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# Postural control in the context of goal-directed action

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## Towards an advanced concept ...



„No functional movement,  
 ..., exists,  
 except as embedded  
 in a **complex situation**  
 and nested into a given  
**postural setting.**”

(Edward S. Reed, 1989)



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## Basic Assumptions



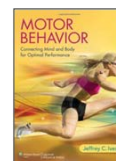
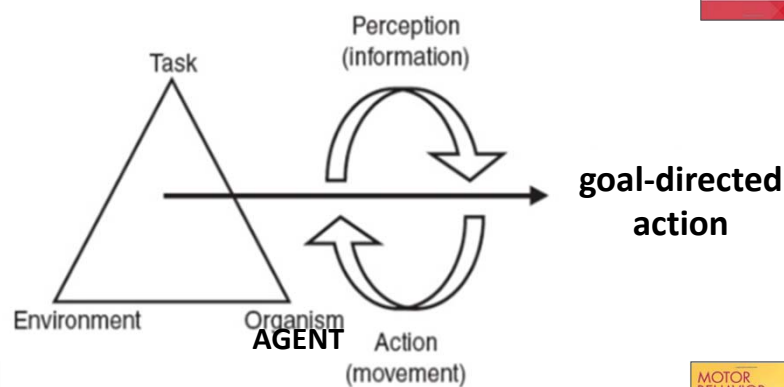
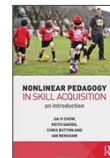
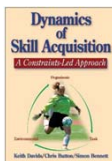
- **constraints:** person, environment, and task (Newell, 1986)
- approach: **functional integration** vs. resource competition (Riccio, 1993)
- postural stabilization of **perceptual** but not cognitive **performance** (Stoffregen et al., 2007)
- paradigm shift: **swaying smart** vs. standing still (Gottschall et al., 2009)

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## Constraints-Led Approach



cf., Newell, 1984, 1986, 1996; Bootsma, 1998; Araújo et al., 2007

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## Suprapostural Tasks (cf., Lippens, 2016)

task	author
<b>perceptual contact:</b> looking touching, anchoring listening	Stoffregen et al., 1999 - 2010 Riley et al., 1999; Mauerberg-deCastro et al., 2004, 2014 Stoffregen et al., 2009 b, 2010;
<b>manual manipulating:</b> aiming (laser pointer) balancing (tube) holding (cup of water) balancing (cylinder/tray) manual fitting tracking (pursuit-rotor)	Balasubramaniam et al., 2000 Wulf et al., 2003 Morioka et al., 2005 de Lima et al., 2010, 2014 Haddad et al., 2010 McNevin et al., 2013
<b>tracking task:</b> bipedal stance handstand !	Bardy et al., 1999 Gautier et al., 2009



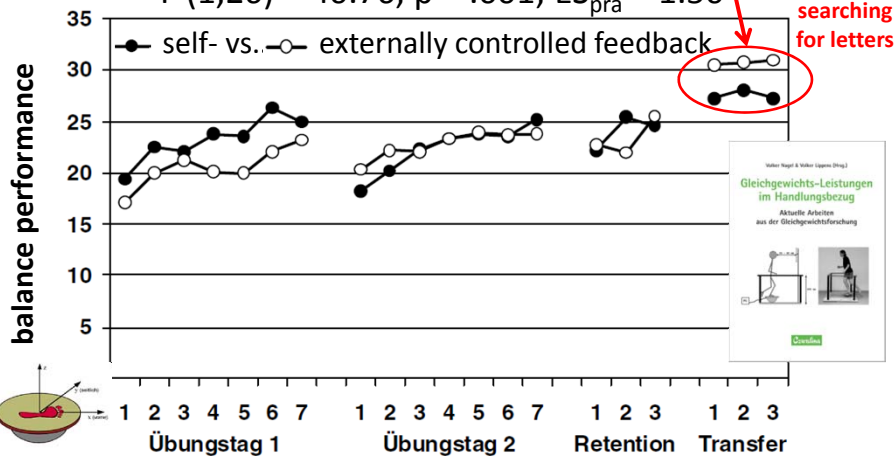
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## Effect of suprapostural Task (cf. Bund et al., 2009)

$F(1,26) = 40.76, p = .001; ES_{prä} = 1.50$

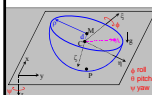


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## Swaying smart vs. *standing still*



Our nature lies in movement.  
Complete calm is death.  
(Blaise Pascal, ~ 1640)

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## “... `nested` within other task goals”

® MFT S3 check system



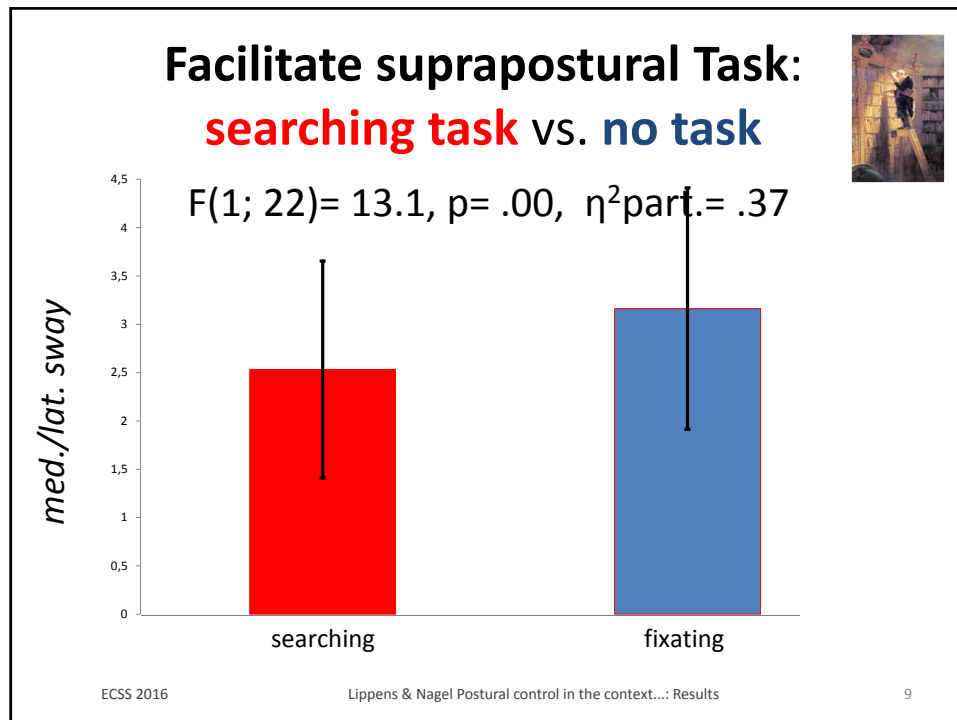
Uni HH 2015

- N = 24
- trials = 2  
(randomized with resp.  
without task)
- dynamic suprapostural task:  
**searching for letters**
- **monopedal balance task:**  
lateral-medial
- postural control:  
index of sensomotoric  
(Raschner et al., 2008)


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**Postural Control ...**  
 (van Wegen et al., 2002, 81)



**„... might not be a distinct goal and  
 ( ) the focus should be  
 on the role of tasks  
 that constrain the postural system“**

e.g.: breathing, reaching, grasping, reading,  
 intentional head movements, etc.  
 (cf., Riley et al., 1999)

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## ***Postural control is not an end in itself!***

Exp.	N	stance	t [s]	trials	device	effect size
Uni OL (transfer)	28	bipededal	45	2	balance disc: $t_{Bal}/RMS_{xyz}$	$ES_{pr\grave{a}} = 1.50$
TU Muc	23	mnopedal med./lat.	45	2	footscan: lat. sway	$d = 1.97$
Uni HH	24	mnopedal med./lat.	45	2	MFT S3 Check: Sensomot.-Index	$d = 0.53$



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### ***Take Home:***

- The postural performance is  
**“nested’ within other task goals”**  
 (van Emmerik 2007, p. 34; cf. Riccio 1993).

- The modulation of  
**task and environmental constraints**  
 is an underestimated method to investigate  
 appropriate movement task solutions  
 for postural control.



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