SUPPLEMENTARY MATERIALS´

Model comparisons

Model 1:
model_BMI_reduced:
correct ~ condition * zBMI + zIQ + zWM_tired + zWM_conc + Gender + (1 | ID)

model_BMI_full:
correct ~ condition * zBMI + zIQ + zWM_tired + zWM_conc + Gender + BED + project + zDFS + zAge + (1 | ID)

Model	N. of Parameters	AIC	BIC	Log Likelihood	Deviance	Chi-Squared	Df	p-value
model_reduced	13	23060	23172	-11517	23034			
model_full	18	23068	23222	-11516	23032	2.41	5	0.791

Model 2:
model_COMT_Taq1A_BMI_reduced:
correct ~ condition * COMT * DRD2 * zBMI + zIQ + Gender + zWM_tired + zWM_conc + (1 | ID)

model_COMT_Taq1A_BMI_full:
correct ~ condition * COMT * DRD2 * zBMI + zIQ + Gender + zWM_tired + zWM_conc + zAge + project + BED + zDFS + (1 | ID)

Model	N. of Parameters	AIC	BIC	Log Likelihood	Deviance	Chi-Squared	Df	p-value
model_reduced	53	23091	23545	-11492	22985			
model_full	58	23098	23595	-11491	22982	2.92	5	0.712

Model 3:
model_DARPP_BMI_reduced:
correct ~ DARPP*zBMI*condition + zIQ + zWM_conc + zWM_tired + Gender + (1 | ID)

model_DARPP_BMI_full:
correct ~ DARPP*zBMI*condition + zIQ + zWM_conc + zWM_tired + Gender + zAge + project + BED + zDFS + (1 | ID)

Model	N. of Parameters	AIC	BIC	Log Likelihood	Deviance	Chi-Squared	Df	p-value
model_reduced	21	23055	23235	-11506	23013			
model_full	26	23063	23286	-11505	23011	2.39	5	0.793

Model 4:
model_C957T_BMI_reduced:
correct ~ C957T*zBMI*condition + zIQ + zWM_conc + zWM_tired + Gender + (1 | ID)

model_C957T_BMI_full:
correct ~ C957T*zBMI*condition + zIQ + zWM_conc + zWM_tired + Gender + zAge + project + BED + zDFS + (1 | ID)

Model	N. of Parameters	AIC	BIC	Log Likelihood	Deviance	Chi-Squared	Df	p-value
model_reduced	21	23069	23249	-11514	23027			
model_full	26	23077	23300	-11512	23025	2.36	5	0.796

Model 5:
model_AA_BMI_reduced:
correct ~ scale(AAratio)*zBMI*condition + zIQ + zWM_conc + Gender + (1 | ID)

model_AA_BMI_full:
correct ~ scale(AAratio)*zBMI*condition + zIQ + zWM_conc + Gender + zWM_tired + zDFS + project + zAge + (1 | ID)

Model	N. of Parameters	AIC	BIC	Log Likelihood	Deviance	Chi-Squared	Df	p-value
model_reduced	20	10812	10970	-5386	10772			
model_full	24	10815	11005	-5383	10767	5.06	4	0.281

Check relationship amino acid ratio x condition x BMI for outlier
Because there was an extreme BMI data point, we re-ran the model excluding this data point to check whether the results still hold. The three-way interaction between Amino Acid Ratio, BMI, and condition became trend-significant ($p_{corrected}$ = 0.063). It should be noted that, although this BMI data-point is a statistical outlier, it can still be considered as a valid data-point and might represent relevant variance in out data.

Table S1. Full output model 5 without extreme data point

	Chisq	Df	Pr(>Chisq)
(Intercept)	10.62	1	0.001
AAratio	0.54	1	0.461
zBMI	0.80	1	0.370
condition	2.98	3	0.394
zIQ	4.88	1	0.027
zWM_conc	11.55	1	< .001
Gender	18.49	1	< .001
AAratio:zBMI	0.28	1	0.597
AAratio:condition	7.28	3	0.064
BMI:condition	8.61	3	0.035
AAratio:BMI:condition	10.34	3	0.016

N = 159

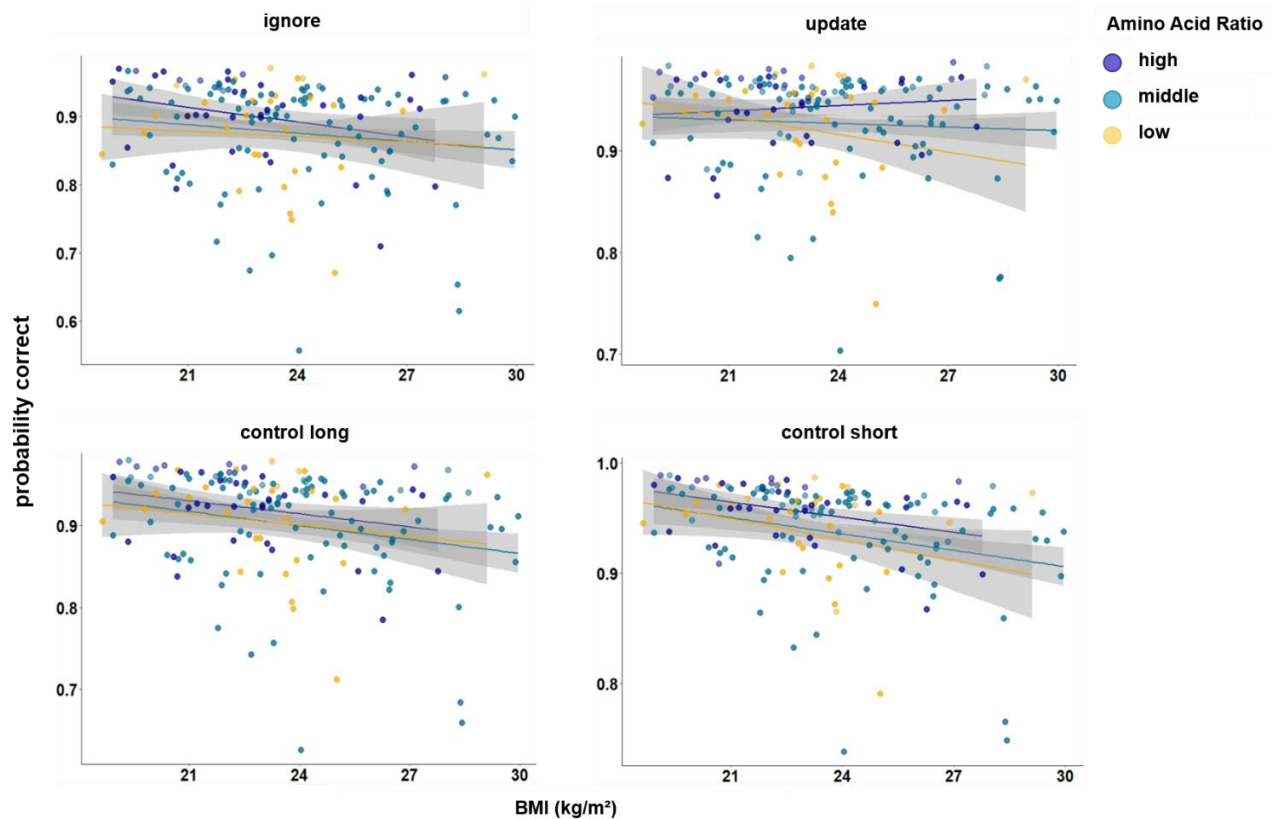Marginal R^2 / Conditional R^2 = 0.068 / 0.170

Figure S1. Interaction of Amino Acid Ratio, BMI and condition on data without the statistical BMI-outlier. Shaded areas represent the 95% confidence intervals.

Interaction effects of various SNPs and Amino Acid Ratio

Because it has been reported that there might be C957T and Taq1A interaction effects on working memory (Frank & Hutchison, 2009), we also looked at this interaction. Table S2 shows the full model output for the model investigating the interaction effect of C957T and Taq1A on accuracy in working memory conditions, depending on BMI.

Furthermore, we ran a model where we investigated the interaction of C957T and COMT, as also these two SNPs have been shown to interact (Xu et al., 2007). See Table S3 for the full model output.

Last but not least, since our initial analyses showed significant effects, we also looked at how amino acid ratio and Taq1A, and amino acid and DARPP would interact. We did not include all three factors in one model but ran separate models for both 4-way interactions since adding all factors would lead to uninterpretable interactions. Table S4 shows the full model output for the model investigating the interaction effect of Amino Acid Ratio and Taq1A. Table S5 shows the full model output for the model investigating the interaction effect of Amino Acid Ratio and DARPP. Both models looked at the effect of these interactions on accuracy in working memory conditions, depending on BMI.

Table S2. Full output for the model investigating C957T and Taq1A interaction effects

	Chisq	Df	Pr(>Chisq)
(Intercept)	276	1	< .001
condition	26.9	3	< .001
C957T	0.078	1	0.780
Taq1A	0.007	1	0.932
zBMI	6.47	1	0.011
zIQ	27.8	1	< .001
Gender	7.75	1	0.005
zWM_tired	11.4	1	< .001
zWM_conc	30.9	1	< .001
condition:C957T	3.64	3	0.303
condition:Taq1A	2.97	3	0.396
C957T:Taq1A	0.047	1	0.828
condition:zBMI	1.21	3	0.751
C957T:zBMI	1.48	1	0.224
Taq1A:zBMI	2.21	1	0.138
condition:C957T:Taq1A	2.69	3	0.442
condition:C957T:zBMI	0.848	3	0.838
condition:Taq1A:zBMI	1.06	3	0.786
C957T:Taq1A:zBMI	0.596	1	0.440
condition:C957T:Taq1A:zBMI	1.8	3	0.615

N = 318

Marginal R^2 / Conditional R^2 = 0.074 / 0.172

Table S3. Full output for the model investigating C957T and COMT interaction effects

	Chisq	Df	Pr(>Chisq)
(Intercept)	265	1	< .001
condition	34.9	3	< .001
C957T	0.797	1	0.372
COMT	2.56	2	0.278
zBMI	2.62	1	0.106
zIQ	24.6	1	< .001
Gender	8.73	1	0.003
zWM_tired	10.4	1	0.001
zWM_conc	32.6	1	< .001
condition:C957T	4.33	3	0.228
condition:COMT	2.91	6	0.820
C957T:COMT	3.12	2	0.210
condition:zBMI	1.67	3	0.644
C957T:zBMI	0.113	1	0.736
COMT:zBMI	1.37	2	0.504
condition:C957T:COMT	1.38	6	0.967
condition:C957T:zBMI	1.45	3	0.694
condition:COMT:zBMI	15.2	6	0.019
C957T:COMT:zBMI	1.27	2	0.529
condition:C957T:COMT:zBMI	14.4	6	0.026

N = 318

Marginal R^2 / Conditional R^2 = 0.073 / 0.173

Table S4. Full output for the model investigating Amino Acid Ratio and Taq1A interaction effects

	Chisq	Df	Pr(>Chisq)
(Intercept)	18.5	1	< .001
condition	2.81	3	0.422
AAratio	0.044	1	0.835
Taq1A	0.294	1	0.588
zBMI	1.75	1	0.185
zIQ	11.1	1	< .001
Gender	4.9	1	0.027
zWM_tired	2.6	1	0.107
zWM_conc	22.1	1	< .001
condition:AAratio	7.31	3	0.063
condition:Taq1A	0.743	3	0.863
AAratio:Taq1A	0.42	1	0.517
condition:zBMI	6.95	3	0.074
AAratio:zBMI	0.403	1	0.525
Taq1A:zBMI	0.174	1	0.676
condition:AAratio:Taq1A	0.784	3	0.853
condition:AAratio:zBMI	9.79	3	0.020
condition:Taq1A:zBMI	1.93	3	0.588
AAratio:Taq1A:zBMI	0.001	1	0.969
condition:AAratio:Taq1A:zBMI	2.07	3	0.559

N = 160
Marginal R^2 / Conditional R^2 = 0.077 / 0.172

Table S5. Full output for the model investigating Amino Acid Ratio and DARPP interaction effects

	Chisq	Df	Pr(>Chisq)
(Intercept)	20	1	< .001
condition	6.92	3	0.075
AAratio	0.001	1	0.972
DARPP	0.147	1	0.701
zBMI	1.06	1	0.303
zIQ	10.1	1	0.001
Gender	3.52	1	0.061
zWM_tired	4.38	1	0.036
zWM_conc	22.6	1	< .001
condition:AAratio	13.2	3	0.004
condition:DARPP	2.32	3	0.508
AAratio:DARPP	0.292	1	0.589
condition:zBMI	16.6	3	< .001
AAratio:zBMI	0.273	1	0.601
DARPP:zBMI	0.017	1	0.896
condition:AAratio:DARPP	2.22	3	0.528
condition:AAratio:zBMI	17.2	3	< .001
condition:DARPP:zBMI	7.4	3	0.060
AAratio:DARPP:zBMI	0.003	1	0.955
condition:AAratio:DARPP:zBMI	8.92	3	0.030

N = 160
Marginal R^2 / Conditional R^2 = 0.076 / 0.173

Table S6. Post hoc effects for the interaction of BMI, condition, and Taq1A

condition	Taq1A group	estimate	SE	lower 95-CI	higher 95-CL
ignore	A1-	-0.156	0.066	-0.285	-0.026
	A1+	-0.159	0.073	-0.302	-0.016
update	**A1-**	**-0.012**	**0.072**	**-0.153**	**0.129**
	A1+	-0.339	0.076	-0.488	-0.191
control long	A1-	-0.143	0.069	-0.279	-0.008
	A1+	-0.321	0.074	-0.466	-0.175
control short	A1-	-0.194	0.078	-0.347	-0.042
	A1+	-0.260	0.081	-0.421	-0.099

Note: the non-significant effect was highlighted in bold.

Table S7. Post hoc effects for the interaction of BMI, condition, and DARPP

condition	DARPP group	estimate	SE	lower 95-CI	higher 95-CL
ignore	A/A	-0.181	0.061	-0.301	-0.062
	G-carrier	**-0.0625**	**0.076**	**-0.211**	**0.086**
update	**A/A**	**-0.044**	**0.066**	**-0.174**	**0.086**
	G-carrier	-0.324	0.079	-0.478	-0.170
control long	A/A	-0.2060	0.063	-0.329	-0.082
	G-carrier	-0.1689	0.078	-0.322	-0.016
control short	A/A	-0.194	0.069	-0.331	-0.057
	G-carrier	-0.213	0.086	-0.380	-0.045

Note: non-significant effects are highlighted in bold.

Table S8. Full outputs for the models investigating the direct relationship of each SNP and BMI

		estimate	SE	t-value	p	adjusted R²
Taq1A	(intercept)	26.117	0.442	59.055	< .001	9.51e-06
	A1+	0.742	0.741	1.002	0.317	
COMT	(intercept)	26.965	0.652	41.326	< .001	-0.001534
	Val/Met	-0.617	0.843	-0.732	0.464	
	Met/Met	-1.179	0.962	-1.226	0.221	
DARPP-32	(intercept)	26.727	0.465	57.452	< .001	0.0009848
	G-carrier	-0.824	0.719	-1.146	0.252	
C957T	(intercept)	26.307	0.714	36.844	< .001	0.002643
	A/G	-0.381	0.873	-0.436	0.663	
	G/G	1.080	1.007	1.073	0.284	

Table S9. Full output for the model investigating the direct relationship of amino acid ratio and BMI

	estimate	SE	t-value	p
(Intercept)	25.330	1.742	14.545	< .001
Amino acid ratio	-7.277	7.543	-0.965	0.336

N = 160
adjusted R^2 = -0.0004356