

Supplementary material

Title: Arm position, but not laterality or climbing ability, modulates forearm oxygen recovery dynamics in rock climbers

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Output from two generalized linear mixed models examining the effects of laterality, climbing ability, and arm position on muscle oxygen saturation (StO₂) half-time recovery (HTR) and StO₂ recovery rate.

1.

Generalized Mixed Model

Model Info		
Info		
Model Type	User Model	Generalized model
Model	lme4::glmer	`StO2 recovery rate` ~ 1 + `ability group` + laterality + `arm position` + `ability group`:laterality + `ability group`:`arm position` + laterality:`arm position` + (1 + `arm position` id)
Distribution	Gamma	Skewed continuous distribution
Link function	log	Coefficients are in the log(y) scale
Direction	y	Dependent variable scores
Sample size	204	
Converged	yes	
C.I. method	Wald	

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Model Results

Model Fit				
Type	R ²	df	LRT X ²	p
Conditional	0.809	12.000	268.644	<.001
Marginal	0.558	9	52.658	<.001

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Additional Indices		
Info	Model Value	Comment
LogLikelihood	-46.129	
AIC	120.258	Less is better
BIC	166.712	Less is better
Deviance	92.258	Less is better
Residual DF	190	
Chi-squared/DF	0.056	Overdispersion indicator

Fixed Effects Omnibus Tests

	χ^2	df	p
ability group	0.772	2.00	.680
laterality	0.203	1.00	.652
arm position	92.126	1.00	<.001
ability group * laterality	3.273	2.00	.195
ability group * arm position	0.733	2.00	.693
laterality * arm position	0.953	1.00	.329

Parameter Estimates (Fixed Coefficients)

Names	Effect	Estimate	SE	95% Confidence Intervals		Exp(B)	z	p
				Lower	Upper			
(Intercept)	(Intercept)	-0.0678	0.0723	-0.2105	0.0748	0.934	-0.938	.349
ability group1	1 - 0	-0.1418	0.1875	-0.5116	0.2280	0.868	-0.756	.450
ability group2	2 - 0	-0.1586	0.1890	-0.5314	0.2141	0.853	-0.840	.402
laterality1	2 - 1	0.0163	0.0361	-0.0550	0.0876	1.016	0.451	.653
arm position1	2 - 1	-0.9438	0.0983	-1.1377	-0.7498	0.389	-9.598	<.001
ability group1 * laterality1	(1 - 0) * (2 - 1)	0.1670	0.0938	-0.0180	0.3520	1.182	1.780	.077
ability group2 * laterality1	(2 - 0) * (2 - 1)	0.1347	0.0942	-0.0512	0.3205	1.144	1.430	.154
ability group1 * arm position1	(1 - 0) * (2 - 1)	-0.1196	0.2548	-0.6222	0.3830	0.887	-0.469	.639
ability group2 * arm position1	(2 - 0) * (2 - 1)	0.0553	0.2569	-0.4515	0.5620	1.057	0.215	.830
laterality1 * arm position1	(2 - 1) * (2 - 1)	-0.0668	0.0684	-0.2018	0.0682	0.935	-0.976	.330

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Marginal Effects

Name	Effect	AME	SE	95% Confidence Intervals		z	p
				Lower	Upper		
ability group	1 - 0	-0.1322	0.1877	-0.5000	0.236	-0.705	.481
ability group	2 - 0	-0.1883	0.1873	-0.5554	0.179	-1.005	.315
arm position	2 - 1	-0.8849	0.0796	-1.0409	-0.729	-11.118	<.001
laterality	2 - 1	0.0520	0.0401	-0.0266	0.131	1.298	.194

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Random Components				
Groups	Name	Variance	SD	ICC
id	(Intercept)	0.0692	0.263	0.464
	arm position1	0.1425	0.377	
Residual		0.0801	0.283	

Note. Number of Obs: 204 , Number of groups: id 51

Random Parameters correlations				
Groups	name	name2	Cov.	Corr.
id	(Intercept)	arm position1	0.0521	0.525

Random Effect LRT					
Test	N. par	AIC	LRT	df	p
'arm position' id	14.0	120	67.3	2.00	<.001

2.

Generalized Mixed Model

Model Info		
Info		
Model Type	User Model	Generalized model
Model	lme4::glmer	'StO2 HTR' ~ 1 + 'ability group' + laterality + 'arm position' + 'ability group':laterality + 'ability group':'arm position' + laterality:'arm position' + (1 + 'arm position' id)
Distribution	Gamma	Skewed continuous distribution
Link function	log	Coefficients are in the log(y) scale
Direction	y	Dependent variable scores
Sample size	204	
Converged	yes	
C.I. method	Wald	

[3]

Model Results

Model Fit				
Type	R ²	df	LRT X ²	p
Conditional	0.841	12.000	417.663	<.001
Marginal	0.609	9	51.685	<.001

[4]

Additional Indices		
Info	Model Value	Comment
LogLikelihood	-574.499	
AIC	1176.997	Less is better
BIC	1223.451	Less is better
Deviance	1148.997	Less is better
Residual DF	190	
Chi-squared/DF	0.035	Overdispersion indicator

Fixed Effects Omnibus Tests

	X ²	df	p
ability group	0.53954	2.00	.764
laterality	0.31816	1.00	.573
arm position	106.71544	1.00	<.001
ability group * laterality	1.69808	2.00	.428
ability group * arm position	1.80100	2.00	.406
laterality * arm position	0.00620	1.00	.937

Parameter Estimates (Fixed Coefficients)

Names	Effect	Estimate	SE	95% Confidence Intervals		Exp(B)	z	p
				Lower	Upper			
(Intercept)	(Intercept)	2.75749	0.0590	2.6412	2.8738	15.760	46.7615	<.001
ability group1	1 - 0	0.11210	0.1528	-0.1893	0.4135	1.119	0.7336	.464
ability group2	2 - 0	0.08022	0.1540	-0.2236	0.3841	1.084	0.5207	.603
laterality1	2 - 1	-0.01515	0.0269	-0.0681	0.0378	0.985	-0.5641	.573
arm position1	2 - 1	0.89325	0.0865	0.7227	1.0638	2.443	10.3303	<.001
ability group1 * laterality1	(1 - 0) * (2 - 1)	-0.08033	0.0697	-0.2179	0.0572	0.923	-1.1522	.251
ability group2 * laterality1	(2 - 0) * (2 - 1)	-0.08581	0.0701	-0.2240	0.0524	0.918	-1.2247	.222
ability group1 * arm position1	(1 - 0) * (2 - 1)	0.16999	0.2241	-0.2721	0.6121	1.185	0.7585	.449
ability group2 * arm position1	(2 - 0) * (2 - 1)	-0.07011	0.2259	-0.5158	0.3756	0.932	-0.3103	.757
laterality1 * arm position1	(2 - 1) * (2 - 1)	-0.00400	0.0508	-0.1042	0.0962	0.996	-0.0787	.937

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Marginal Effects

Name	Effect	AME	SE	95% Confidence Intervals		z	p
				Lower	Upper		
ability group	1 - 0	2.910	3.523	-4.00	9.815	0.826	.409
ability group	2 - 0	1.190	3.384	-5.44	7.823	0.352	.725
arm position	2 - 1	17.862	2.332	13.29	22.432	7.661	<.001
laterality	2 - 1	-0.558	0.548	-1.63	0.517	-1.017	.309

[6]

Random Components

Groups	Name	Variance	SD	ICC
id	(Intercept)	0.0497	0.223	0.476
	arm position1	0.1213	0.348	
Residual		0.0547	0.234	

Note. Number of Obs: 204 , Number of groups: id 51

Random Parameters correlations

Groups	name	name2	Cov.	Corr.
id	(Intercept)	arm position1	0.0369	0.475

Random Effect LRT

Test	N. par	AIC	LRT	df	p
'arm position' id	14.0	1177	119	2.00	<.001