

# The Influence of Different Playing Speeds on Muscle Activity in the Back, Upper Arm, and Forearm in Skilled Piano Playing

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## Introduction

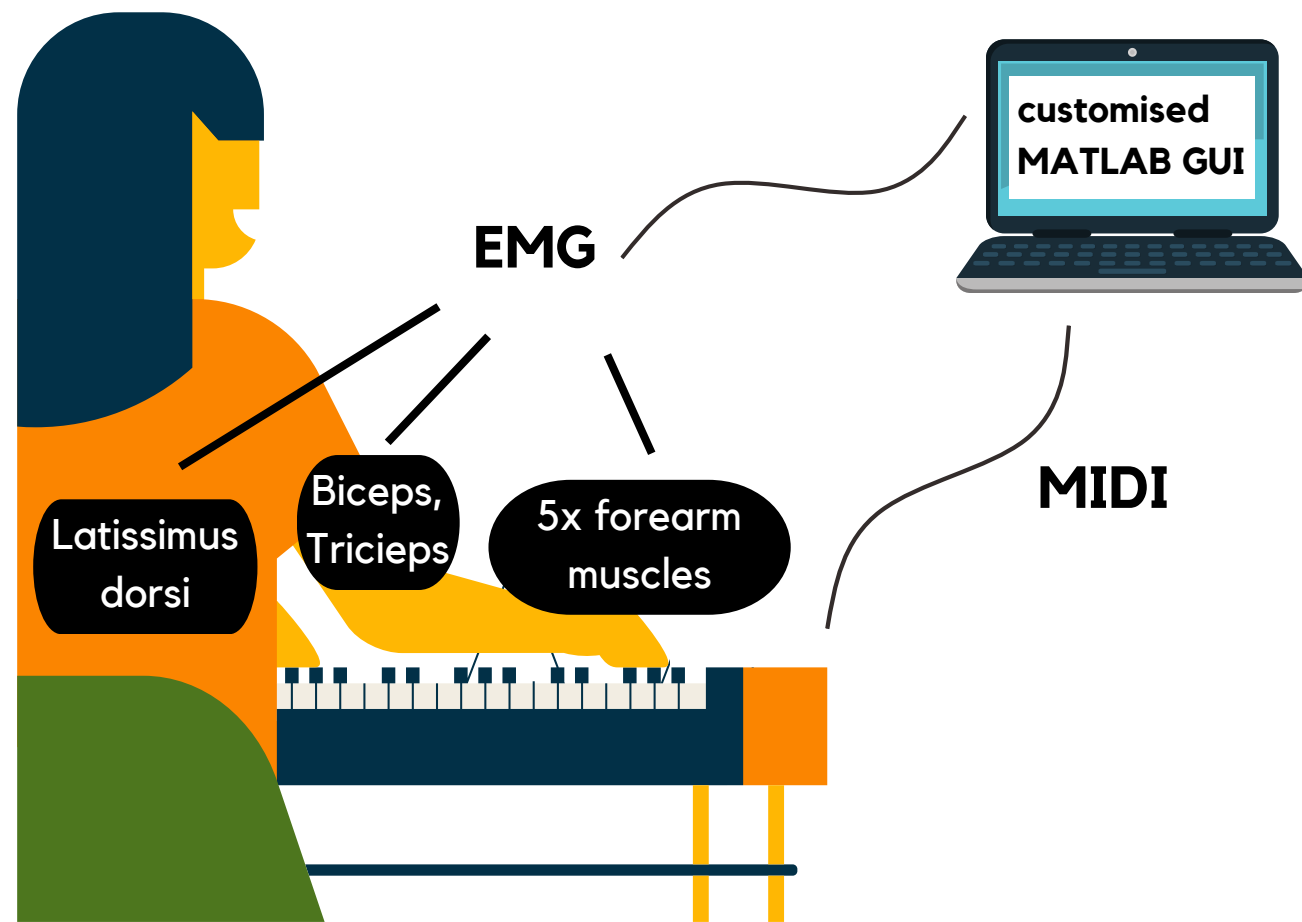
- Pianists demonstrate extraordinarily fine movement control, even at considerable playing speeds [1]
- Previous studies demonstrated different upper extremity movement organisation between expert pianists & novice piano players [2-4]
- Novice piano players' forearm muscle activity increased as the playing speed raised [5]



Does skilled piano players' muscle activity also increase with faster tempi?

## Methods

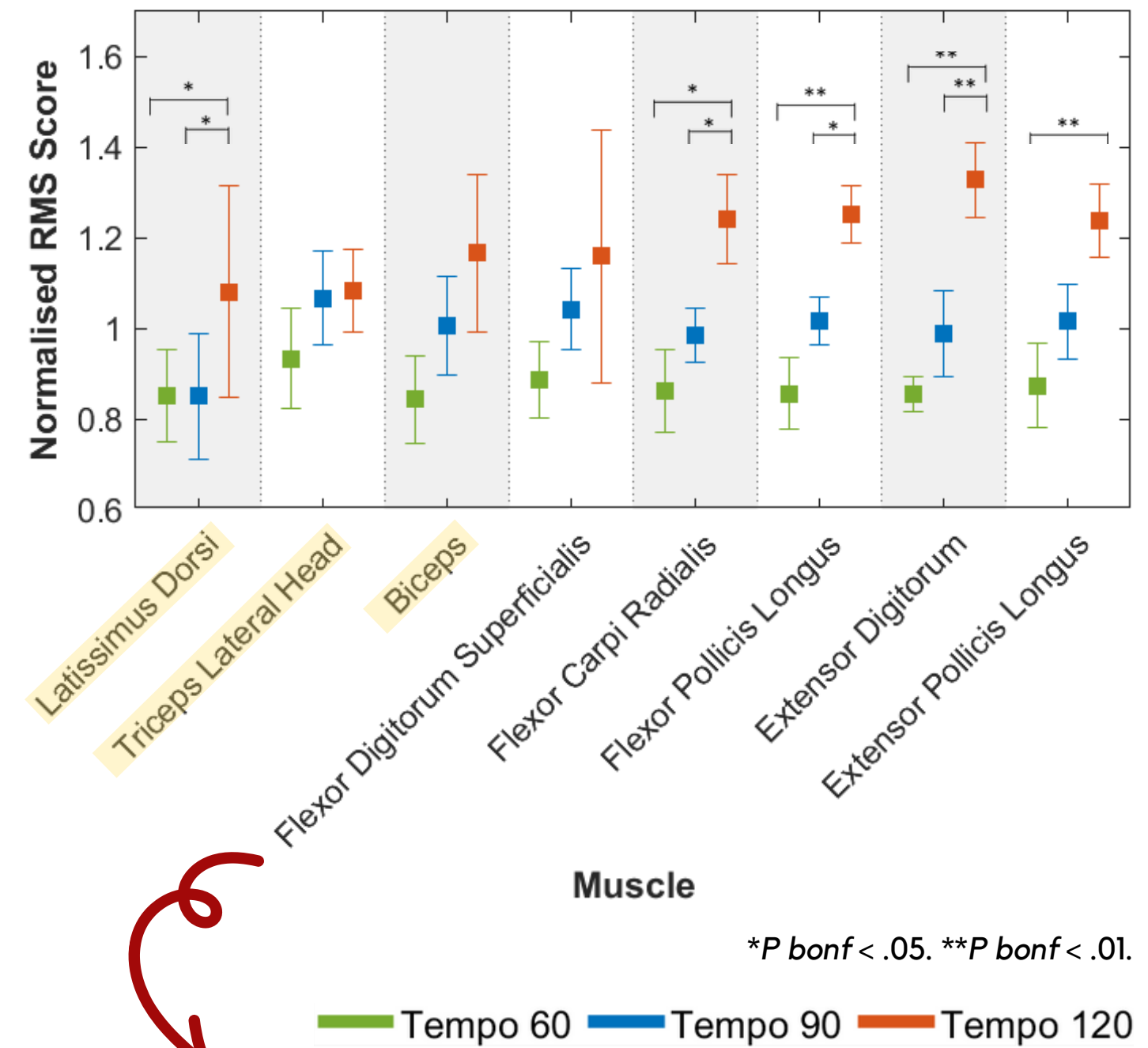
- 4 skilled pianists (4F/0M)
- Bach: Prelude in C Minor, BWV 847 [6]



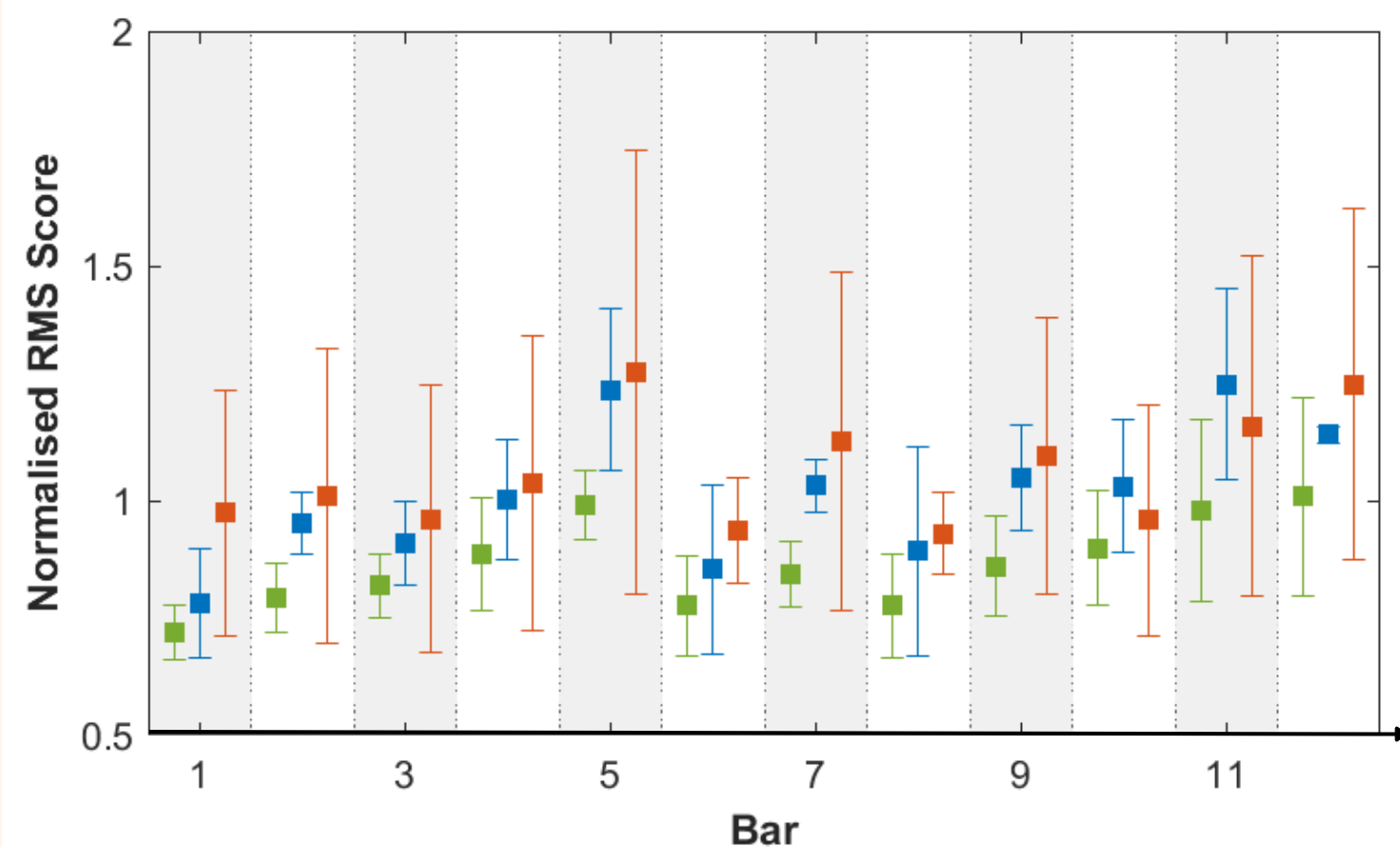
Warm-up	Experiment			Analysis
	Randomised order			
	60 bpm, 15 reps	90 bpm, 15 reps	120 bpm, 15 reps	

## Results

Muscle activity increased with playing speed in all muscles

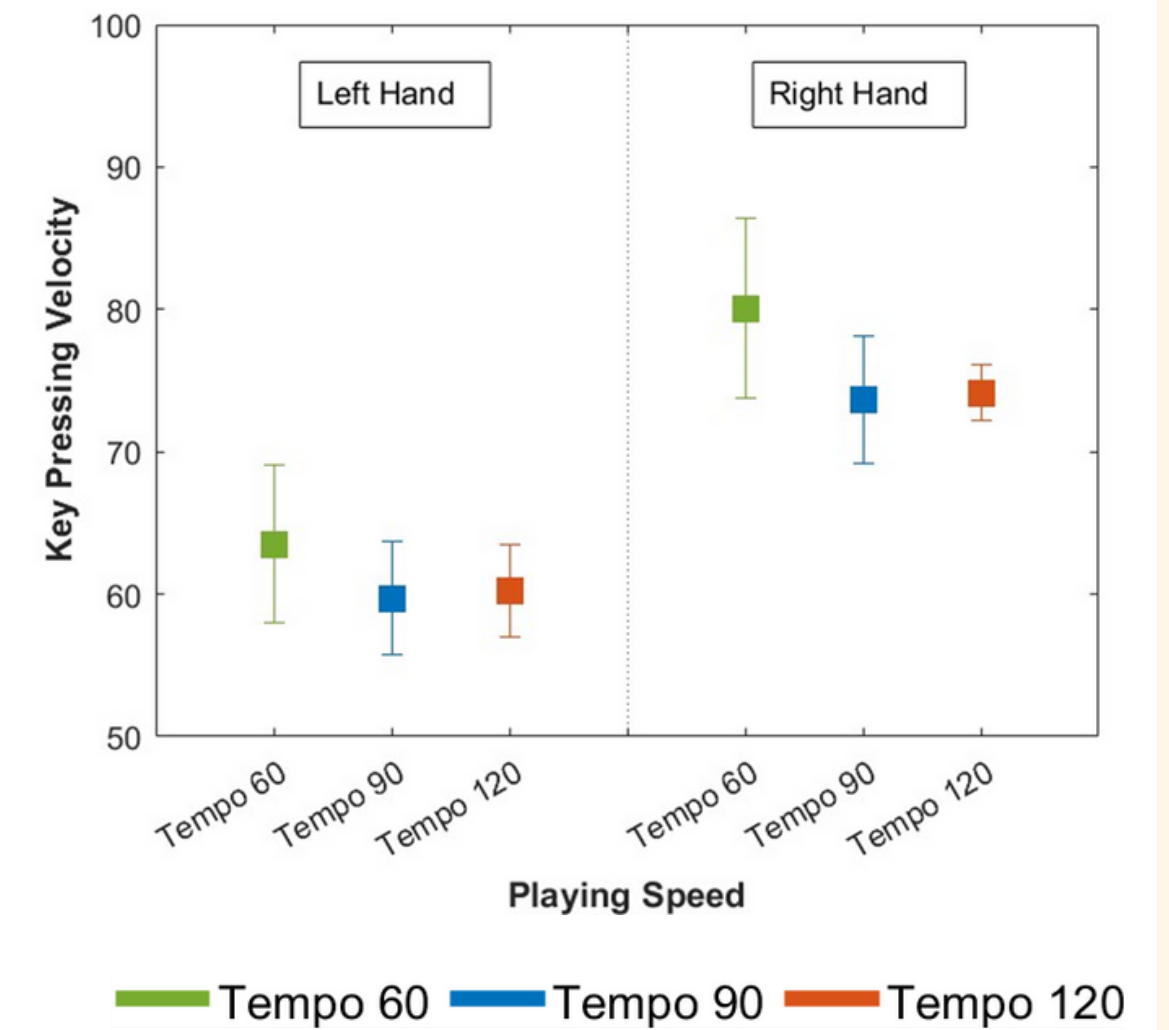


Bar-to-bar progression of muscle activity exhibited similar changes



## Results - con.

Highest key pressing velocity appeared at the slow tempo in both hands



## Conclusion

- Similar changes in muscle activity in the forearm muscles between novices [5] and skilled piano players
- Analogous changes in the upper arm and back muscles
- Elucidation of underlying mechanisms such as co-contraction or muscle synergies requires further analyses

### References:

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4. Furuya, S. and H. Kinoshita. *Experimental Brain Research*, 2008. 185(4): p. 581-593.
5. Chong, H.J., S.J. Kim, and G.E. Yoo. *Frontiers in Psychology*, 2015.
6. Bach, J.S., *Das wohltemperierte Klavier*. 1722.

### Acknowledgements:

Supported by Lighthouse Initiative Geriatrics by StMWi Bayern (Project X, grant no. 5140951).