

# THE INFLUENCE OF SEX AND AGE ON ANTICIPATORY POSTURAL ADJUSTMENTS IN HEALTHY PEOPLE

Van Oosterwijck Sophie<sup>1,2,3</sup>, Danneels Lieven<sup>1,3</sup>, Van Oosterwijck Jessica<sup>1,2,3,4</sup>

<sup>1</sup>SPINE Research Unit Ghent, Department of Rehabilitation Sciences, Faculty of Medicine and Health Sciences, Ghent University, Ghent, Belgium; <sup>2</sup>Pain in Motion international research group, [www.paininmotion.be](http://www.paininmotion.be); <sup>3</sup>Research Foundation – Flanders (FWO), Brussels, Belgium; <sup>4</sup>Department of Rehabilitation Sciences and Physiotherapy, Faculty of Medicine and Health Sciences, University of Antwerp, Antwerp, Belgium

**Anticipatory postural adjustments (APA)** are a neuromuscular strategy to stabilize the spine during an expected perturbation.

Using **electromyography (EMG)** the onset of APA in the trunk muscles can be measured prior to and during such a perturbation.

Evaluation of **APA in healthy persons presents a large variability**, which may occur **due to personal factors, such as age and sex**.

## What do we know?

**Anticipatory postural adjustments (APA)** occur to maintain balance and **stabilize spine** in response to perturbations due to **self-initiated** movements

**1**  
= **Feed-forward** mechanism,  
originating in the central nervous system



**2**

Trunk muscles will contract to maintain balance, such as:  
**internal oblique/transversus abdominis (IO/TrA), external oblique (EO), multifidus (MF) and iliocostalis pars thoracis (ILT)**

Muscle activity, such as **onset** and amplitude, is measured using **electromyography (EMG)**

Low back pain patients display APA onset latencies compared to healthy persons.  
However, even in healthy persons a **large variability in APA onsets** is observed, this may be due to personal factors

## Methods and materials



**Cross-sectional** study including **healthy men and women** aged **18-45 years** old



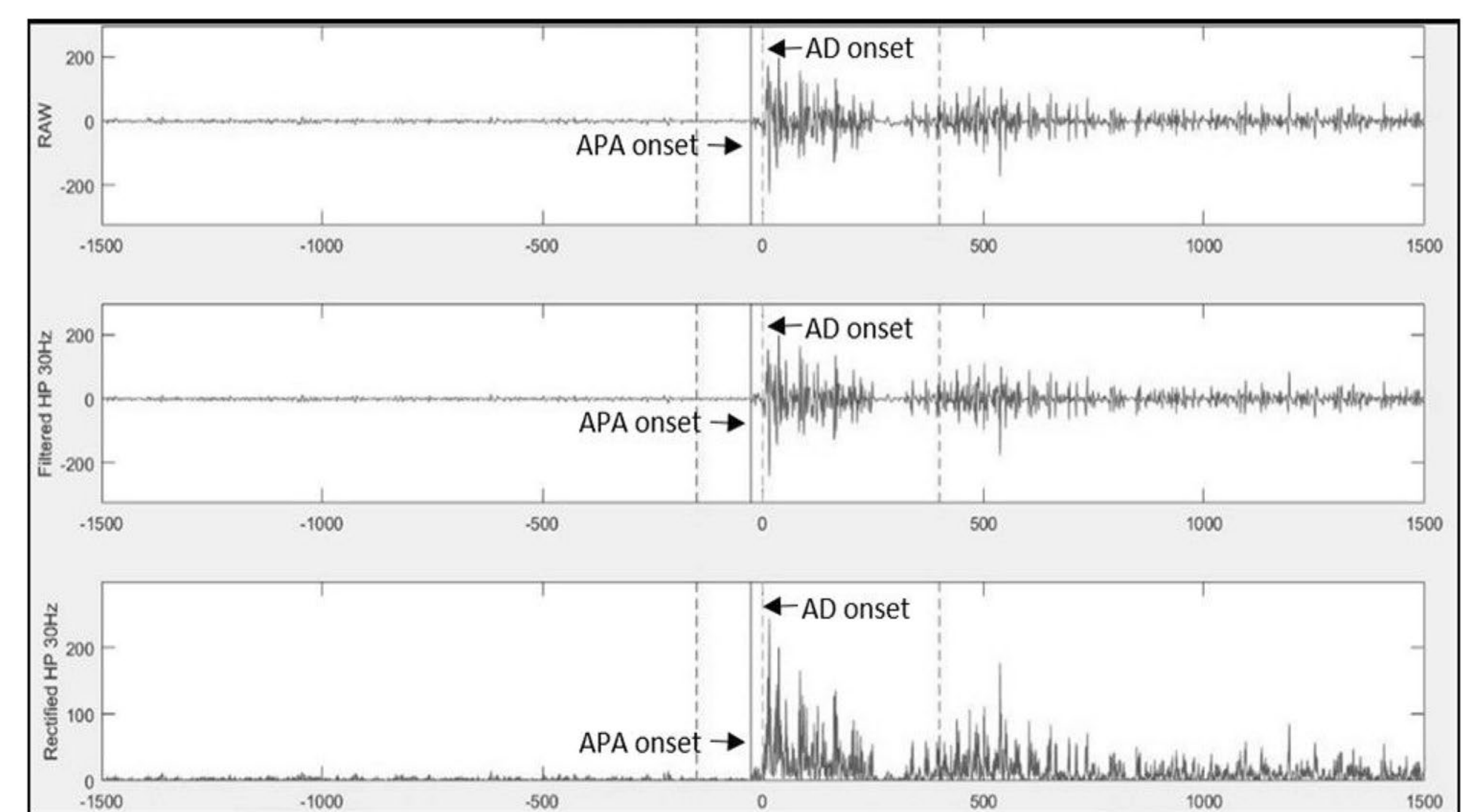
**Rapid arm movement test** with the dominant arm, comprising of 40 ante- and retroflexion shoulder movements



**Surface EMG** of **IO/TA, EO, MF** and **ILT** bilaterally and anterior deltoid (AD) of the dominant arm



**Visual APA onset determination** of anteflexion movements blinded to the muscle, body side, age and sex of the participants



## Results



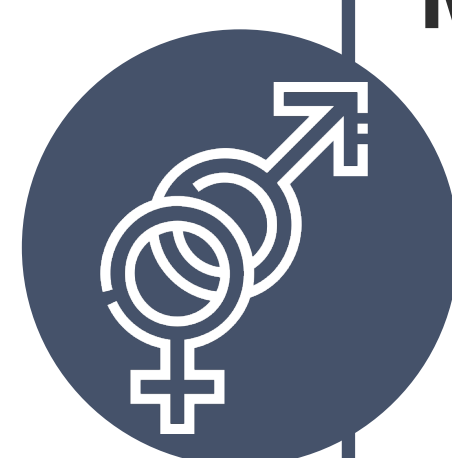
n=24

26.4y (8.8y)



n=26

24.4y (11.3y)



**Mann-Whitney U analysis** for sex differences demonstrated a...

... significantly ( $p=0.027$ ) **later APA onset** of the **IO/TrA** at the **non-dominant** body side **in women** ( $-19.6 \pm 6.34\text{ms}$ ) compared to men ( $-45.6 \pm 8.34\text{ms}$ )

... significantly ( $p=0.034$ ) **later APA onset** of the **MF** at the **non-dominant** body side **in women** ( $-3.2 \pm 7.06\text{ms}$ ) compared to men ( $-28.8 \pm 6.90\text{ms}$ )



**Linear regression analysis** revealed...

... that **15.4%** of the **variation** in **APA onset** of the **IO/TrA** at the **dominant** body side can be accounted for by **age** ( $p=0.022$ )

... **larger APA onset latencies** of the **IO/TrA** at the **dominant** body side along with **increasing age**

## Implications

The present study demonstrates that **variability in APA onset** in **healthy adults** can be accounted for by the personal factors **age** and **sex**:

A **later APA onset** was observed in **women** for both the **IO/TA** and **MF** at the **non-dominant** body side

A **later APA onset** of the **IO/TrA** at the **dominant** body side was observed along with **increasing age**

Based on these findings, future research on APA should take **age and sex** into account as **confounding factors**

Further research is needed to **unravel the underlying mechanisms** of age and sex related differences in APA onsets, as it might aid in **preventing onset and chronicity of poor postural control**, such as in low back pain patients.



Contact: [Sophie.VanOosterwijck@UGent.be](mailto:Sophie.VanOosterwijck@UGent.be)