47 studies with 917 participants fulfilled the criteria and was coded independently by two raters with Cohen's  $\kappa > .80$ . Mean effect sizes (Hedges'  $g$ ) were computed using the random effect-model and analyzed in terms of significance ( $Z$ ), homogeneity ( $Q$ ), and publication bias (Funnel plot, Orwin's fail-safe  $N$ ).

## Results & Discussion

- *Overall effect*  
In fact, suprapostural tasks improve postural performance significantly,  $g = 0.35$ , with  $Z = 3.81$ ,  $p < .001$ . Postural sway is reduced in settings in which a suprapostural task is given compared to settings in which a suprapostural task is not given. Thus, the first hypothesis is confirmed.

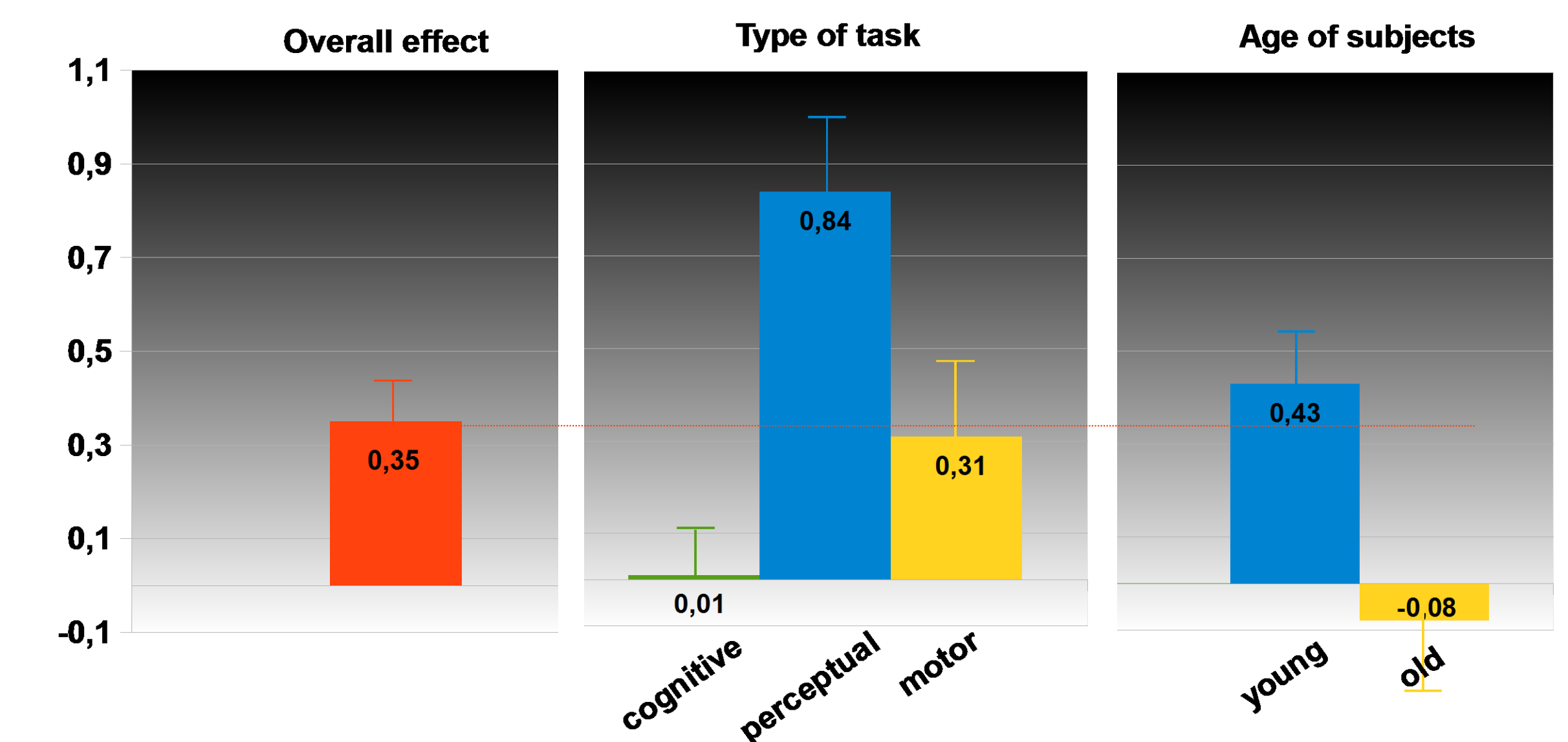


This sway-reducing effect was found both in anterior-posterior-direction ( $g = 0.49$ ) and medio-lateral-direction ( $g = 0.46$ ).

**Graph 1. Overall effect of suprapostural tasks on postural performance.**

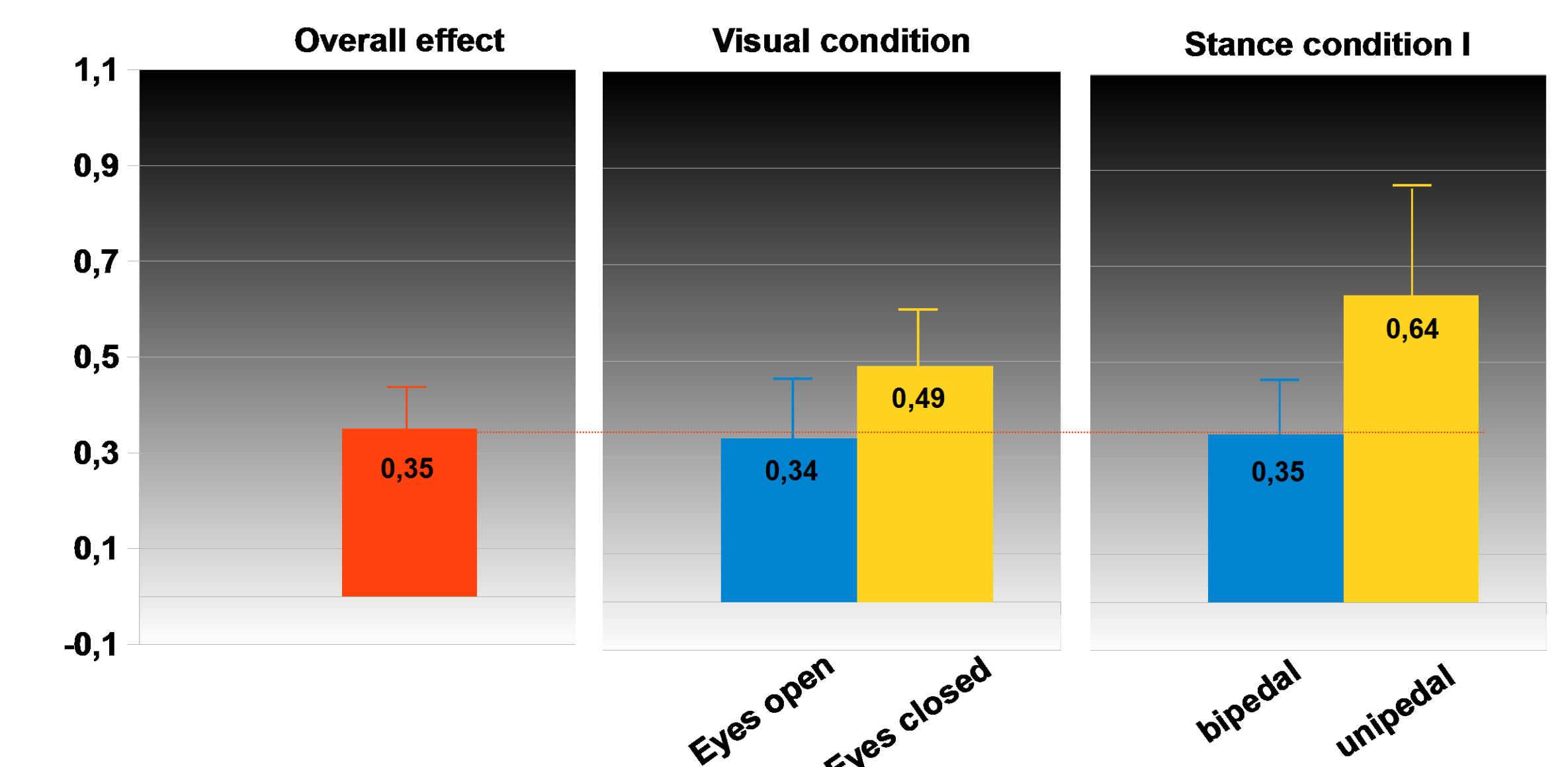
- *Subgroup analysis*  
Results of subgroup analysis showed that the variables “Type of suprapostural task” and “Age of subjects” moderate the effect of suprapostural tasks on postural performance. The sway-reducing effect is significantly greater for predominantly perceptual tasks ( $g = 0.84$ ) than for predominantly motor tasks ( $g = 0.31$ ). Suprapostural tasks of predominantly cognitive demands have no sway-reducing effect ( $g = 0.01$ ).

Similarly, we found a sway-reducing effect of suprapostural tasks only in young(er) adults ( $g = 0.43$ ), but not in old(er) adults ( $g = -0.08$ ).



**Graph 2. Subgroup analysis I**

Furthermore, the effect of suprapostural tasks tends to be greater under eyes closed-condition ( $g = 0.49$ ) than under eyes open-condition ( $g = 0.34$ ), and for unipedal stance ( $g = 0.64$ ) than for bipedal stance ( $g = 0.35$ ).



**Graph 3. Subgroup analysis II**

- *Discussion*  
Overall, results of this meta-analysis support the ecological approach to human postural control.

## Reference

- Stoffregen, T.A., Hove, P., Bardy, B.G., Riley, M. & Bonnet, C.T. (2007). Postural stabilization of perceptual but not cognitive performance. *Journal of Motor Behavior*, 29, 126-138.