

Bilateral neuromuscular control one year after anterior cruciate ligament reconstruction or conservative treatment

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Background & Objective

Neuromuscular alterations are reported in patients after anterior cruciate ligament (ACL) reconstruction (ACL-R) [1] or conservative treatment (ACL-C) [2]. ACL rupture seems to affect neuromuscular control of the involved, injured leg but also of the non-involved limb. Therefore, this cross-sectional study investigated bilateral neuromuscular control one year after ACL rupture in two different treatment groups (ACL-R, ACL-C) compared to healthy controls with an intact ACL (ACL-I).



Materials & Methods

cross-sectional study



Characteristics of participants

Mean ± standard deviation; BMI = Body Mass Index; Tegner activity score from 0 (sick leave or disability pension) to 10 (competitive sport on a professional level)

Group	ACL-R	ACL-C	ACL-I
Total, male:female	N=38, 21:17	N=26, 10:16	N=38, 18:20
age [years]	32.0±12.2	38.4±11.7	33.1±9.2
BMI [kg/m ²]	23.9±2.7	24.5±4.6	22.6±2.0
physical activity [min/wk]	426.0±265.1	373.0±158.2	293.3±182.8
Tegner score (10 max.)	6.7±1.5	7.0±1.2	5.5±1.3

Stair descent



Anterior tibial translation

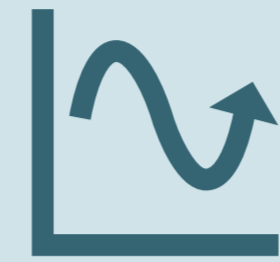


- Electromyography (EMG): vastus medialis (VM), vastus lateralis (VL), biceps femoris (BF) and semitendinosus (ST) muscle
- Submaximal EMG normalization: treadmill walking (5 km/h) [3]
- **Outcomes:** normalized root mean squares (RMS) [%subMVC] for each muscle, movement phase and reflex response ($\alpha = 0.05$)
 - preactivity (PRE), weight-acceptance (WA) and push-off (PO) phases [4–6]
 - reflex responses: preactivation (PRE_50), short, medium, long latency responses (SLR, MLR, LLR) [4–6]

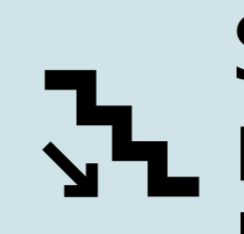


Conclusions

One year after an ACL rupture, neuromuscular alterations are still present in both legs, regardless of treatment option. Current rehabilitation protocols may not be able to restore normal neuromuscular control in either leg. Future research should include standardized rehabilitation programs with neuromuscular exercises to restore bilateral neuromuscular function.

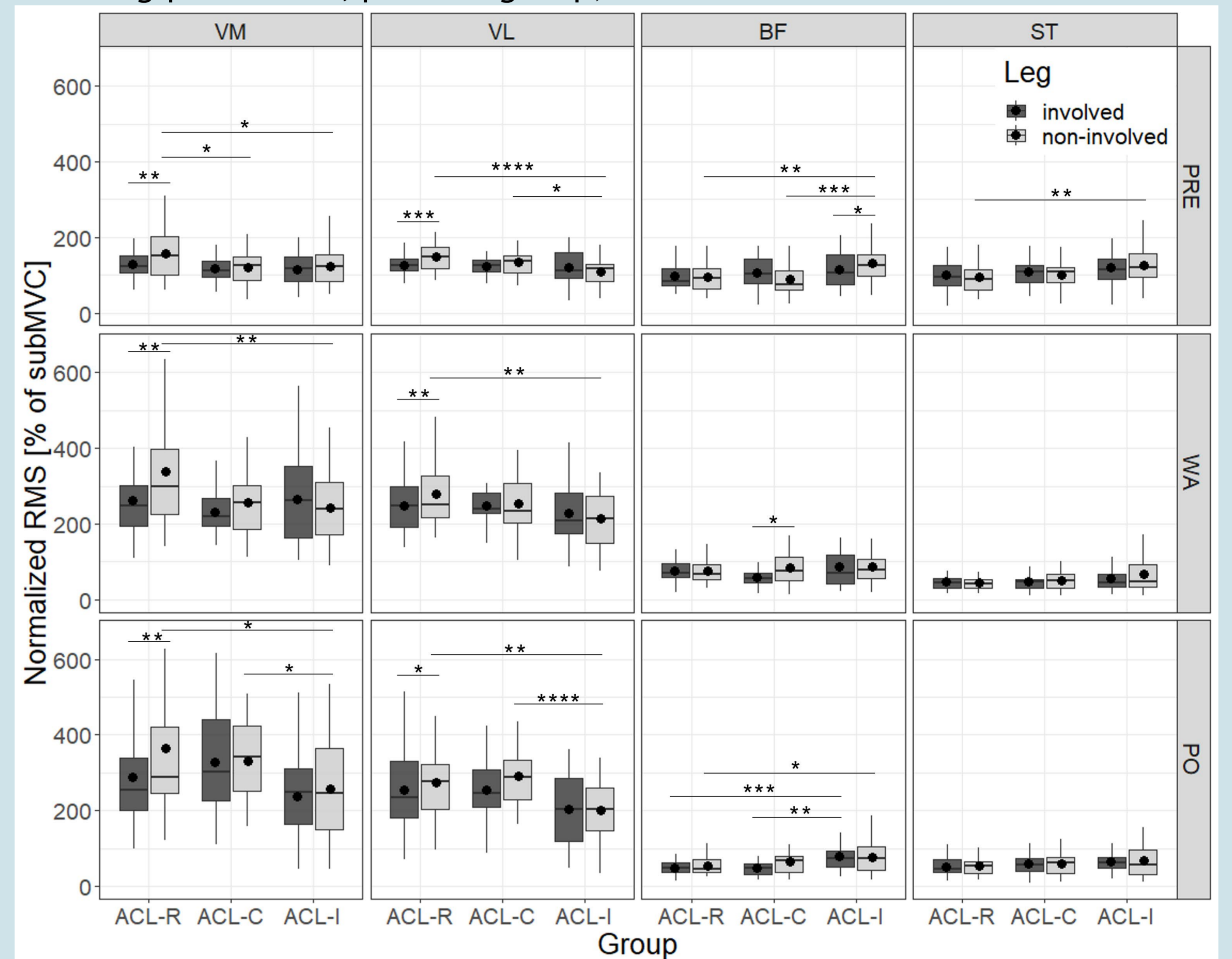


Results



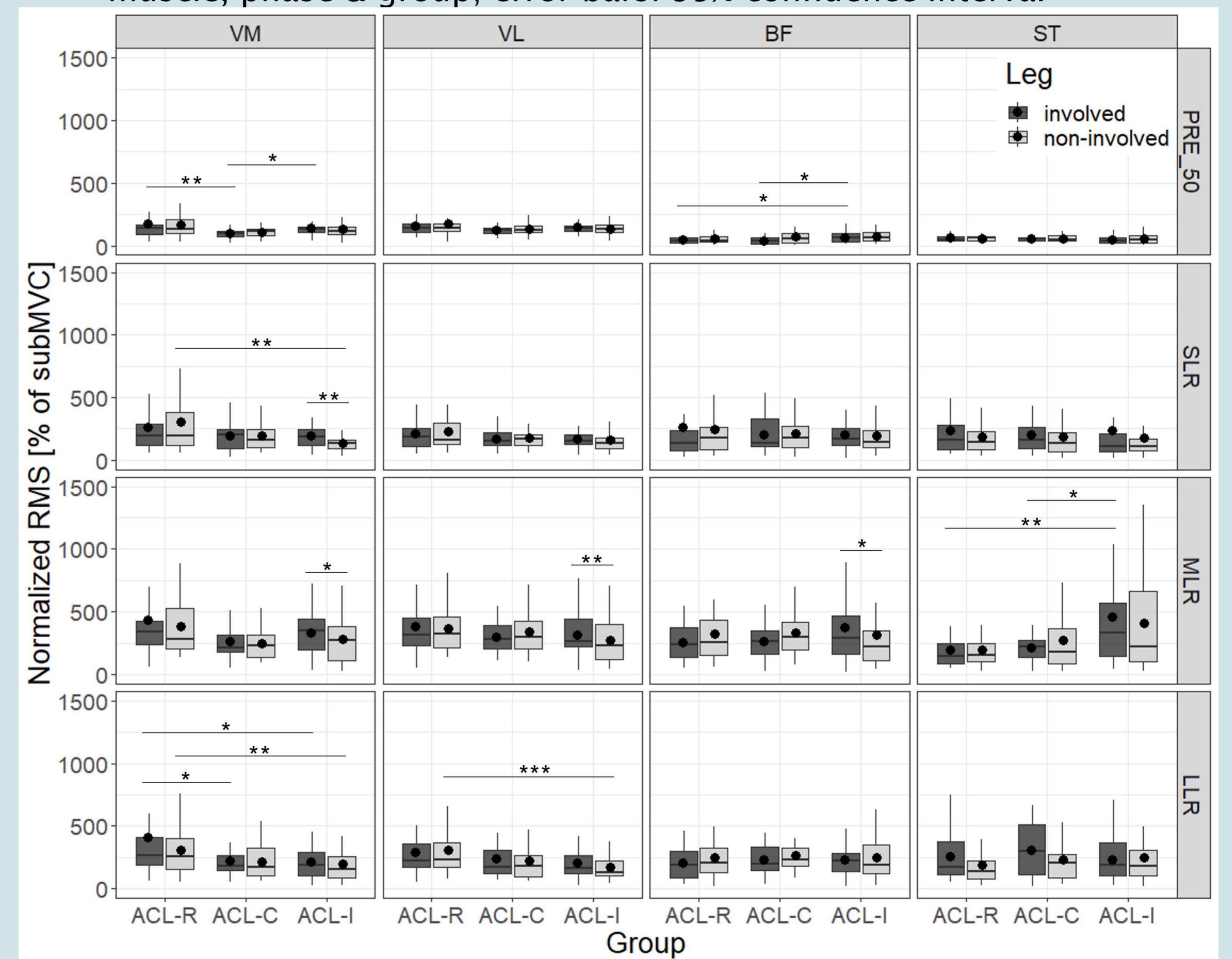
Stair descent

Box plots of neuromuscular activity for involved and contralateral leg per muscle, phase & group; error bars: 95% confidence interval



Anterior tibial translation

Box plots of reflex responses for involved and contralateral leg per muscle, phase & group; error bars: 95% confidence interval



References: [1] He et al. J Sport Rehab. 2020;29(8):1194-1203. [2] Shanbehzadeh et al. Knee Surg Sports Traumatol Arthrosc. 2017;25(5):1432-1442. [3] Baur et al. Clin Biomech. 2010;25(9):938-943. [4] Bruhn et al. Hum Mov Sci. 2011;30(6):1079-1091. [5] Behrens et al. PLoS One. 2013;8(2):e56988. [6] Blasimann et al. Orthop J Sports Med. 2022 Oct 13;10(10):23259671221123299. Pictures & Graphs: ©Bern Movement Lab, BFH

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