

Supplementary information - Additional file 5.

Article: Temporal trends in health-related components of physical fitness of European children and adolescents from 1965 to 2025: A systematic review of data on 417,362 participants from 20 countries.

Journal: Sports Medicine - Open.

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Cardiorespiratory endurance

Mixed Model Comparisons: Cubic vs. Quadratic

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	292	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + (1 Study)
Comparison	Tested terms	~ I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R²	df	LRT X²	p
Full	Conditional	0.7231	8	107.6642	<.001
Full	Marginal	0.4649	7	107.6642	<.001
Nested	Conditional	0.6274	7	81.4366	<.001
Nested	Marginal	0.3957	6	81.4366	<.001
ΔR²	Comparison	0.0957	1	26.2275	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-65.1408	-78.2546	13.1138	
AIC	150.2816	174.5091	-24.2275	Less is better
BIC	187.0491	207.5999	-20.5508	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	128.2076	1	290.6482	<.001
Sex	0.0216	1	273.5189	0.883
AgeGroup	0.0001	1	234.7175	0.994
Time²	17.5664	1	280.3691	<.001
Time³	28.2552	1	291.6471	<.001
Time * Sex	0.3818	1	273.5917	0.537
Time * AgeGroup	1.5494	1	289.0548	0.214

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.1547	0.0712	17.4850	-2.1732	0.044
Time	Time	-0.5141	0.0454	290.6482	-11.3229	<.001
Sex1	Female - Male	0.0050	0.0341	273.5189	0.1468	0.883
AgeGroup1	Adolescents - Children	0.0005	0.0684	234.7175	0.0077	0.994
Time ²	Time ²	0.0987	0.0236	280.3691	4.1912	<.001
Time ³	Time ³	0.0738	0.0139	291.6471	5.3156	<.001
Time * Sex1	Time * (Female - Male)	-0.0225	0.0364	273.5917	-0.6179	0.537
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0665	0.0534	289.0548	-1.2447	0.214

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0739	0.2719	0.4826
Residual		0.0793	0.2815	

Note. Number of Obs: 292 , Number of groups: Study 18

Mixed Model Comparisons: Cubic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	292	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2) + I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.7231	8	107.6642	<.001
Full	Marginal	0.4649	7	107.6642	<.001
Nested	Conditional	0.6282	6	81.1690	<.001
Nested	Marginal	0.3978	5	81.1690	<.001
ΔR ²	Comparison	0.0949	2	26.4952	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-65.1408	-78.3884	13.2476	
AIC	150.2816	172.7767	-22.4952	Less is better
BIC	187.0491	202.1908	-15.1417	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	128.2076	1	290.6482	<.001
Sex	0.0216	1	273.5189	0.883
AgeGroup	0.0001	1	234.7175	0.994
Time²	17.5664	1	280.3691	<.001
Time³	28.2552	1	291.6471	<.001
Time * Sex	0.3818	1	273.5917	0.537
Time * AgeGroup	1.5494	1	289.0548	0.214

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.1547	0.0712	17.4850	-2.1732	0.044
Time	Time	-0.5141	0.0454	290.6482	-11.3229	<.001
Sex1	Female - Male	0.0050	0.0341	273.5189	0.1468	0.883
AgeGroup1	Adolescents - Children	0.0005	0.0684	234.7175	0.0077	0.994
Time ²	Time ²	0.0987	0.0236	280.3691	4.1912	<.001
Time ³	Time ³	0.0738	0.0139	291.6471	5.3156	<.001
Time * Sex1	Time * (Female - Male)	-0.0225	0.0364	273.5917	-0.6179	0.537
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0665	0.0534	289.0548	-1.2447	0.214

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0739	0.2719	0.4826
Residual		0.0793	0.2815	

Note. Number of Obs: 292 , Number of groups: Study 18

Mixed Model Comparisons: Quadratic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	292	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.6274	7	81.4366	<.001
Full	Marginal	0.3957	6	81.4366	<.001
Nested	Conditional	0.6282	6	81.1690	<.001
Nested	Marginal	0.3978	5	81.1690	<.001
ΔR ²	Comparison	-0.0008	1	0.2676	0.605

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-78.2546	-78.3884	0.1338	
AIC	174.5091	172.7767	1.7324	Less is better
BIC	207.5999	202.1908	5.4091	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	97.8140	1	286.5958	<.001
Sex	0.0578	1	273.5671	0.810
AgeGroup	0.2633	1	187.0300	0.608
Time ²	0.2678	1	289.4039	0.605
Time * Sex	1.6085	1	274.5819	0.206
Time * AgeGroup	3.9973	1	281.7798	0.047

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.1139	0.0637	16.4405	-1.7870	0.092
Time	Time	-0.3319	0.0336	286.5958	-9.8901	<.001
Sex1	Female - Male	0.0087	0.0361	273.5671	0.2404	0.810
AgeGroup1	Adolescents - Children	-0.0358	0.0697	187.0300	-0.5131	0.608
Time ²	Time ²	0.0089	0.0173	289.4039	0.5175	0.605
Time * Sex1	Time * (Female - Male)	-0.0483	0.0381	274.5819	-1.2683	0.206
Time * AgeGroup1	Time * (Adolescents - Children)	-0.1099	0.0550	281.7798	-1.9993	0.047

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0551	0.2347	0.3834
Residual		0.0886	0.2976	

Note. Number of Obs: 292 , Number of groups: Study 18

Mixed Model: Cubic (selected by AIC/BIC)

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	292	
Converged	yes	
Y transform	none	
C.I. method	Wald	

Note. All covariates are standardized

[3]

Model Results

Model Fit

Type	R²	df	LRT X²	p
Conditional	0.7231	8	107.6642	<.001
Marginal	0.4649	7	107.6642	<.001

[4]

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Sex	0.0216	1	273.5189	0.883
AgeGroup	0.0001	1	234.7175	0.994
Time	128.2076	1	290.6482	<.001
Time²	17.5664	1	280.3691	<.001
Time³	28.2552	1	291.6471	<.001
Sex * Time	0.3818	1	273.5917	0.537
AgeGroup * Time	1.5494	1	289.0548	0.214

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.1547	0.0712	17.4850	-2.1732	0.044
Sex1	Female - Male	0.0050	0.0341	273.5189	0.1468	0.883
AgeGroup1	Adolescents - Children	0.0005	0.0684	234.7175	0.0077	0.994
Time	Time	-0.5141	0.0454	290.6482	-11.3229	<.001
Time²	Time²	0.0987	0.0236	280.3691	4.1912	<.001
Time³	Time³	0.0738	0.0139	291.6471	5.3156	<.001
Sex1 * Time	(Female - Male) * Time	-0.0225	0.0364	273.5917	-0.6179	0.537
AgeGroup1 * Time	(Adolescents - Children) * Time	-0.0665	0.0534	289.0548	-1.2447	0.214

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0739	0.2719	0.4826
Residual		0.0793	0.2815	

Note. Number of Obs: 292 , Number of groups: Study 18

References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved

from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Gallucci, M. (2019). *GAMLj: General analyses for linear models (Version 3.6.5)*. [jamovi module]. Retrieved from <https://gamlj.github.io/>.

[4] Gallucci, M. (2020). *Model goodness of fit in GAMLj*. . [link](#).

[5] Lüdtke, Ben-Shachar, Patil & Makowski (2020). *Extracting, Computing and Exploring the Parameters of Statistical Models using R*. CRAN. [link](#).

Body composition

Mixed Model Comparisons: Cubic vs. Quadratic

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	228	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + (1 Study)
Comparison	Tested terms	~ I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R²	df	LRT X²	p
Full	Conditional	0.6127	8	81.7233	<.001
Full	Marginal	0.3577	7	81.1485	<.001
Nested	Conditional	0.5439	7	77.2049	<.001
Nested	Marginal	0.3371	6	76.6300	<.001
ΔR²	Comparison	0.0687	1	4.5185	0.034

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	161.6203	159.3611	2.2592	
AIC	-303.2406	-300.7222	-2.5185	Less is better
BIC	-268.9472	-269.8580	0.9109	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	1.9812	1	227.2319	0.161
Sex	4.2519	1	215.8487	0.040
AgeGroup	0.1330	1	218.1620	0.716
Time²	0.0896	1	203.5242	0.765
Time³	4.9678	1	222.6601	0.027
Time * Sex	0.9623	1	227.5759	0.328
Time * AgeGroup	0.1787	1	216.9790	0.673

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0376	0.0322	9.8813	-1.1667	0.271
Time	Time	-0.0362	0.0257	227.2319	-1.4075	0.161
Sex1	Female - Male	0.0498	0.0242	215.8487	2.0620	0.040
AgeGroup1	Adolescents - Children	0.0057	0.0155	218.1620	0.3647	0.716
Time ²	Time ²	0.0036	0.0121	203.5242	0.2993	0.765
Time ³	Time ³	-0.0315	0.0141	222.6601	-2.2289	0.027
Time * Sex1	Time * (Female - Male)	0.0210	0.0214	227.5759	0.9810	0.328
Time * AgeGroup1	Time * (Adolescents - Children)	0.0065	0.0154	216.9790	0.4227	0.673

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0083	0.0911	0.3969
Residual		0.0126	0.1123	

Note. Number of Obs: 228 , Number of groups: Study 10

Mixed Model Comparisons: Cubic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	228	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2) + I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized
[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.6127	8	81.7233	<.001
Full	Marginal	0.3577	7	81.1485	<.001
Nested	Conditional	0.5920	6	74.9433	<.001
Nested	Marginal	0.3495	5	74.3685	<.001
ΔR ²	Comparison	0.0207	2	6.7800	0.034

Note. Models comparison is done on the conditional models (random and fixed effects)
[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	161.6203	158.2303	3.3900	
AIC	-303.2406	-300.4606	-2.7800	Less is better
BIC	-268.9472	-273.0259	4.0787	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	1.9812	1	227.2319	0.161
Sex	4.2519	1	215.8487	0.040
AgeGroup	0.1330	1	218.1620	0.716
Time²	0.0896	1	203.5242	0.765
Time³	4.9678	1	222.6601	0.027
Time * Sex	0.9623	1	227.5759	0.328
Time * AgeGroup	0.1787	1	216.9790	0.673

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0376	0.0322	9.8813	-1.1667	0.271
Time	Time	-0.0362	0.0257	227.2319	-1.4075	0.161
Sex1	Female - Male	0.0498	0.0242	215.8487	2.0620	0.040
AgeGroup1	Adolescents - Children	0.0057	0.0155	218.1620	0.3647	0.716
Time ²	Time ²	0.0036	0.0121	203.5242	0.2993	0.765
Time ³	Time ³	-0.0315	0.0141	222.6601	-2.2289	0.027
Time * Sex1	Time * (Female - Male)	0.0210	0.0214	227.5759	0.9810	0.328
Time * AgeGroup1	Time * (Adolescents - Children)	0.0065	0.0154	216.9790	0.4227	0.673

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0083	0.0911	0.3969
Residual		0.0126	0.1123	

Note. Number of Obs: 228 , Number of groups: Study 10

Mixed Model Comparisons: Quadratic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	228	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.5439	7	77.2049	<.001
Full	Marginal	0.3371	6	76.6300	<.001
Nested	Conditional	0.5920	6	74.9433	<.001
Nested	Marginal	0.3495	5	74.3685	<.001
ΔR ²	Comparison	-0.0480	1	2.2615	0.133

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	159.3611	158.2303	1.1308	
AIC	-300.7222	-300.4606	-0.2615	Less is better
BIC	-269.8580	-273.0259	3.1678	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	39.1898	1	151.9585	<.001
Sex	2.2475	1	206.5447	0.135
AgeGroup	0.1318	1	219.3268	0.717
Time²	2.5305	1	188.1094	0.113
Time * Sex	3.6559	1	227.5357	0.057
Time * AgeGroup	0.0655	1	218.7043	0.798

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0448	0.0282	10.6287	-1.5912	0.141
Time	Time	-0.0816	0.0130	151.9585	-6.2602	<.001
Sex1	Female - Male	0.0346	0.0231	206.5447	1.4992	0.135
AgeGroup1	Adolescents - Children	0.0057	0.0158	219.3268	0.3630	0.717
Time²	Time²	0.0173	0.0109	188.1094	1.5908	0.113
Time * Sex1	Time * (Female - Male)	0.0380	0.0199	227.5357	1.9120	0.057
Time * AgeGroup1	Time * (Adolescents - Children)	0.0040	0.0156	218.7043	0.2560	0.798

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0059	0.0770	0.3120
Residual		0.0131	0.1143	

Note. Number of Obs: 228 , Number of groups: Study 10

Mixed Model: Linear (selected by AIC/BIC)

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Sex + AgeGroup + Time + Sex:Time + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	228	
Converged	yes	
Y transform	none	
C.I. method	Wald	

Note. All covariates are standardized

[3]

Model Results

Model Fit

Type	R ²	df	LRT X ²	p
Conditional	0.5920	6	74.9433	<.001
Marginal	0.3495	5	74.3685	<.001

[4]

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Sex	1.5240	1	220.8916	0.218
AgeGroup	0.1559	1	219.6508	0.693
Time	68.8669	1	224.0706	<.001
Sex * Time	6.1381	1	226.7709	0.014
AgeGroup * Time	0.0337	1	218.7527	0.854

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0287	0.0295	9.0040	-0.9733	0.356
Sex1	Female - Male	0.0284	0.0230	220.8916	1.2345	0.218
AgeGroup1	Adolescents - Children	0.0062	0.0158	219.6508	0.3948	0.693
Time	Time	-0.0944	0.0114	224.0706	-8.2986	<.001
Sex1 * Time	(Female - Male) * Time	0.0474	0.0191	226.7709	2.4775	0.014
AgeGroup1 * Time	(Adolescents - Children) * Time	0.0029	0.0156	218.7527	0.1837	0.854

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0078	0.0881	0.3727
Residual		0.0131	0.1143	

Note. Number of Obs: 228 , Number of groups: Study 10

References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Gallucci, M. (2019). *GAMLj: General analyses for linear models (Version 3.6.5)*. [jamovi module]. Retrieved from <https://gamlj.github.io/>.

[4] Gallucci, M. (2020). *Model goodness of fit in GAMLj*. . [link](#).

[5] Lüdecke, Ben-Shachar, Patil & Makowski (2020). *Extracting, Computing and Exploring the Parameters of Statistical Models using R*. CRAN. [link](#).

Upper-body strength

Mixed Model Comparisons: Cubic vs. Quadratic

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	346	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + (1 Study)
Comparison	Tested terms	~ I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R²	df	LRT X²	p
Full	Conditional	0.7359	8	157.4190	<.001
Full	Marginal	0.4900	7	157.4190	<.001
Nested	Conditional	0.7120	7	87.2625	<.001
Nested	Marginal	0.4366	6	87.2625	<.001
ΔR²	Comparison	0.0239	1	70.1565	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-80.8709	-115.9491	35.0783	
AIC	181.7418	249.8983	-68.1565	Less is better
BIC	220.2062	284.5162	-64.3101	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	8.4571	1	342.6019	0.004
Sex	0.3426	1	334.5313	0.559
AgeGroup	0.0349	1	345.2799	0.852
Time ²	80.2292	1	337.0091	<.001
Time ³	77.7793	1	339.3551	<.001
Time * Sex	0.6999	1	334.7581	0.403
Time * AgeGroup	0.0504	1	338.1415	0.822

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0516	0.0832	13.4708	0.6197	0.546
Time	Time	-0.1443	0.0496	342.6019	-2.9081	0.004
Sex1	Female - Male	0.0189	0.0324	334.5313	0.5854	0.559
AgeGroup1	Adolescents - Children	-0.0085	0.0457	345.2799	-0.1868	0.852
Time ²	Time ²	-0.2681	0.0299	337.0091	-8.9571	<.001
Time ³	Time ³	-0.1666	0.0189	339.3551	-8.8193	<.001
Time * Sex1	Time * (Female - Male)	0.0277	0.0331	334.7581	0.8366	0.403
Time * AgeGroup1	Time * (Adolescents - Children)	0.0088	0.0392	338.1415	0.2245	0.822

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0780	0.2792	0.4822
Residual		0.0837	0.2893	

Note. Number of Obs: 346 , Number of groups: Study 13

Mixed Model Comparisons: Cubic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	346	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2) + I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.7359	8	157.4190	<.001
Full	Marginal	0.4900	7	157.4190	<.001
Nested	Conditional	0.6687	6	76.4221	<.001
Nested	Marginal	0.4089	5	76.4221	<.001
ΔR ²	Comparison	0.0672	2	80.9969	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-80.8709	-121.3693	40.4984	
AIC	181.7418	258.7386	-76.9969	Less is better
BIC	220.2062	289.5101	-69.3040	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	8.4571	1	342.6019	0.004
Sex	0.3426	1	334.5313	0.559
AgeGroup	0.0349	1	345.2799	0.852
Time²	80.2292	1	337.0091	<.001
Time³	77.7793	1	339.3551	<.001
Time * Sex	0.6999	1	334.7581	0.403
Time * AgeGroup	0.0504	1	338.1415	0.822

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0516	0.0832	13.4708	0.6197	0.546
Time	Time	-0.1443	0.0496	342.6019	-2.9081	0.004
Sex1	Female - Male	0.0189	0.0324	334.5313	0.5854	0.559
AgeGroup1	Adolescents - Children	-0.0085	0.0457	345.2799	-0.1868	0.852
Time ²	Time ²	-0.2681	0.0299	337.0091	-8.9571	<.001
Time ³	Time ³	-0.1666	0.0189	339.3551	-8.8193	<.001
Time * Sex1	Time * (Female - Male)	0.0277	0.0331	334.7581	0.8366	0.403
Time * AgeGroup1	Time * (Adolescents - Children)	0.0088	0.0392	338.1415	0.2245	0.822

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0780	0.2792	0.4822
Residual		0.0837	0.2893	

Note. Number of Obs: 346 , Number of groups: Study 13

Mixed Model Comparisons: Quadratic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	346	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.7120	7	87.2625	<.001
Full	Marginal	0.4366	6	87.2625	<.001
Nested	Conditional	0.6687	6	76.4221	<.001
Nested	Marginal	0.4089	5	76.4221	<.001
ΔR ²	Comparison	0.0433	1	10.8404	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-115.9491	-121.3693	5.4202	
AIC	249.8983	258.7386	-8.8404	Less is better
BIC	284.5162	289.5101	-4.9939	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	118.4954	1	339.9467	<.001
Sex	0.1793	1	334.0583	0.672
AgeGroup	0.0000	1	345.0710	0.995
Time ²	11.1918	1	342.1605	<.001
Time * Sex	0.9056	1	334.2026	0.342
Time * AgeGroup	0.9780	1	337.2839	0.323

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0041	0.0929	12.8749	-0.0438	0.966
Time	Time	-0.4408	0.0405	339.9467	-10.8856	<.001
Sex1	Female - Male	0.0152	0.0358	334.0583	0.4235	0.672
AgeGroup1	Adolescents - Children	-0.0003	0.0506	345.0710	-0.0060	0.995
Time ²	Time ²	-0.0759	0.0227	342.1605	-3.3454	<.001
Time * Sex1	Time * (Female - Male)	0.0348	0.0366	334.2026	0.9516	0.342
Time * AgeGroup1	Time * (Adolescents - Children)	0.0427	0.0432	337.2839	0.9890	0.323

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0979	0.3130	0.4888
Residual		0.1024	0.3200	

Note. Number of Obs: 346 , Number of groups: Study 13

Mixed Model: Cubic (selected by AIC/BIC)

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	346	
Converged	yes	
Y transform	none	
C.I. method	Wald	

Note. All covariates are standardized

[3]

Model Results

Model Fit

Type	R²	df	LRT X²	p
Conditional	0.7359	8	157.4190	<.001
Marginal	0.4900	7	157.4190	<.001

[4]

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Sex	0.3426	1	334.5313	0.559
AgeGroup	0.0349	1	345.2799	0.852
Time	8.4571	1	342.6019	0.004
Time²	80.2292	1	337.0091	<.001
Time³	77.7793	1	339.3551	<.001
Sex * Time	0.6999	1	334.7581	0.403
AgeGroup * Time	0.0504	1	338.1415	0.822

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0516	0.0832	13.4708	0.6197	0.546
Sex1	Female - Male	0.0189	0.0324	334.5313	0.5854	0.559
AgeGroup1	Adolescents - Children	-0.0085	0.0457	345.2799	-0.1868	0.852
Time	Time	-0.1443	0.0496	342.6019	-2.9081	0.004
Time²	Time²	-0.2681	0.0299	337.0091	-8.9571	<.001
Time³	Time³	-0.1666	0.0189	339.3551	-8.8193	<.001
Sex1 * Time	(Female - Male) * Time	0.0277	0.0331	334.7581	0.8366	0.403
AgeGroup1 * Time	(Adolescents - Children) * Time	0.0088	0.0392	338.1415	0.2245	0.822

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0780	0.2792	0.4822
Residual		0.0837	0.2893	

Note. Number of Obs: 346 , Number of groups: Study 13

References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved

from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Gallucci, M. (2019). *GAMLj: General analyses for linear models (Version 3.6.5)*. [jamovi module]. Retrieved from <https://gamlj.github.io/>.

[4] Gallucci, M. (2020). *Model goodness of fit in GAMLj*. . [link](#).

[5] Lüdtke, Ben-Shachar, Patil & Makowski (2020). *Extracting, Computing and Exploring the Parameters of Statistical Models using R*. CRAN. [link](#).

Lower-body strength

Mixed Model Comparisons: Cubic vs. Quadratic

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	316	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + (1 Study)
Comparison	Tested terms	~ I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.3241	8	36.1095	<.001
Full	Marginal	0.2090	7	36.1095	<.001
Nested	Conditional	0.3406	7	34.5174	<.001
Nested	Marginal	0.2168	6	34.5174	<.001
ΔR ²	Comparison	-0.0165	1	1.5921	0.207

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-25.1212	-25.9173	0.7961	
AIC	70.2424	69.8345	0.4079	Less is better
BIC	107.7998	103.6362	4.1636	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	20.5655	1	183.0823	<.001
Sex	0.1419	1	309.7889	0.707
AgeGroup	1.2280	1	222.4078	0.269
Time²	16.7358	1	315.5692	<.001
Time³	1.6266	1	287.5818	0.203
Time * Sex	1.9056	1	310.7702	0.168
Time * AgeGroup	0.9223	1	315.6603	0.338

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0242	0.0367	21.2076	0.6592	0.517
Time	Time	-0.1679	0.0370	183.0823	-4.5349	<.001
Sex1	Female - Male	0.0112	0.0298	309.7889	0.3768	0.707
AgeGroup1	Adolescents - Children	-0.0465	0.0420	222.4078	-1.1082	0.269
Time ²	Time ²	-0.1067	0.0261	315.5692	-4.0909	<.001
Time ³	Time ³	-0.0164	0.0129	287.5818	-1.2754	0.203
Time * Sex1	Time * (Female - Male)	-0.0469	0.0340	310.7702	-1.3804	0.168
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0339	0.0353	315.6603	-0.9604	0.338

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0110	0.1048	0.1455
Residual		0.0645	0.2540	

Note. Number of Obs: 316 , Number of groups: Study 17

Mixed Model Comparisons: Cubic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	316	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2) + I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.3241	8	36.1095	<.001
Full	Marginal	0.2090	7	36.1095	<.001
Nested	Conditional	0.1138	6	8.3433	0.214
Nested	Marginal	0.0632	5	8.3433	0.138
ΔR ²	Comparison	0.2103	2	27.7662	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-25.1212	-39.0043	13.8831	
AIC	70.2424	94.0086	-23.7662	Less is better
BIC	107.7998	124.0546	-16.2548	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	20.5655	1	183.0823	<.001
Sex	0.1419	1	309.7889	0.707
AgeGroup	1.2280	1	222.4078	0.269
Time²	16.7358	1	315.5692	<.001
Time³	1.6266	1	287.5818	0.203
Time * Sex	1.9056	1	310.7702	0.168
Time * AgeGroup	0.9223	1	315.6603	0.338

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0242	0.0367	21.2076	0.6592	0.517
Time	Time	-0.1679	0.0370	183.0823	-4.5349	<.001
Sex1	Female - Male	0.0112	0.0298	309.7889	0.3768	0.707
AgeGroup1	Adolescents - Children	-0.0465	0.0420	222.4078	-1.1082	0.269
Time ²	Time ²	-0.1067	0.0261	315.5692	-4.0909	<.001
Time ³	Time ³	-0.0164	0.0129	287.5818	-1.2754	0.203
Time * Sex1	Time * (Female - Male)	-0.0469	0.0340	310.7702	-1.3804	0.168
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0339	0.0353	315.6603	-0.9604	0.338

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0110	0.1048	0.1455
Residual		0.0645	0.2540	

Note. Number of Obs: 316 , Number of groups: Study 17

Mixed Model Comparisons: Quadratic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	316	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.3406	7	34.5174	<.001
Full	Marginal	0.2168	6	34.5174	<.001
Nested	Conditional	0.1138	6	8.3433	0.214
Nested	Marginal	0.0632	5	8.3433	0.138
ΔR ²	Comparison	0.2268	1	26.1741	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-25.9173	-39.0043	13.0871	
AIC	69.8345	94.0086	-24.1741	Less is better
BIC	103.6362	124.0546	-20.4184	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	50.0462	1	212.6252	<.001
Sex	0.1999	1	310.4344	0.655
AgeGroup	1.1768	1	231.8328	0.279
Time ²	29.7612	1	292.0274	<.001
Time * Sex	2.7244	1	313.7374	0.100
Time * AgeGroup	0.6999	1	315.9692	0.403

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0141	0.0369	19.2579	0.3809	0.707
Time	Time	-0.2017	0.0285	212.6252	-7.0743	<.001
Sex1	Female - Male	0.0134	0.0299	310.4344	0.4472	0.655
AgeGroup1	Adolescents - Children	-0.0458	0.0423	231.8328	-1.0848	0.279
Time ²	Time ²	-0.0799	0.0146	292.0274	-5.4554	<.001
Time * Sex1	Time * (Female - Male)	-0.0552	0.0335	313.7374	-1.6506	0.100
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0295	0.0352	315.9692	-0.8366	0.403

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0121	0.1101	0.1581
Residual		0.0646	0.2542	

Note. Number of Obs: 316 , Number of groups: Study 17

Mixed Model: Quadratic (selected by AIC/BIC)

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	316	
Converged	yes	
Y transform	none	
C.I. method	Wald	

Note. All covariates are standardized

[3]

Model Results

Model Fit

Type	R ²	df	LRT X ²	p
Conditional	0.3406	7	34.5174	<.001
Marginal	0.2168	6	34.5174	<.001

[4]

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Sex	0.1999	1	310.4344	0.655
AgeGroup	1.1768	1	231.8328	0.279
Time	50.0462	1	212.6252	<.001
Time ²	29.7612	1	292.0274	<.001
Sex * Time	2.7244	1	313.7374	0.100
AgeGroup * Time	0.6999	1	315.9692	0.403

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0141	0.0369	19.2579	0.3809	0.707
Sex1	Female - Male	0.0134	0.0299	310.4344	0.4472	0.655
AgeGroup1	Adolescents - Children	-0.0458	0.0423	231.8328	-1.0848	0.279
Time	Time	-0.2017	0.0285	212.6252	-7.0743	<.001
Time ²	Time ²	-0.0799	0.0146	292.0274	-5.4554	<.001
Sex1 * Time	(Female - Male) * Time	-0.0552	0.0335	313.7374	-1.6506	0.100
AgeGroup1 * Time	(Adolescents - Children) * Time	-0.0295	0.0352	315.9692	-0.8366	0.403

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0121	0.1101	0.1581
Residual		0.0646	0.2542	

Note. Number of Obs: 316 , Number of groups: Study 17

References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Gallucci, M. (2019). *GAMLj: General analyses for linear models (Version 3.6.5)*. [jamovi module]. Retrieved from <https://gamlj.github.io/>.

[4] Gallucci, M. (2020). *Model goodness of fit in GAMLj*. . [link](#).

[5] Lüdtke, Ben-Shachar, Patil & Makowski (2020). *Extracting, Computing and Exploring the Parameters of Statistical Models using R*. CRAN. [link](#).

Flexibility

Mixed Model Comparisons: Cubic vs. Quadratic

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	100	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + (1 Study)
Comparison	Tested terms	~ I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R²	df	LRT X²	p
Full	Conditional	0.7962	8	68.7766	<.001
Full	Marginal	0.5677	7	68.7766	<.001
Nested	Conditional	0.7877	7	55.3657	<.001
Nested	Marginal	0.5380	6	55.3657	<.001
ΔR²	Comparison	0.0085	1	13.4109	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	32.7845	26.0791	6.7055	
AIC	-45.5691	-34.1582	-11.4109	Less is better
BIC	-19.5174	-10.7116	-8.8057	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	5.3403	1	99.9858	0.023
Sex	4.0988	1	93.8416	0.046
AgeGroup	2.9922	1	99.1543	0.087
Time²	57.3959	1	94.4795	<.001
Time³	14.3586	1	98.2811	<.001
Time * Sex	0.5358	1	95.2061	0.466
Time * AgeGroup	0.1859	1	96.3930	0.667

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0329	0.0692	7.9352	0.4759	0.647
Time	Time	-0.1511	0.0654	99.9858	-2.3109	0.023
Sex1	Female - Male	0.0681	0.0337	93.8416	2.0246	0.046
AgeGroup1	Adolescents - Children	-0.0769	0.0445	99.1543	-1.7298	0.087
Time ²	Time ²	-0.2115	0.0279	94.4795	-7.5760	<.001
Time ³	Time ³	-0.0983	0.0259	98.2811	-3.7893	<.001
Time * Sex1	Time * (Female - Male)	-0.0283	0.0386	95.2061	-0.7320	0.466
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0172	0.0398	96.3930	-0.4311	0.667

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0284	0.1686	0.5287
Residual		0.0253	0.1592	

Note. Number of Obs: 100 , Number of groups: Study 7

Mixed Model Comparisons: Cubic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	100	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2) + I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.7962	8	68.7766	<.001
Full	Marginal	0.5677	7	68.7766	<.001
Nested	Conditional	0.5048	6	24.1683	<.001
Nested	Marginal	0.3411	5	24.1683	<.001
ΔR ²	Comparison	0.2914	2	44.6084	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	32.7845	10.4804	22.3042	
AIC	-45.5691	-4.9607	-40.6084	Less is better
BIC	-19.5174	15.8807	-35.3980	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	5.3403	1	99.9858	0.023
Sex	4.0988	1	93.8416	0.046
AgeGroup	2.9922	1	99.1543	0.087
Time²	57.3959	1	94.4795	<.001
Time³	14.3586	1	98.2811	<.001
Time * Sex	0.5358	1	95.2061	0.466
Time * AgeGroup	0.1859	1	96.3930	0.667

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0329	0.0692	7.9352	0.4759	0.647
Time	Time	-0.1511	0.0654	99.9858	-2.3109	0.023
Sex1	Female - Male	0.0681	0.0337	93.8416	2.0246	0.046
AgeGroup1	Adolescents - Children	-0.0769	0.0445	99.1543	-1.7298	0.087
Time ²	Time ²	-0.2115	0.0279	94.4795	-7.5760	<.001
Time ³	Time ³	-0.0983	0.0259	98.2811	-3.7893	<.001
Time * Sex1	Time * (Female - Male)	-0.0283	0.0386	95.2061	-0.7320	0.466
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0172	0.0398	96.3930	-0.4311	0.667

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0284	0.1686	0.5287
Residual		0.0253	0.1592	

Note. Number of Obs: 100 , Number of groups: Study 7

Mixed Model Comparisons: Quadratic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	100	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.7877	7	55.3657	<.001
Full	Marginal	0.5380	6	55.3657	<.001
Nested	Conditional	0.5048	6	24.1683	<.001
Nested	Marginal	0.3411	5	24.1683	<.001
ΔR ²	Comparison	0.2829	1	31.1975	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	26.0791	10.4804	15.5987	
AIC	-34.1582	-4.9607	-29.1975	Less is better
BIC	-10.7116	15.8807	-26.5923	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	94.3989	1	99.9501	<.001
Sex	0.7514	1	92.7775	0.388
AgeGroup	1.3910	1	98.9764	0.241
Time²	40.4820	1	97.7967	<.001
Time * Sex	1.7690	1	92.8414	0.187
Time * AgeGroup	3.4589	1	95.8768	0.066

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0296	0.0754	7.6042	0.3931	0.705
Time	Time	-0.3617	0.0372	99.9501	-9.7159	<.001
Sex1	Female - Male	0.0297	0.0343	92.7775	0.8668	0.388
AgeGroup1	Adolescents - Children	-0.0556	0.0472	98.9764	-1.1794	0.241
Time²	Time²	-0.1412	0.0222	97.7967	-6.3625	<.001
Time * Sex1	Time * (Female - Male)	0.0470	0.0353	92.8414	1.3301	0.187
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0734	0.0395	95.8768	-1.8598	0.066

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0340	0.1844	0.5406
Residual		0.0289	0.1700	

Note. Number of Obs: 100 , Number of groups: Study 7

Mixed Model: Cubic (selected by AIC/BIC)

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	100	
Converged	yes	
Y transform	none	
C.I. method	Wald	

Note. All covariates are standardized

[3]

Model Results

Model Fit

Type	R ²	df	LRT X ²	p
Conditional	0.7962	8	68.7766	<.001
Marginal	0.5677	7	68.7766	<.001

[4]

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Sex	4.0988	1	93.8416	0.046
AgeGroup	2.9922	1	99.1543	0.087
Time	5.3403	1	99.9858	0.023
Time ²	57.3959	1	94.4795	<.001
Time ³	14.3586	1	98.2811	<.001
Sex * Time	0.5358	1	95.2061	0.466
AgeGroup * Time	0.1859	1	96.3930	0.667

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	0.0329	0.0692	7.9352	0.4759	0.647
Sex1	Female - Male	0.0681	0.0337	93.8416	2.0246	0.046
AgeGroup1	Adolescents - Children	-0.0769	0.0445	99.1543	-1.7298	0.087
Time	Time	-0.1511	0.0654	99.9858	-2.3109	0.023
Time ²	Time ²	-0.2115	0.0279	94.4795	-7.5760	<.001
Time ³	Time ³	-0.0983	0.0259	98.2811	-3.7893	<.001
Sex1 * Time	(Female - Male) * Time	-0.0283	0.0386	95.2061	-0.7320	0.466
AgeGroup1 * Time	(Adolescents - Children) * Time	-0.0172	0.0398	96.3930	-0.4311	0.667

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0284	0.1686	0.5287
Residual		0.0253	0.1592	

Note. Number of Obs: 100 , Number of groups: Study 7

References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved

from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Gallucci, M. (2019). *GAMLj: General analyses for linear models (Version 3.6.5)*. [jamovi module]. Retrieved from <https://gamlj.github.io/>.

[4] Gallucci, M. (2020). *Model goodness of fit in GAMLj*. . [link](#).

[5] Lüdtke, Ben-Shachar, Patil & Makowski (2020). *Extracting, Computing and Exploring the Parameters of Statistical Models using R*. CRAN. [link](#).

Cardiorespiratory endurance (without 20 m shuttle run test)

Mixed Model Comparisons: Cubic vs. Quadratic

Model Info		
Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	204	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + (1 Study)
Comparison	Tested terms	~ I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit					
Model	Type	R²	df	LRT X²	p
Full	Conditional	0.5077	8	36.8576	<.001
Full	Marginal	0.3246	7	36.8566	<.001
Nested	Conditional	0.5036	7	36.8499	<.001
Nested	Marginal	0.3223	6	36.8489	<.001
ΔR²	Comparison	0.0041	1	0.0077	0.930

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices				
Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-13.6086	-13.6124	0.0038	
AIC	47.2172	45.2249	1.9923	Less is better
BIC	80.3984	75.0879	5.3104	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	6.7175	1	132.4366	0.011
Sex	0.0238	1	195.9267	0.877
AgeGroup	0.1348	1	167.5018	0.714
Time ²	1.7580	1	202.9302	0.186
Time ³	0.0084	1	141.9750	0.927
Time * Sex	1.6681	1	194.3507	0.198
Time * AgeGroup	0.0017	1	202.4921	0.967

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.1465	0.0665	13.9968	-2.2025	0.045
Time	Time	-0.1926	0.0743	132.4366	-2.5918	0.011
Sex1	Female - Male	0.0056	0.0365	195.9267	0.1544	0.877
AgeGroup1	Adolescents - Children	-0.0355	0.0967	167.5018	-0.3672	0.714
Time ²	Time ²	0.0333	0.0251	202.9302	1.3259	0.186
Time ³	Time ³	0.0017	0.0187	141.9750	0.0919	0.927
Time * Sex1	Time * (Female - Male)	-0.0507	0.0393	194.3507	-1.2916	0.198
Time * AgeGroup1	Time * (Adolescents - Children)	0.0033	0.0807	202.4921	0.0415	0.967

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0229	0.1513	0.2711
Residual		0.0616	0.2481	

Note. Number of Obs: 204 , Number of groups: Study 10

Mixed Model Comparisons: Cubic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	204	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2) + I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.5077	8	36.8576	<.001
Full	Marginal	0.3246	7	36.8566	<.001
Nested	Conditional	0.5072	6	34.2073	<.001
Nested	Marginal	0.3272	5	34.2063	<.001
ΔR ²	Comparison	0.0005	2	2.6503	0.266

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-13.6086	-14.9337	1.3252	
AIC	47.2172	45.8675	1.3497	Less is better
BIC	80.3984	72.4124	7.9859	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	6.7175	1	132.4366	0.011
Sex	0.0238	1	195.9267	0.877
AgeGroup	0.1348	1	167.5018	0.714
Time ²	1.7580	1	202.9302	0.186
Time ³	0.0084	1	141.9750	0.927
Time * Sex	1.6681	1	194.3507	0.198
Time * AgeGroup	0.0017	1	202.4921	0.967

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.1465	0.0665	13.9968	-2.2025	0.045
Time	Time	-0.1926	0.0743	132.4366	-2.5918	0.011
Sex1	Female - Male	0.0056	0.0365	195.9267	0.1544	0.877
AgeGroup1	Adolescents - Children	-0.0355	0.0967	167.5018	-0.3672	0.714
Time ²	Time ²	0.0333	0.0251	202.9302	1.3259	0.186
Time ³	Time ³	0.0017	0.0187	141.9750	0.0919	0.927
Time * Sex1	Time * (Female - Male)	-0.0507	0.0393	194.3507	-1.2916	0.198
Time * AgeGroup1	Time * (Adolescents - Children)	0.0033	0.0807	202.4921	0.0415	0.967

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0229	0.1513	0.2711
Residual		0.0616	0.2481	

Note. Number of Obs: 204 , Number of groups: Study 10

Mixed Model Comparisons: Quadratic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	204	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.5036	7	36.8499	<.001
Full	Marginal	0.3223	6	36.8489	<.001
Nested	Conditional	0.5072	6	34.2073	<.001
Nested	Marginal	0.3272	5	34.2063	<.001
ΔR ²	Comparison	-0.0036	1	2.6426	0.104

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	-13.6124	-14.9337	1.3213	
AIC	45.2249	45.8675	-0.6426	Less is better
BIC	75.0879	72.4124	2.6755	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	15.6536	1	200.5599	<.001
Sex	0.0252	1	197.3756	0.874
AgeGroup	0.1330	1	161.3916	0.716
Time²	2.6598	1	203.4020	0.104
Time * Sex	1.7408	1	197.8844	0.189
Time * AgeGroup	0.0029	1	200.6605	0.957

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.1448	0.0642	13.9521	-2.2564	0.041
Time	Time	-0.1869	0.0472	200.5599	-3.9565	<.001
Sex1	Female - Male	0.0058	0.0365	197.3756	0.1587	0.874
AgeGroup1	Adolescents - Children	-0.0348	0.0956	161.3916	-0.3647	0.716
Time²	Time²	0.0318	0.0195	203.4020	1.6309	0.104
Time * Sex1	Time * (Female - Male)	-0.0512	0.0388	197.8844	-1.3194	0.189
Time * AgeGroup1	Time * (Adolescents - Children)	0.0043	0.0795	200.6605	0.0542	0.957

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0225	0.1500	0.2675
Residual		0.0616	0.2482	

Note. Number of Obs: 204 , Number of groups: Study 10

Mixed Model: Linear (selected by AIC/BIC)

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Sex + AgeGroup + Time + Sex:Time + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	204	
Converged	yes	
Y transform	none	
C.I. method	Wald	

Note. All covariates are standardized

[3]

Model Results

Model Fit

Type	R ²	df	LRT X ²	p
Conditional	0.5072	6	34.2073	<.001
Marginal	0.3272	5	34.2063	<.001

[4]

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Sex	0.0119	1	198.0014	0.913
AgeGroup	0.8352	1	152.1456	0.362
Time	38.6419	1	191.5983	<.001
Sex * Time	1.1502	1	199.7720	0.285
AgeGroup * Time	0.4363	1	194.6926	0.510

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.1432	0.0646	14.4708	-2.2178	0.043
Sex1	Female - Male	0.0040	0.0367	198.0014	0.1093	0.913
AgeGroup1	Adolescents - Children	-0.0835	0.0914	152.1456	-0.9139	0.362
Time	Time	-0.2340	0.0376	191.5983	-6.2163	<.001
Sex1 * Time	(Female - Male) * Time	-0.0414	0.0386	199.7720	-1.0725	0.285
AgeGroup1 * Time	(Adolescents - Children) * Time	-0.0483	0.0732	194.6926	-0.6605	0.510

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0228	0.1510	0.2675
Residual		0.0624	0.2498	

Note. Number of Obs: 204 , Number of groups: Study 10

References

[1] The jamovi project (2024). *jamovi*. (Version 2.6) [Computer Software]. Retrieved from <https://www.jamovi.org>.

[2] R Core Team (2024). *R: A Language and environment for statistical computing*. (Version 4.4) [Computer software]. Retrieved from <https://cran.r-project.org>. (R packages retrieved from CRAN snapshot 2024-08-07).

[3] Gallucci, M. (2019). *GAMLj: General analyses for linear models (Version 3.6.5)*. [jamovi module]. Retrieved from <https://gamlj.github.io/>.

[4] Gallucci, M. (2020). *Model goodness of fit in GAMLj*. . [link](#).

[5] Lüdecke, Ben-Shachar, Patil & Makowski (2020). *Extracting, Computing and Exploring the Parameters of Statistical Models using R*. CRAN. [link](#).

Body mass index

Mixed Model Comparisons: Cubic vs. Quadratic

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	272	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + (1 Study)
Comparison	Tested terms	~ I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R²	df	LRT X²	p
Full	Conditional	0.4447	8	103.7137	<.001
Full	Marginal	0.3395	7	103.6530	<.001
Nested	Conditional	0.3789	7	77.0031	<.001
Nested	Marginal	0.2719	6	76.9424	<.001
ΔR²	Comparison	0.0657	1	26.7107	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	240.1145	226.7592	13.3553	
AIC	-460.2291	-435.5184	-24.7107	Less is better
BIC	-424.1711	-403.0662	-21.1049	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	49.8044	1	229.7295	<.001
Sex	2.2277	1	263.8744	0.137
AgeGroup	0.0287	1	251.0811	0.866
Time²	43.8293	1	41.5613	<.001
Time³	28.0989	1	162.8057	<.001
Time * Sex	0.8951	1	271.9838	0.345
Time * AgeGroup	1.1872	1	271.9032	0.277

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0493	0.0143	24.6402	-3.4579	0.002
Time	Time	-0.1235	0.0175	229.7295	-7.0572	<.001
Sex1	Female - Male	0.0211	0.0141	263.8744	1.4925	0.137
AgeGroup1	Adolescents - Children	-0.0023	0.0136	251.0811	-0.1693	0.866
Time ²	Time ²	0.0578	0.0087	41.5613	6.6204	<.001
Time ³	Time ³	0.0443	0.0083	162.8057	5.3008	<.001
Time * Sex1	Time * (Female - Male)	0.0134	0.0142	271.9838	0.9461	0.345
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0140	0.0128	271.9032	-1.0896	0.277

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0017	0.0417	0.1592
Residual		0.0092	0.0958	

Note. Number of Obs: 272 , Number of groups: Study 22

Mixed Model Comparisons: Cubic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	272	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2) + I(Time^3)
Comparison	Tested random	~

Note. All covariates are standardized
[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.4447	8	103.7137	<.001
Full	Marginal	0.3395	7	103.6530	<.001
Nested	Conditional	0.5287	6	55.9297	<.001
Nested	Marginal	0.3159	5	55.8690	<.001
ΔR ²	Comparison	-0.0840	2	47.7841	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)
[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	240.1145	216.2225	23.8920	
AIC	-460.2291	-416.4450	-43.7841	Less is better
BIC	-424.1711	-387.5986	-36.5725	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	49.8044	1	229.7295	<.001
Sex	2.2277	1	263.8744	0.137
AgeGroup	0.0287	1	251.0811	0.866
Time²	43.8293	1	41.5613	<.001
Time³	28.0989	1	162.8057	<.001
Time * Sex	0.8951	1	271.9838	0.345
Time * AgeGroup	1.1872	1	271.9032	0.277

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0493	0.0143	24.6402	-3.4579	0.002
Time	Time	-0.1235	0.0175	229.7295	-7.0572	<.001
Sex1	Female - Male	0.0211	0.0141	263.8744	1.4925	0.137
AgeGroup1	Adolescents - Children	-0.0023	0.0136	251.0811	-0.1693	0.866
Time ²	Time ²	0.0578	0.0087	41.5613	6.6204	<.001
Time ³	Time ³	0.0443	0.0083	162.8057	5.3008	<.001
Time * Sex1	Time * (Female - Male)	0.0134	0.0142	271.9838	0.9461	0.345
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0140	0.0128	271.9032	-1.0896	0.277

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0017	0.0417	0.1592
Residual		0.0092	0.0958	

Note. Number of Obs: 272 , Number of groups: Study 22

Mixed Model Comparisons: Quadratic vs. Linear

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Time + Sex + AgeGroup + I(Time^2) + Time:Sex + AgeGroup:Time + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	272	
Converged	yes	
Y transform	none	
C.I. method	Wald	
Comparison	Nested model	ZScore ~ 1 + Sex + AgeGroup + Sex:Time + AgeGroup:Time + Time + (1 Study)
Comparison	Tested terms	~ I(Time^2)
Comparison	Tested random	~

Note. All covariates are standardized

[3]

Model Results

Model Fit

Model	Type	R ²	df	LRT X ²	p
Full	Conditional	0.3789	7	77.0031	<.001
Full	Marginal	0.2719	6	76.9424	<.001
Nested	Conditional	0.5287	6	55.9297	<.001
Nested	Marginal	0.3159	5	55.8690	<.001
ΔR ²	Comparison	-0.1498	1	21.0734	<.001

Note. Models comparison is done on the conditional models (random and fixed effects)

[4]

Additional Indices

Info	Model Value	Nested Model	Δ	Comment
LogLikelihood	226.7592	216.2225	10.5367	
AIC	-435.5184	-416.4450	-19.0734	Less is better
BIC	-403.0662	-387.5986	-15.4676	Less is better

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Time	20.9582	1	46.4199	<.001
Sex	4.8595	1	262.2870	0.028
AgeGroup	0.0192	1	249.2525	0.890
Time ²	27.0012	1	51.7639	<.001
Time * Sex	0.7023	1	271.9959	0.403
Time * AgeGroup	0.1890	1	271.6567	0.664

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0479	0.0146	25.8241	-3.2718	0.003
Time	Time	-0.0445	0.0097	46.4199	-4.5780	<.001
Sex1	Female - Male	0.0323	0.0147	262.2870	2.2044	0.028
AgeGroup1	Adolescents - Children	-0.0020	0.0142	249.2525	-0.1385	0.890
Time ²	Time ²	0.0451	0.0087	51.7639	5.1963	<.001
Time * Sex1	Time * (Female - Male)	-0.0118	0.0140	271.9959	-0.8380	0.403
Time * AgeGroup1	Time * (Adolescents - Children)	-0.0058	0.0134	271.6567	-0.4348	0.664

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0018	0.0419	0.1470
Residual		0.0102	0.1009	

Note. Number of Obs: 272 , Number of groups: Study 22

Mixed Model: Cubic (selected by AIC/BIC)

Model Info

Info		
Model Type	Mixed Model	Linear Mixed model for continuous y
Model	lmer	ZScore ~ 1 + Sex + AgeGroup + Time + I(Time^2) + Sex:Time + AgeGroup:Time + I(Time^3) + (1 Study)
Distribution	Gaussian	Normal distribution of residuals
Direction	y	Dependend variable scores
Optimizer	bobyqa	
DF method	Satterthwaite	
Sample size	272	
Converged	yes	
Y transform	none	
C.I. method	Wald	

Note. All covariates are standardized

[3]

Model Results

Model Fit

Type	R²	df	LRT X²	p
Conditional	0.4447	8	103.7137	<.001
Marginal	0.3395	7	103.6530	<.001

[4]

Fixed Effects Omnibus Tests

	F	df	df (res)	p
Sex	2.2277	1	263.8744	0.137
AgeGroup	0.0287	1	251.0811	0.866
Time	49.8044	1	229.7295	<.001
Time²	43.8293	1	41.5613	<.001
Time³	28.0989	1	162.8058	<.001
Sex * Time	0.8951	1	271.9838	0.345
AgeGroup * Time	1.1872	1	271.9032	0.277

Parameter Estimates (Fixed coefficients)

Names	Effect	Estimate	SE	df	t	p
(Intercept)	(Intercept)	-0.0493	0.0143	24.6402	-3.4579	0.002
Sex1	Female - Male	0.0211	0.0141	263.8744	1.4925	0.137
AgeGroup1	Adolescents - Children	-0.0023	0.0136	251.0811	-0.1693	0.866
Time	Time	-0.1235	0.0175	229.7295	-7.0572	<.001
Time²	Time²	0.0578	0.0087	41.5613	6.6204	<.001
Time³	Time³	0.0443	0.0083	162.8058	5.3008	<.001
Sex1 * Time	(Female - Male) * Time	0.0134	0.0142	271.9838	0.9461	0.345
AgeGroup1 * Time	(Adolescents - Children) * Time	-0.0140	0.0128	271.9032	-1.0896	0.277

[5]

Random Components

Groups	Name	Variance	SD	ICC
Study	(Intercept)	0.0017	0.0417	0.1592
Residual		0.0092	0.0958	

Note. Number of Obs: 272 , Number of groups: Study 22

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