

## Supplementary file.

The following supplementary file provides presents the WAMBS (When to worry, and how to Avoid the Misuse of Bayesian Statistics) checklist as a diagnostic tool that was used to assess prior distributions, the estimation process, and the influence of priors for analysis of body composition outcomes; and overview of simulation based calibration performed on Bayes factors. The following provides details of the WAMBS checklist and how it was used.

<b>THE WAMBS-CHECKLIST</b> <u>When to worry, and how to Avoid the Misuse of Bayesian Statistics</u> <i>DEPAOLI &amp; VAN DE SCHOOT (2017)(1)</i>	
<b>TO BE CHECKED BEFORE ESTIMATING</b>	
<b>Point 1:</b> Do you understand the priors?	Analyses were conducted using linear mixed effects models with random effects included to account for the within participant design such that participant intercepts were included, and also modelled variation in change across conditions. Informative priors were included to model within-condition change based on likely improvements in strength and conditioning (2), and average treatment effects (3). Default weakly informative priors were used for all variance parameters including random effects.
<b>TO BE CHECKED AFTER ESTIMATION</b>	
<b>Point 2:</b> Does the trace-plot exhibit convergence?	Trace-plots were examined and all Rhat values were reported.
<b>Point 3:</b> Does convergence remain after doubling the number of iterations?	Trace-plots were examined and bias for group parameter presented as a percentage $100 * (\text{doubling} - \text{original}) / \text{original}$ reported.
<b>Point 4:</b> Does the histogram have enough information?	Plot of histogram for all parameters presented.
<b>Point 5:</b> Do chains exhibit autocorrelation?	Plot of autocorrelation for all parameters presented.
<b>Point 6:</b> Do posterior distributions make sense?	In all cases yes
<b>UNDERSTANDING INFLUENCE OF PRIORS</b>	
<b>Point 7:</b> Do different variance priors influence the results?	Sigma was modelled using weakly-informative Half-t distributions with 3df. As a check, informative gamma priors with shape $k$ based on outcome and scale $\theta$ set to 1. Bias in group parameter was presented.
<b>Point 8:</b> Is there a notable effect of the prior when compared with non-informative priors?	As a check, models were conducted with all default weakly informative priors and bias in group parameter presented.
<b>Point 9:</b> Are the results stable from a sensitivity analysis?	Checked in each case, use of informative priors tended to reduce point estimate and tails of ATE.
<b>AFTER INTERPRETATION OF RESULTS</b>	
<b>Point 10:</b> Is the Bayesian way of interpreting and reporting model results used? <i>(a) Also report on: missing data, model fit and comparison, non-response, generalizability, ability to replicate, etc.</i>	Reporting of results combining in-text and supplementary file was done in a comprehensive and systematic manner, focussing on the ATE. Posterior probabilities were also used to summarise likely differences and Bayes factors used to quantify strength of evidence for the two hypotheses.

(1) Depaoli S, van de Schoot R. Improving transparency and replication in Bayesian statistics: The WAMBS-Checklist. Psychol Methods 2017 June 01;22(2):240-261.

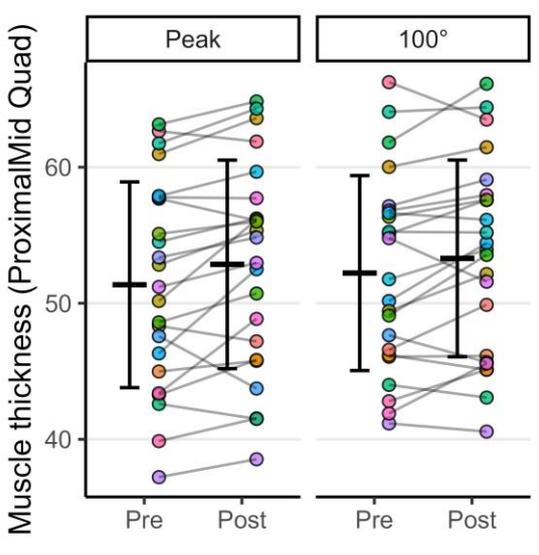
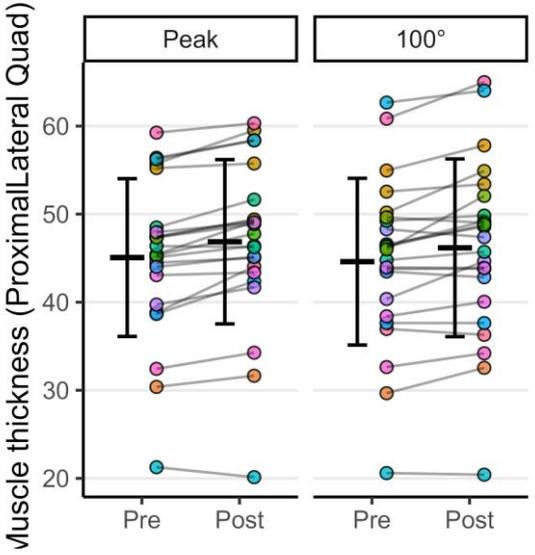
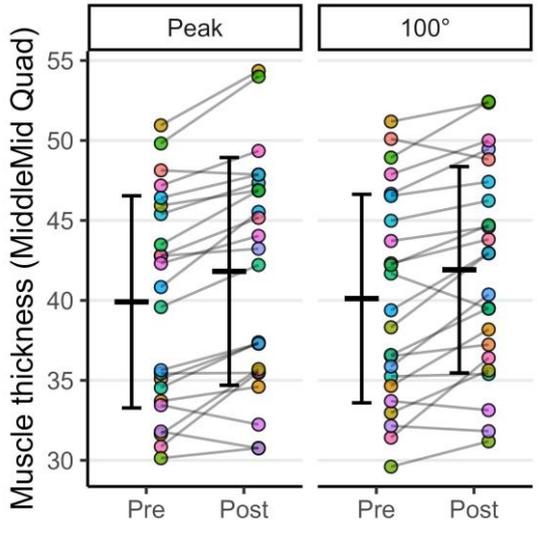
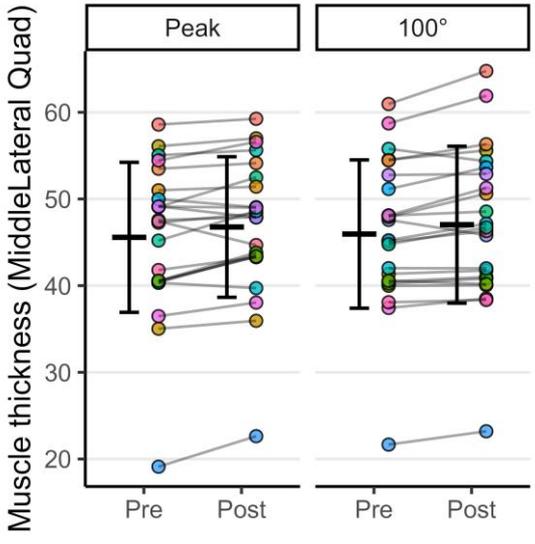
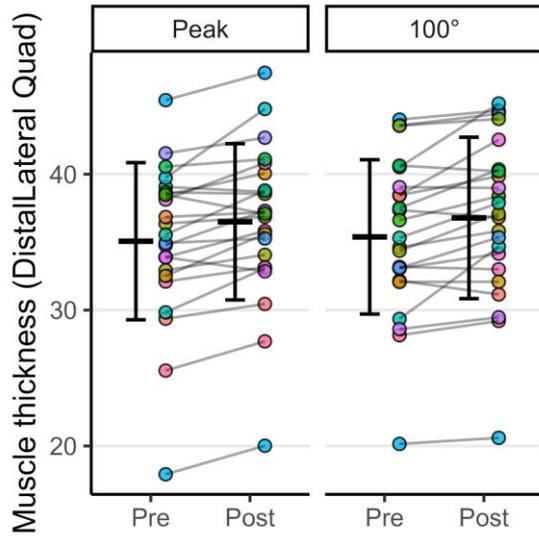
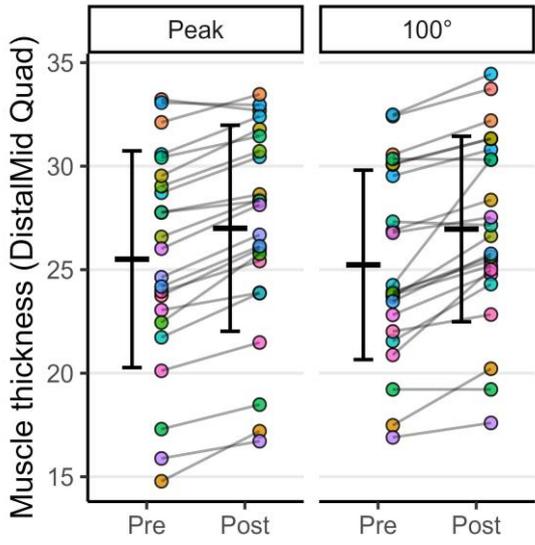
(2) Swinton PA, Burgess K, Hall A, Greig L, Psyllas J, Aspe R, et al. Interpreting magnitude of change in strength and conditioning: Effect size selection, threshold values and Bayesian updating. J Sports Sci 2022 September 01;40(18):2047-2054.

(3) Swinton PA, Murphy A. Comparative effect size distributions in strength and conditioning and implications for future research: A meta-analysis. SportRxiv 2022:DOI: 10.51224/SRXIV.202.

## Study Data

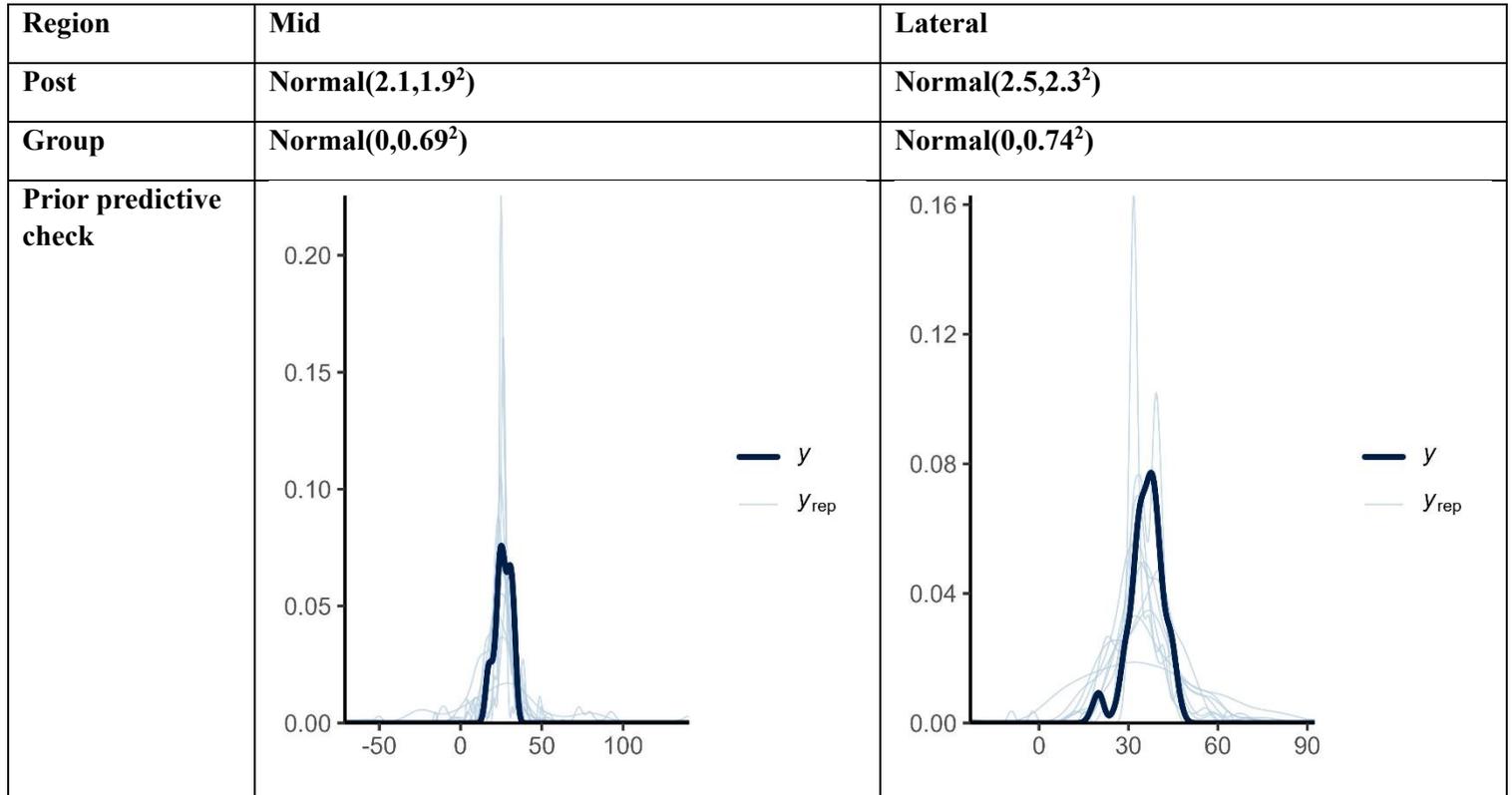
Pre-post intervention muscle thickness values for the individual quadriceps femoris sites.

Variable	Baseline (mm)	Posttest (mm)	Change (mm)	Change (%)
Distal mid-thigh peak knee flexion	25.50 ± 5.12	27.00 ± 4.87	1.49	6.37
Distal mid-thigh 100° knee flexion	25.23 ± 4.47	26.96 ± 4.38	1.73	7.27
Distal lateral-thigh peak knee flexion	35.07 ± 5.65	36.5 ± 5.62	1.43	4.38
Distal lateral-thigh 100° knee flexion	35.38 ± 5.56	36.78 ± 5.81	1.40	4.02
Middle mid-thigh peak knee flexion	39.91 ± 6.49	41.82 ± 6.96	1.91	4.80
Middle mid-thigh 100° knee flexion	40.11 ± 6.38	41.92 ± 6.31	1.80	4.74
Middle lateral-thigh peak knee flexion	45.57 ± 8.46	46.77 ± 7.93	1.19	3.21
Middle lateral-thigh 100° knee flexion	45.95 ± 8.37	47.03 ± 8.85	1.08	2.34
Proximal mid-thigh peak knee flexion	51.36 ± 7.39	52.86 ± 7.49	1.50	3.06
Proximal mid-thigh 100° knee flexion	52.22 ± 7.01	53.3 ± 7.07	1.08	2.16
Proximal lateral-thigh peak knee flexion	45.07 ± 8.76	46.86 ± 9.12	1.79	3.92
Proximal lateral-thigh 100° knee flexion	44.6 ± 9.26	46.18 ± 9.87	1.57	3.63

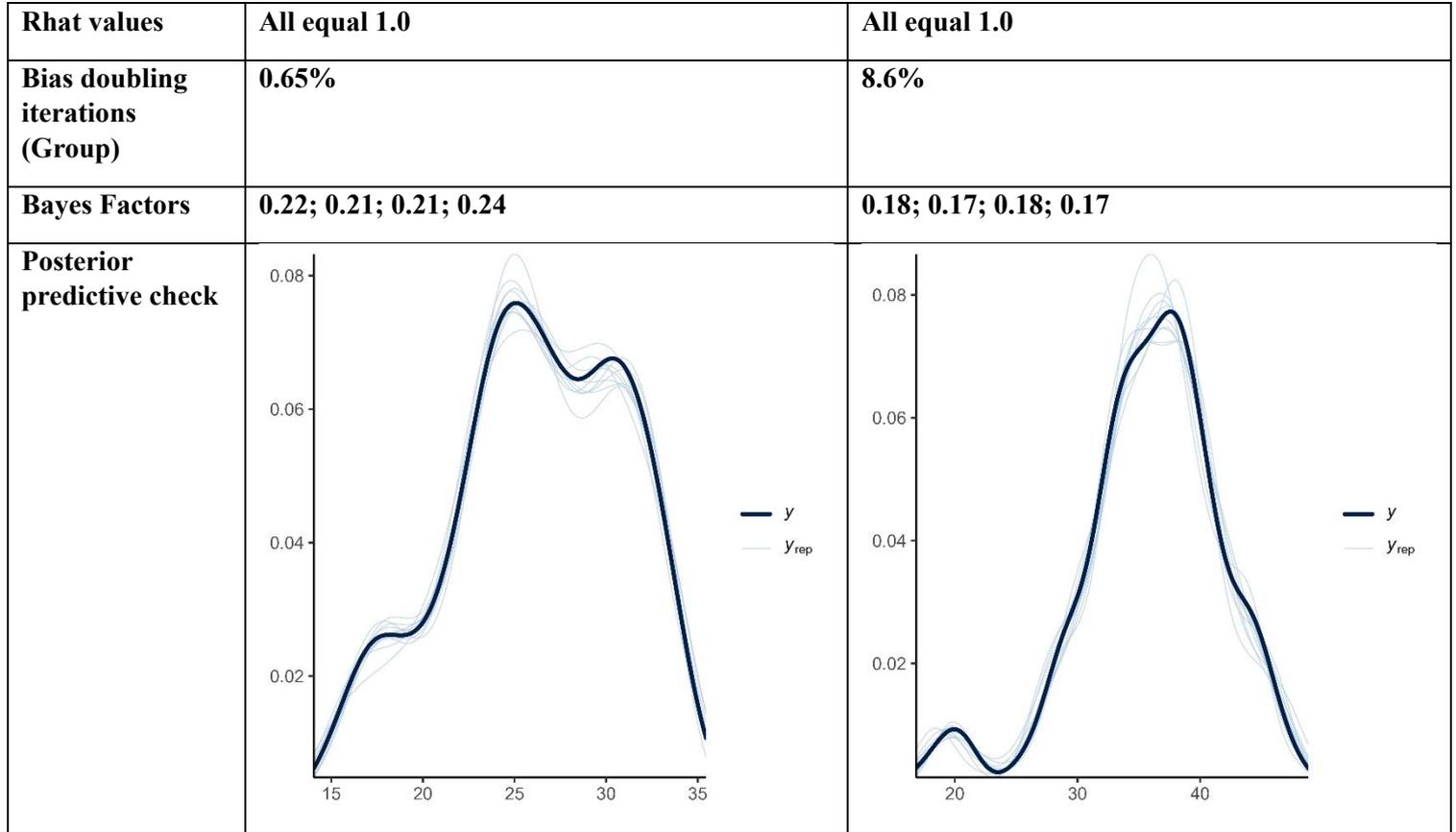


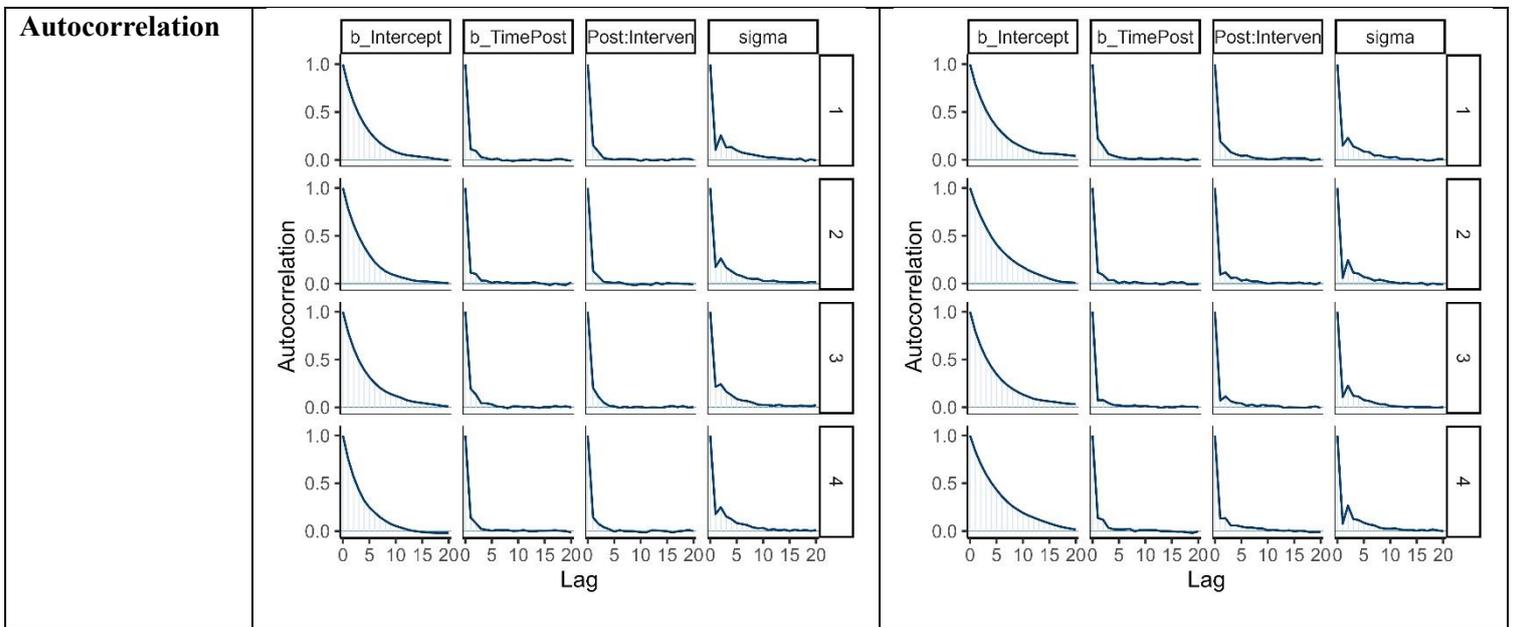
# WAMBS: Univariate Distal Quadriceps Femoris

## Understanding priors



## Estimation





**Influence of priors**

<b>Bias different specification variance (Group)</b>	<b>1.2%</b>	<b>5.1%</b>
<b>Bias after non-informative priors (Group)</b>	<b>34.3%</b>	<b>-9.4%</b>

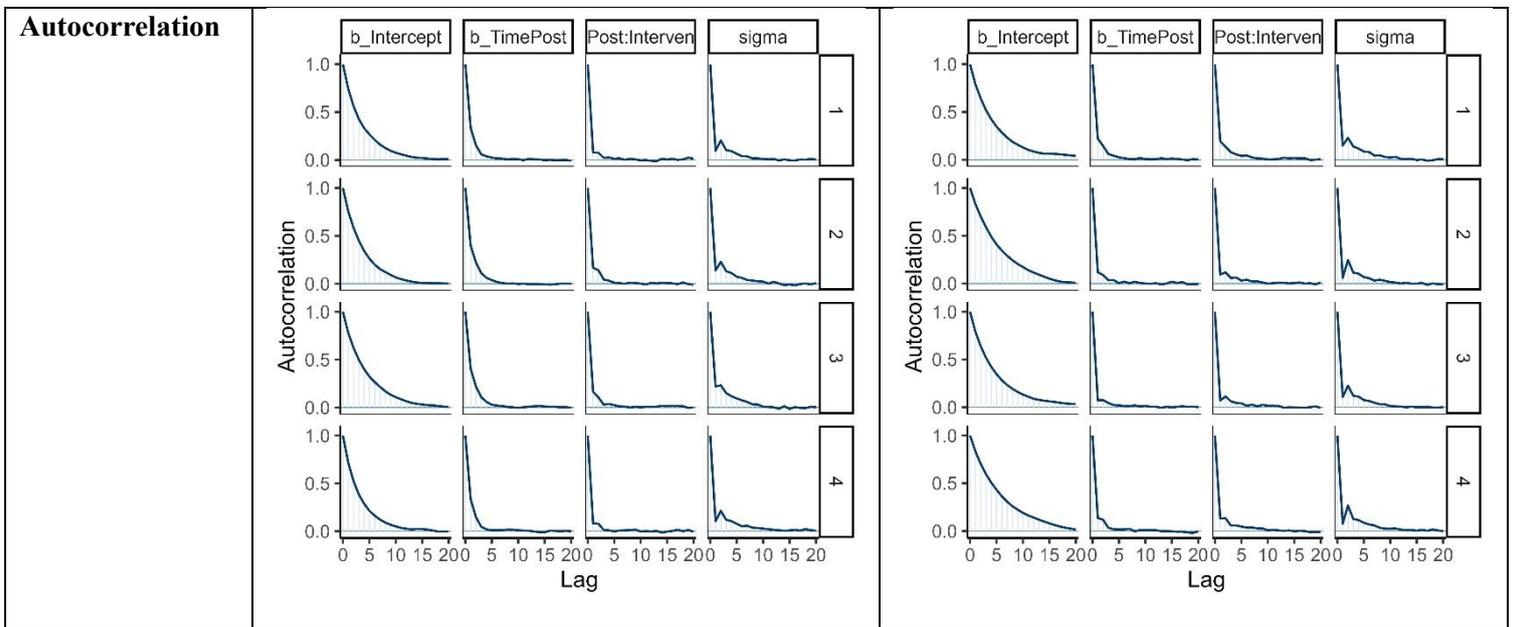
# WAMBS: Univariate Middle Quadriceps Femoris

## Understanding priors

Region	Mid	Lateral
Post	Normal(2.9,2.6 <sup>2</sup> )	Normal(3.7,3.4 <sup>2</sup> )
Group	Normal(0,0.85 <sup>2</sup> )	Normal(0,0.96 <sup>2</sup> )
Prior predictive check		

## Estimation

Rhat values	All equal 1.0	All equal 1.0
Bias doubling iterations (Group)	8.7%	-2.4%
Bayes Factors	0.14; 0.13; 0.13; 0.16	0.15; 0.16; 0.15; 0.17
Posterior predictive check		



**Influence of priors**

<b>Bias different specification variance (Group)</b>	<b>19.1%</b>	<b>-1.0%</b>
<b>Bias after non-informative priors (Group)</b>	<b>-21.9%</b>	<b>-5.5%</b>

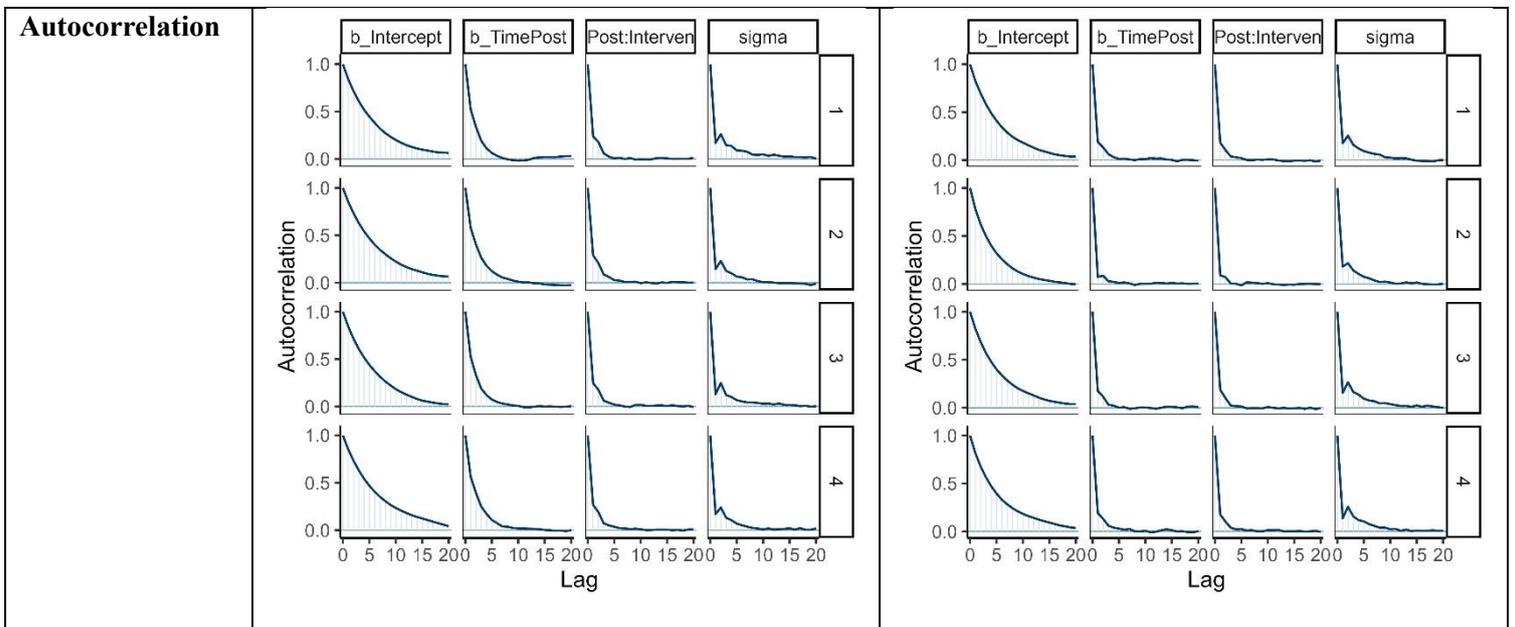
# WAMBS: Univariate Proximal Quadriceps Femoris

## Understanding priors

Region	Mid	Lateral
Post	Normal(3.2,2.9 <sup>2</sup> )	Normal(4.0,3.6 <sup>2</sup> )
Group	Normal(0,0.91 <sup>2</sup> )	Normal(0,1.05 <sup>2</sup> )
Prior predictive check		

## Estimation

Rhat values	All equal 1.0	All equal 1.0
Bias doubling iterations (Group)	-6.6%	0.38%
Bayes Factors	0.19; 0.18; 0.16; 0.20	0.17; 0.18; 0.17; 0.18
Posterior predictive check		



**Influence of priors**

<b>Bias different specification variance (Group)</b>	<b>-2.4%</b>	<b>-0.40%</b>
<b>Bias after non-informative priors (Group)</b>	<b>-89.7%</b>	<b>7.5%</b>

## Simulation based calibration of Bayes factors

Simulation based calibration (SBC) of Bayes factors was performed to assess whether Bayes factors obtained for this study were likely to be appropriate. Artificial data were simulated ( $m=500$  samples) based on the number of participants and design of the study, with parameters selected and distributed to match our a priori expectations.

Priors were set on a standardized scale, included distributions for typical improvement  $N(0.44, 0.40^2)$ , average treatment effect  $N(0.30, 0.27^2)$ , heterogeneous response  $N(0, 0.15^2)$ , and measurement error  $N(0, 0.20^2)$ .

For half of the simulations the ATE was set to 0, and for the other half set to the random draw from  $N(0.30, 0.27^2)$ . For each iteration, the model with the research hypothesis ( $ATE \neq 0$ ,  $H_1$ ) and null hypothesis ( $ATE=0$ ,  $H_0$ ) were fit and the Bayes factor estimated.

The distribution of the Bayes factors given the true hypothesis  $n = 30$ :

