

CHANGES IN ANXIETY AND BALANCE CONFIDENCE AFFECT BALANCE PERFORMANCE IN YOUNG AND OLDER ADULTS

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Disclosure Statement

Dr. Mark Carpenter has no involvement with industry, and cannot identify any potential conflict of interest.

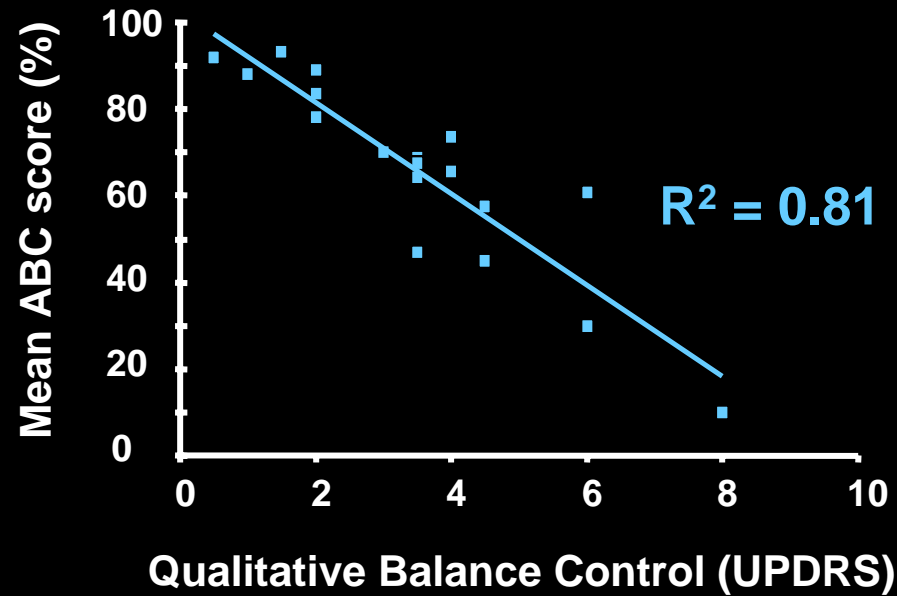
Why is it important to understand the effects of fear of falling on balance

- In older adults, over 50% of people that have fallen have a fear of falling
- Over 30% of older adults, who have not fallen have a fear of falling

Even higher prevalence of fear of falling in patients with balance disorders including:

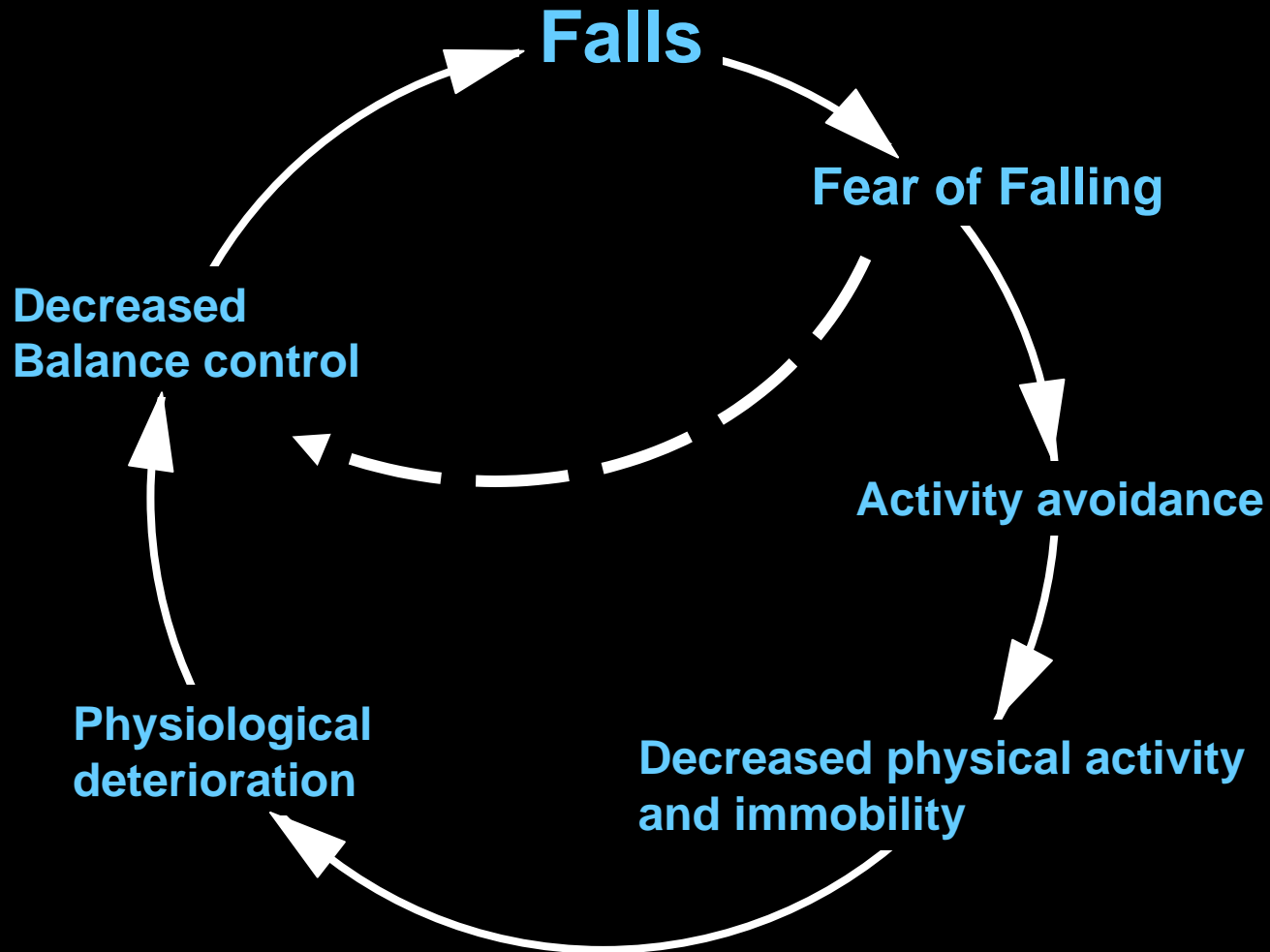
- Vestibular loss (Yardley et al. 1996)
- Parkinson's disease (Adkin et al. 2003)
- Stroke (Watanable 2005)

Fear of falling related to severity of balance symptoms



(Adkin et al. 2003)

Viscious circle between fear and falls



Evidence for fear of falling effects on balance control?

Study Type

Compare balance in groups of older adults with or without a self-reported fear of falling

Research Group

Maki et al. (1991, 1994)

Baloh et al. (1994)

Hughes et al. (1996)

Myers et al. (1996)

Okada et al. (2001)

Findings

Decreased balance performance in fearful compared to non-fearful adults

Limitations

Only associative, no causal links

Depends on self-reported fear

Direct evidence for effects of fear/anxiety on balance control?

Study Type

Compare balance in healthy adults during different postural threat conditions

Research Group

Brown and Frank (1997)

Carpenter et al. (1999, 2001, 2004, 2006)

Adkin et al. (2000, 2002)



Experimental Paradigm



Subjects stand and maintain balance while performing different tasks at different surface heights

Typically:

Low Height = 20 to 40 cm above ground

High Height = 80 to 160 cm above ground

Stand either at the edge or away from the edge

Measure changes in:

- postural performance

- physiological indicators of anxiety/arousal

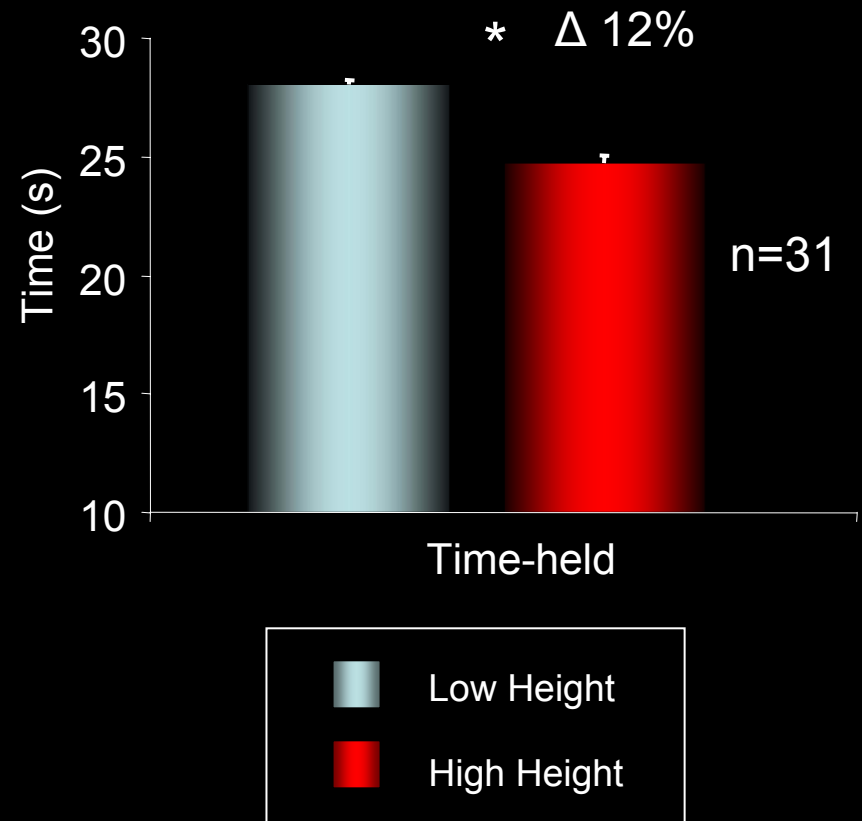
- psycho-social measures of anxiety and confidence

Research Question

Can height-induced changes in anxiety and balance confidence influence static, reactive and anticipatory postural control ?

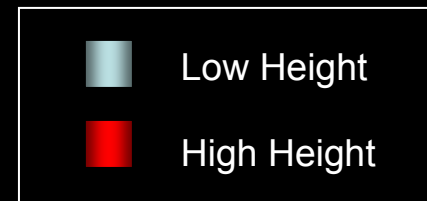
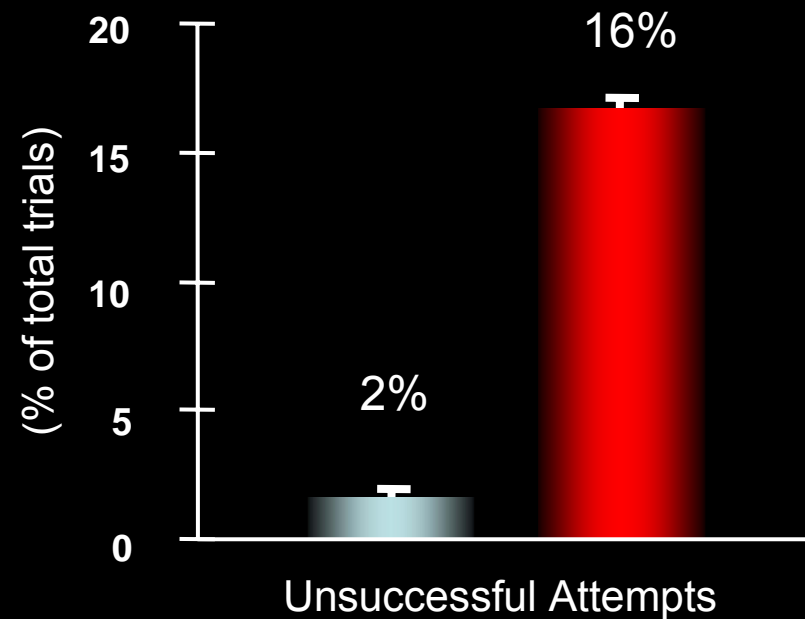
General Balance Performance

Time Standing on One-Leg



General Balance Performance

Voluntary Rise to Toes

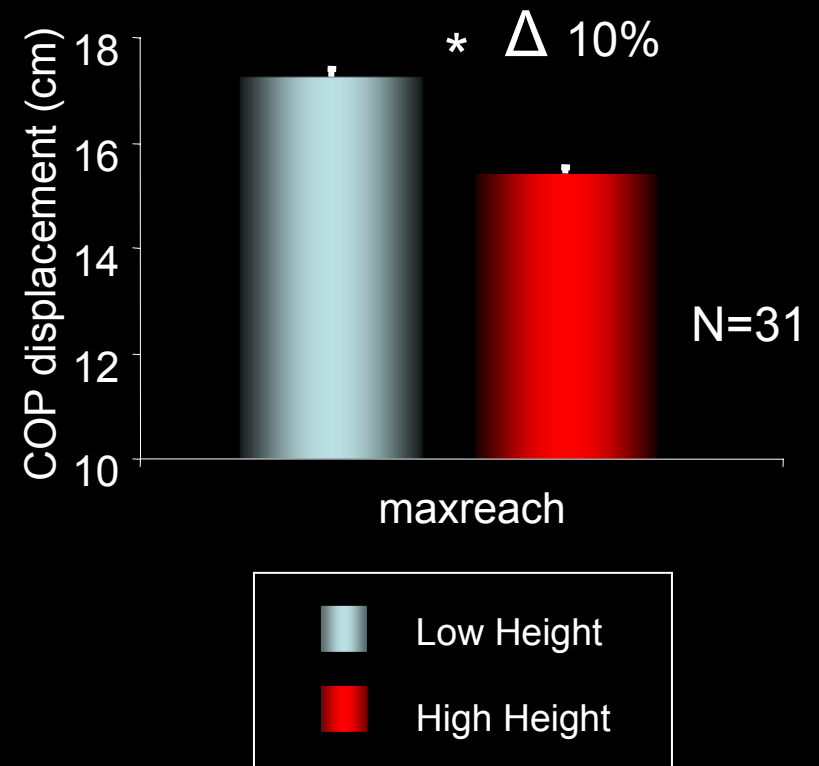


General Balance Performance

Maximum Reach Test



Photo from Cavanaugh et al. 1999



Characteristics of Static Balance

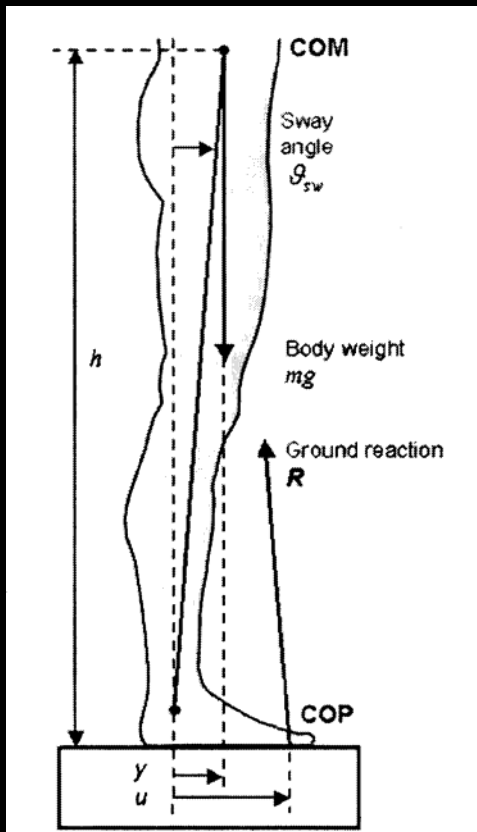


Diagram from Morasso and Sanguineti, 2002

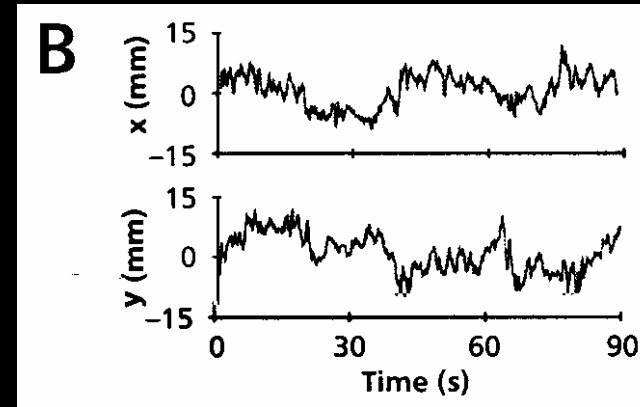
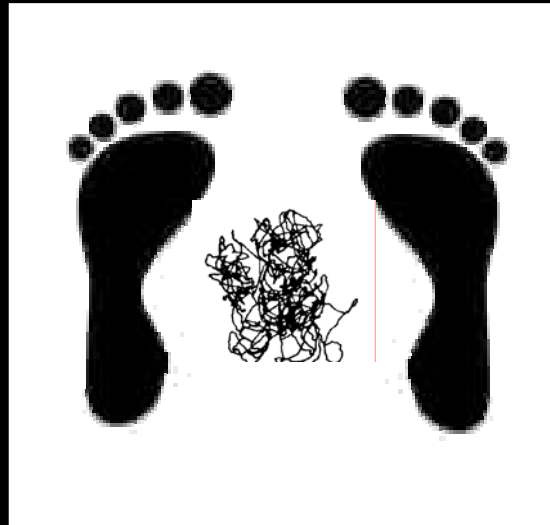
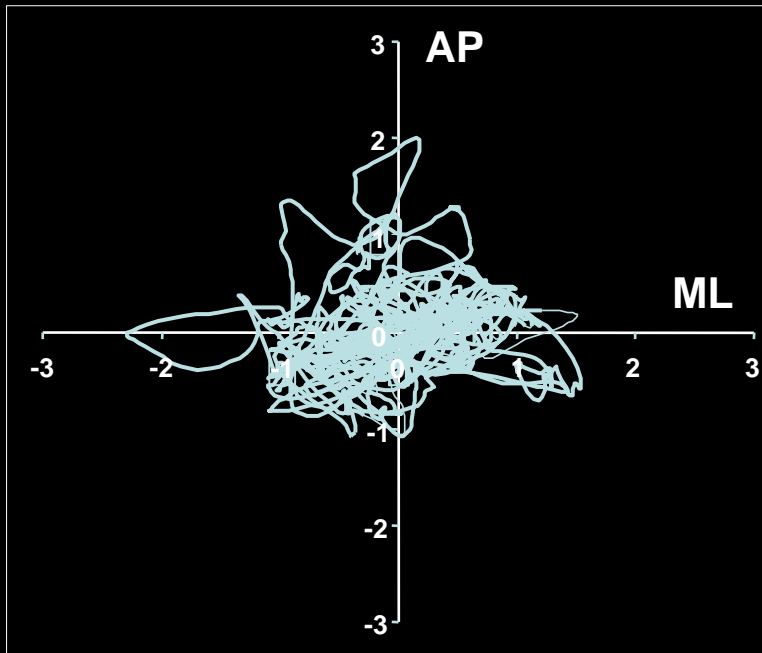


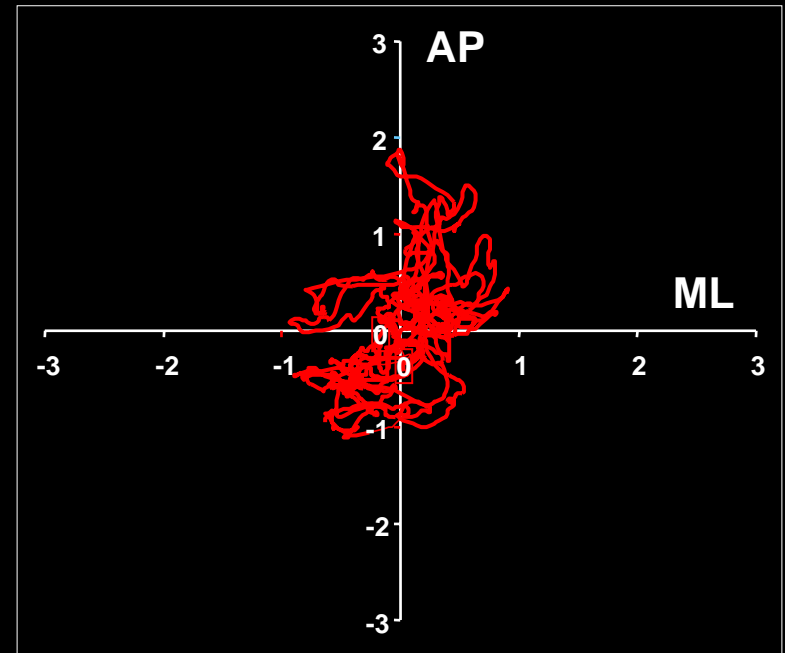
Diagram from Collins and DeLuca 1994

Decreased sway in conditions of increased threat

Low Height

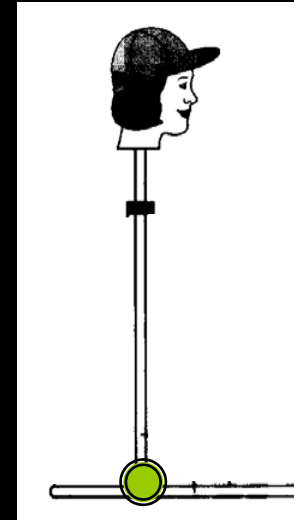
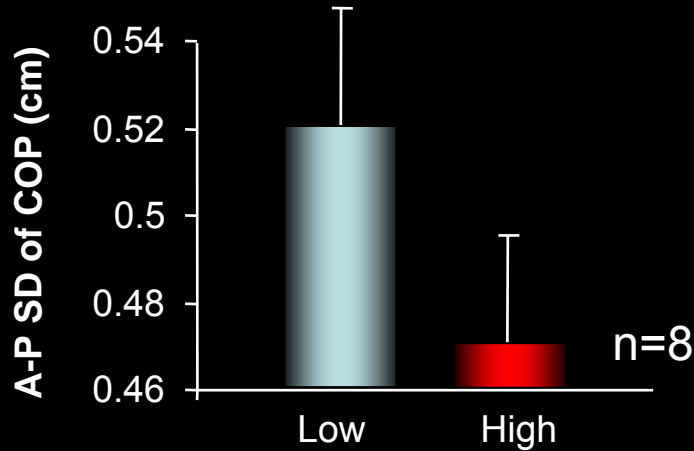


High Height



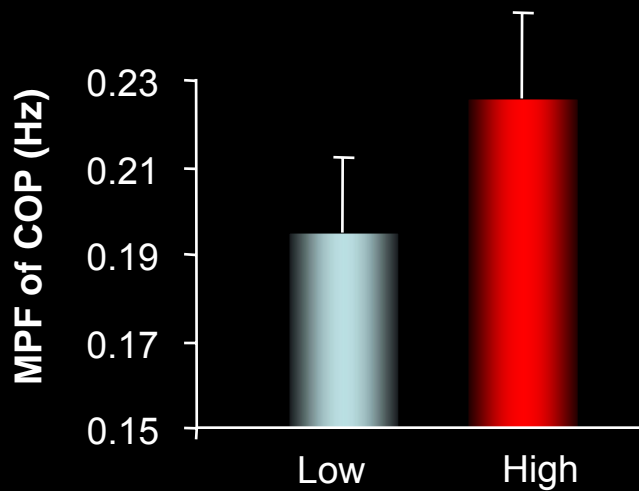
Centre of Pressure (COP)

Sway Decreased with Height

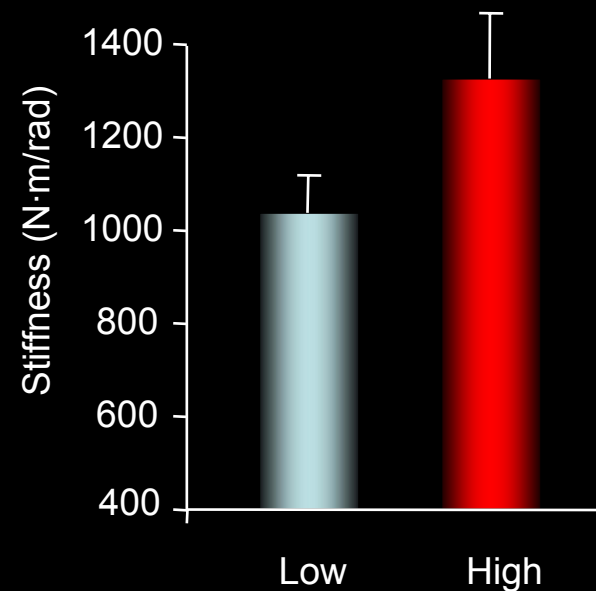


Modified from
Loram and Lakie 2002

Frequency Increased with Height



Increased Ankle Stiffness with Height



Physiological and psychological changes with increased postural threat

Physiological indicators:

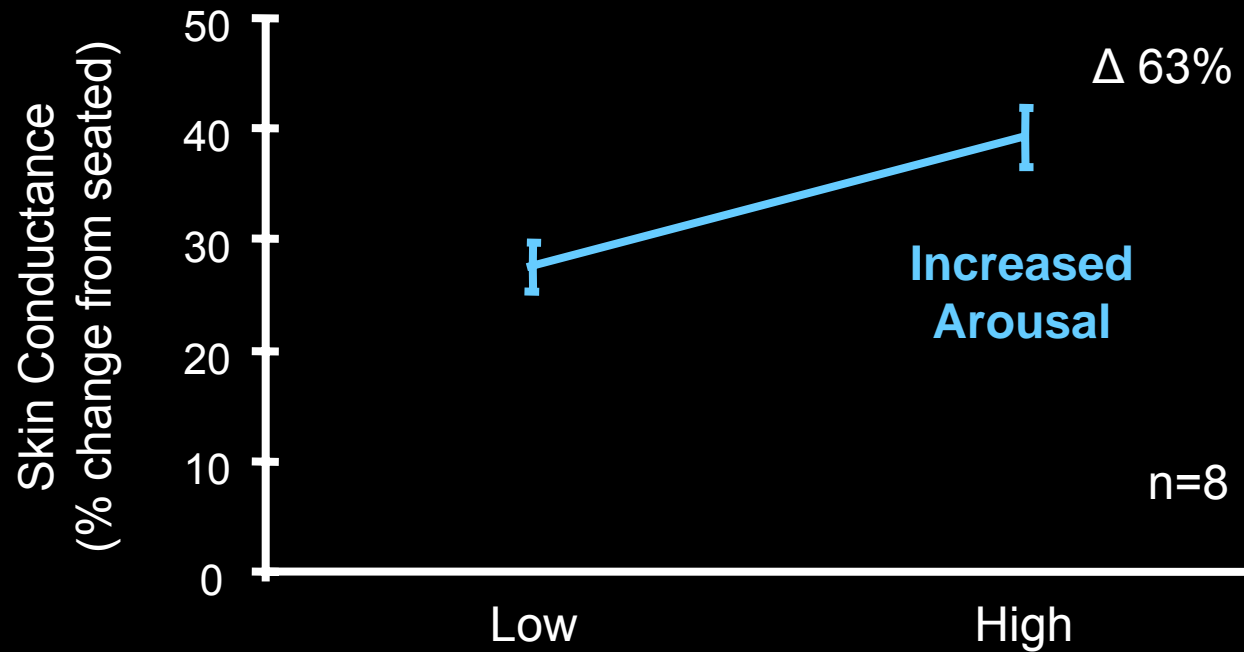
- Galvanic skin conductance

- Heart rate, blood pressure, respiration rate

Psycho-social measures of anxiety and confidence (efficacy):

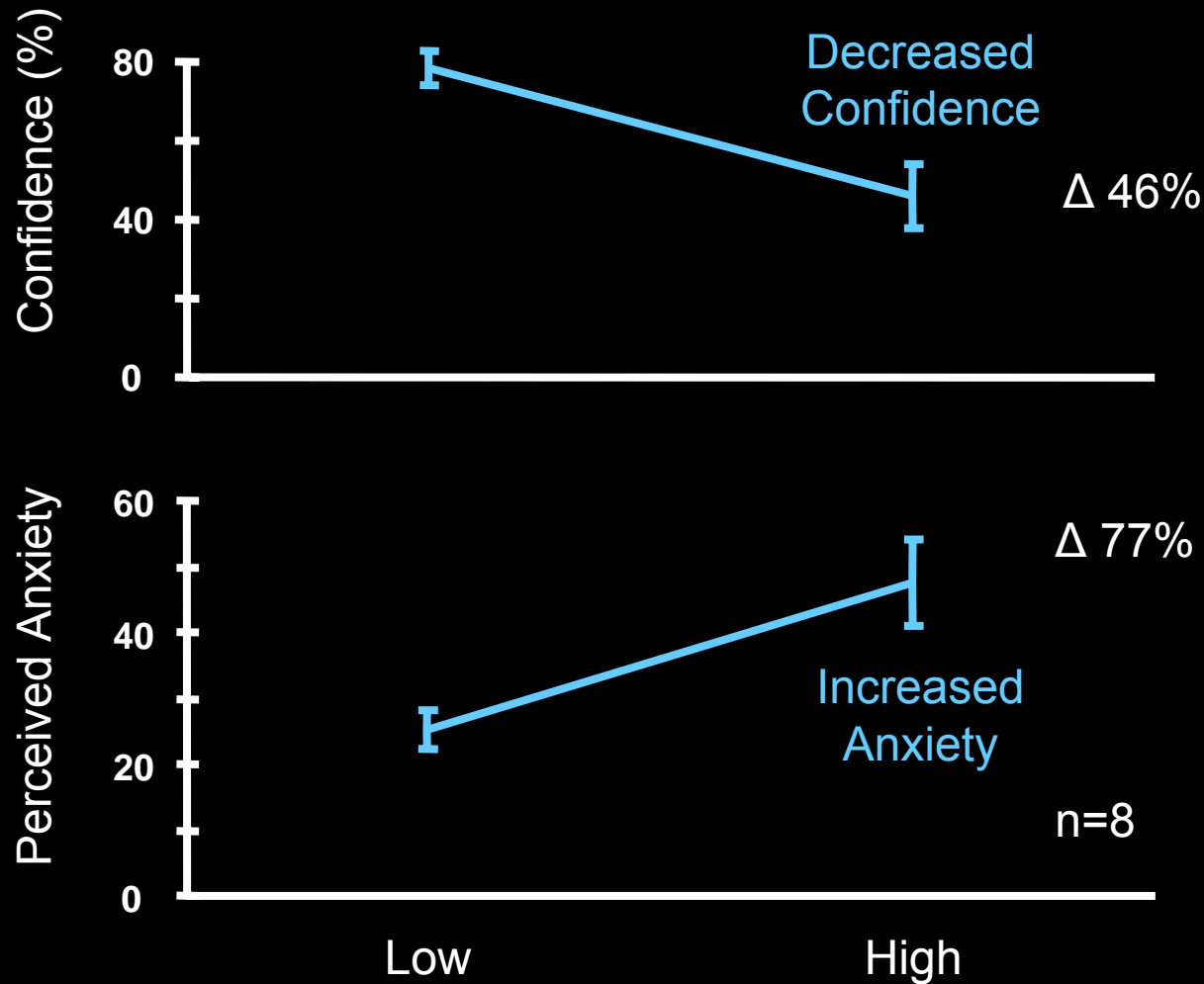
- Questionnaires probing task-specific balance efficacy and state-anxiety

Physiological arousal increased as balance threat increased



Adkin et al. 2002

Participants reported less confidence and more anxiety as surface height increased



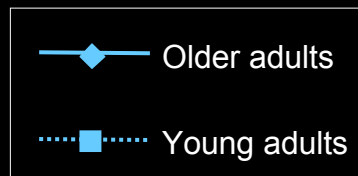
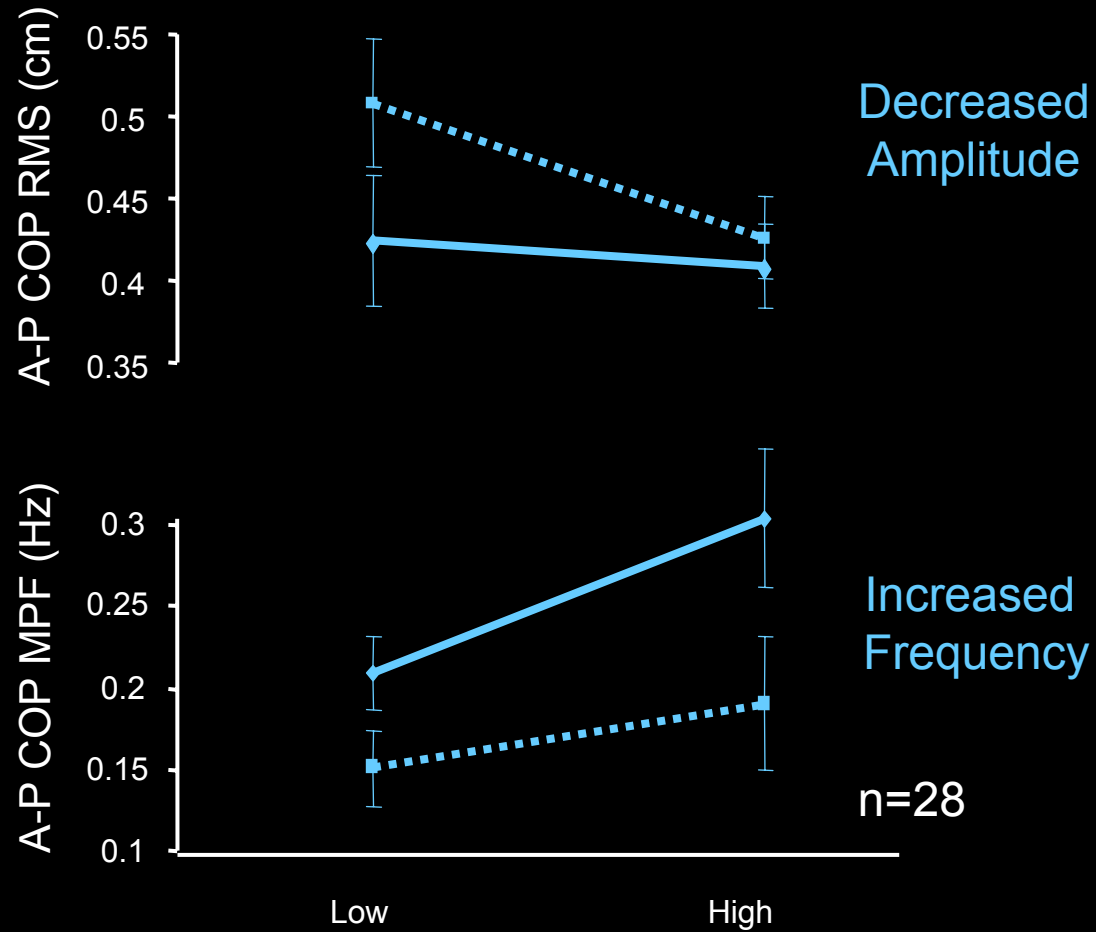
Correlation Data

Blood pressure significantly correlated with COP amplitude ($r = -0.545$)
Carpenter et al. (2006)

State Anxiety significantly correlated with COP amplitude ($r = -0.307$)
Grin et al. (submitted)

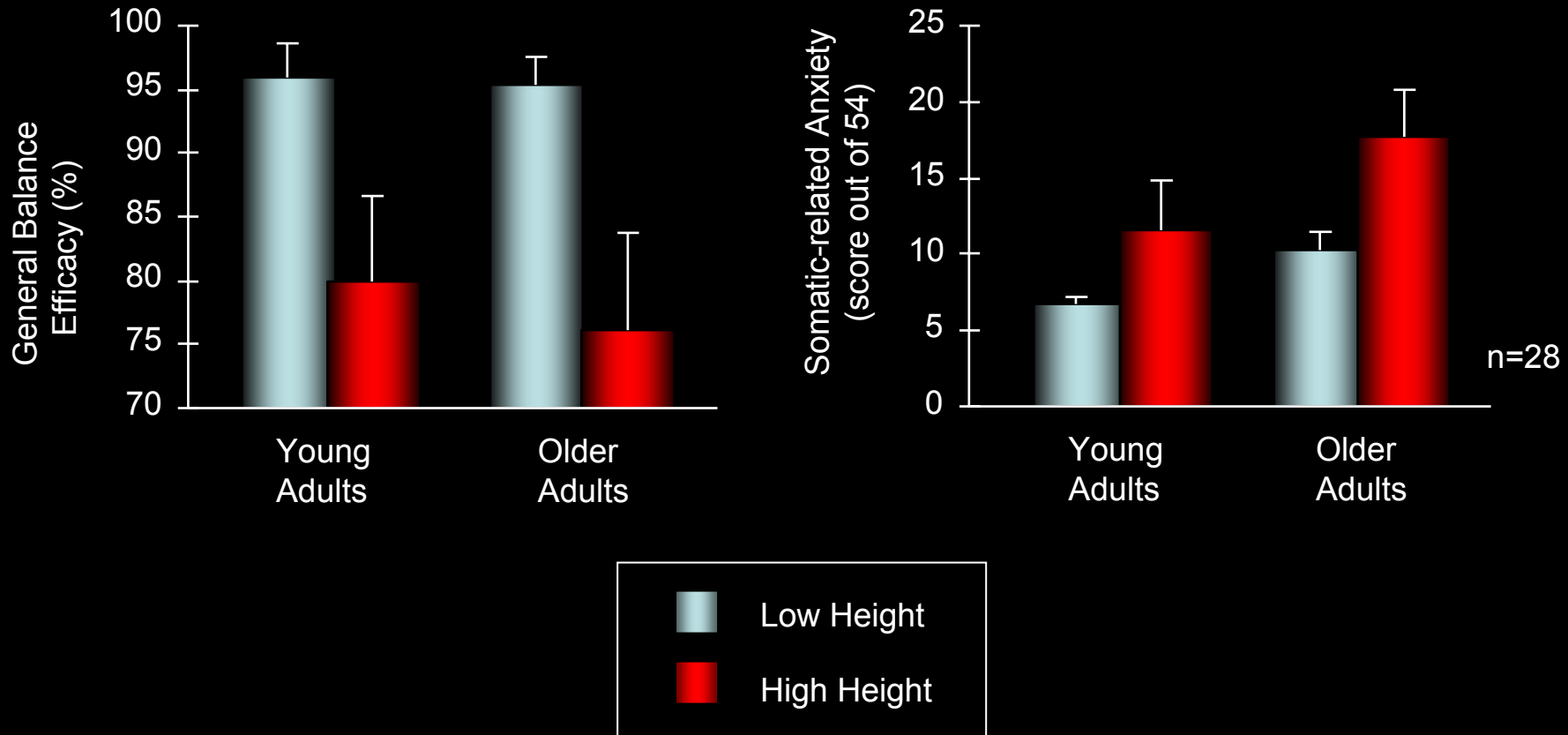
Balance efficacy significantly correlated with COP frequency ($r = -0.396$)
Grin et al. (submitted)

Similar Postural Strategies found In Young and Older Adults

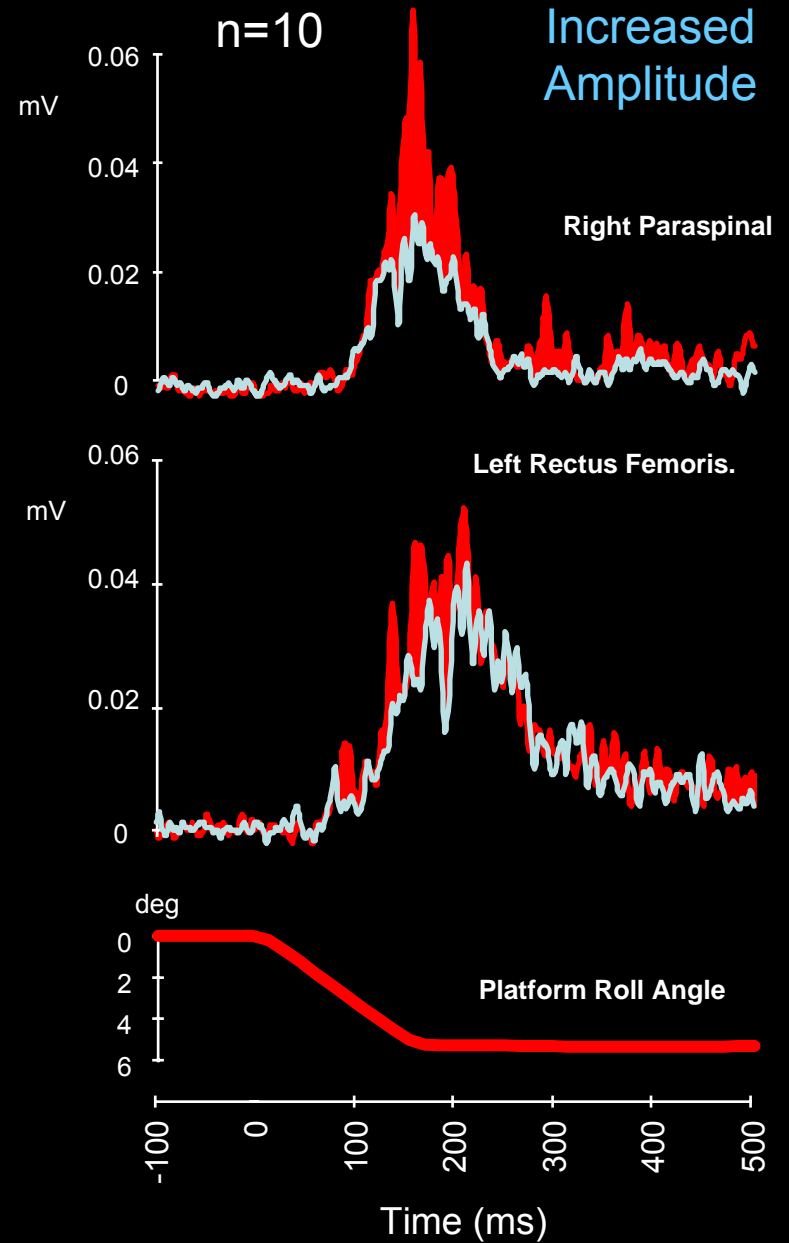


Carpenter et al. (2006)

Confidence decreased and anxiety increased in young and older adults



Increased muscle responses to unpredictable balance disturbances



Summary of Results

- In otherwise healthy young adults, increased anxiety can change balance responses during:
 - Quiet standing
 - Reaction to unexpected balance disturbance
 - Voluntary balance tasks
- Suggests that anxiety and fear can have a direct influence on balance control in young and old healthy adults, and patients with balance disorders

Implications

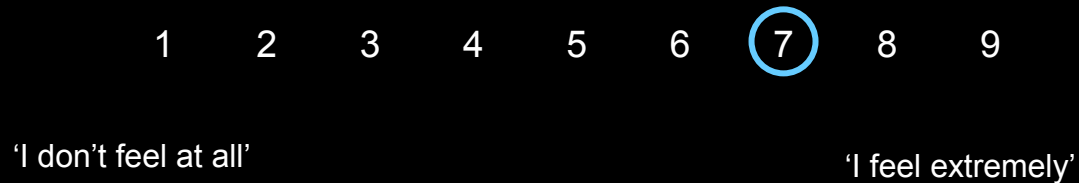
- Important to recognize the potential for factors such as anxiety, balance confidence and fear to contribute to balance control deficits associated with age and disease.
- Need to investigate new treatment and rehabilitation programs designed to address both the physiological and psychological aspects of a specific balance disorder.

Thank You!

Perceived anxiety questionnaires

16 questions based on somatic, worry and concentration elements of perceived anxiety

i.e. My heart was racing when standing at the high / low surface height:



Task-specific balance efficacy (confidence) questionnaires

Rate how confident you are that you can maintain your balance and avoid a fall during the balance task:

