

Supplementary information

Level of play and coach-rated game intelligence are related to performance on design fluency in elite soccer players

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Supplementary Table 1. ANCOVA assessing whether there was a significant difference between *DF Total Correct* results of NTP and PLP when correcting for 1) CS processing-speed, 2) CS working memory accuracy, 3) sex and 4) age. We checked that the model assumptions were met using Levene's test of equality of residual variances ($p = 0.086$) and Shapiro-Wilk test for normality of the residuals ($p = 0.85$).

Source	df	F	Sig.
Sex	1	5.18	0.028
NTP vs. PLP	1	5.96	0.019
Age	1	0.09	0.765
<i>CS Processing Speed</i>	1	3.63	0.063
<i>CS Working Memory Accuracy</i>	1	1.49	0.228

Exploratory tests of CS and other D-KEFS measurements

Supplementary Table 2. CS tasks - mean normalized results for NTP.

One-Sample Statistics NTP

	N	Mean	Std. Deviation
<i>CS Processing speed</i>	23	104.66	5.09
<i>CS Attention</i>	23	108.93	4.62
<i>CS Learning</i>	23	103.80	9.06
<i>CS Working Memory Speed</i>	23	104.10	6.76
<i>CS Working Memory Accuracy</i>	23	106.01	6.45

Supplementary Table 3. One-sample t-test assessing whether CS results of NTP were significantly different from the norm (i.e. 100).

One-Sample Test NTP

	Test Value = 100			
	t	df	Sig.	Mean Difference
<i>CS Processing Speed</i>	4.39	22	0.001	4.66
<i>CS Attention</i>	9.28	22	0.001	8.93
<i>CS Learning</i>	2.01	22	0.057	3.80
<i>CS Working Memory Speed</i>	2.91	22	0.008	4.10
<i>CS Working Memory Accuracy</i>	4.47	22	0.001	6.01

Supplementary Table 4. CS tasks- average normalized results for PLP.

One-Sample Statistics PLP

	N	Mean	Std. Deviation
<i>CS Processing Speed</i>	28	107.12	4.96
<i>CS Attention</i>	28	108.71	3.29
<i>CS Learning</i>	28	104.90	8.61
<i>CS Working Memory Speed</i>	28	104.78	6.73
<i>CS Working Memory Accuracy</i>	28	104.37	14.53

Supplementary Table 5. One-sample t-test assessing whether CS results of PLP were significantly different from the norm (i.e. 100).

One-Sample Test PLP

	Test Value = 100			
	t	df	Sig.	Mean Difference
<i>CS Processing Speed</i>	7.61	27	0.001	7.12
<i>CS Attention</i>	13.99	27	0.001	8.71
<i>CS Learning</i>	3.01	27	0.006	4.90
<i>CS Working Memory Speed</i>	3.76	27	0.001	4.78
<i>CS Working Memory Accuracy</i>	1.59	27	0.123	4.37

Supplementary Table 6. D-KEFS tasks CWI and TMT - average normalized results for NTP.

One-Sample Statistics National Team Players

	N	Mean	Std. Deviation
<i>CWI 3</i>	23	12.13	2.28
<i>CWI 4</i>	23	12.30	1.66
<i>TMT 2-3</i>	23	13.78	1.68
<i>TMT 4</i>	23	12.17	1.40

Supplementary Table 7. One-sample t-test for assessing whether *CWI* and *TMT* results of NTP were significantly different from the norm (i.e. 100).

One-Sample Test National Team Players

	Test Value = 10			
	t	df	Sig.	Mean Difference
<i>CWI 3</i>	4.48	22	0.001	2.13
<i>CWI 4</i>	6.64	22	0.001	2.30
<i>TMT 2-3</i>	10.81	22	0.001	3.78
<i>TMT 4</i>	7.43	22	0.001	2.17

Supplementary Table 8. *D-KEFS* tasks *CWI* and *TMT* - average normalized results for PLP.

One-Sample Statistics Premier League Players

	N	Mean	Std. Deviation
<i>CWI 3</i>	28	10.89	2.57
<i>CWI 4</i>	28	10.89	2.28
<i>TMT 2-3</i>	28	13.11	1.97
<i>TMT 4</i>	28	11.54	1.62

Supplementary Table 9. One-sample t-test for assessing whether *CWI* and *TMT* results of PLP were significantly different from the norm (i.e. 100).

One-Sample Test Premier League Players

	Test Value = 10			
	t	df	Sig.	Mean Difference
<i>CWI 3</i>	1.84	27	0.077	0.89
<i>CWI 4</i>	2.07	27	0.048	0.89
<i>TMT 2-3</i>	8.35	27	0.001	3.11
<i>TMT 4</i>	5.01	27	0.001	1.54

Supplementary Table 10. Independent sample t-test assessing whether there was a significant difference between *CWI*, *TMT* and CS results of NTP and PLP.

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means			
	F	Sig.	t	df	Sig.	Mean Difference
<i>CWI 3</i>	0.25	0.621	1.80	49	0.078	1.24
<i>CWI 4</i>	1.55	0.219	2.47	49	0.017	1.41
<i>TMT 2-3</i>	0.003	0.958	1.30	49	0.199	0.68
<i>TMT 4</i>	0.98	0.328	1.49	49	0.144	0.64
<i>CS Processing Speed</i>	0.00	0.994	-1.75	49	0.087	-2.47
<i>CS Attention</i>	2.90	0.095	0.20	49	0.844	0.22
<i>CS Learning</i>	0.09	0.765	-0.44	49	0.658	-1.10
<i>CS Working Memory Speed</i>	0.009	0.924	-0.36	49	0.721	-0.68
<i>CS Working Memory Accuracy</i>	1.73	0.195	0.50	49	0.618	1.64

Supplementary Table 11.

Correlation between rated game *intelligence* vs WM (*Working memory / Learning*) and Stroop tasks (*CWI 3* and *4*)

Pearson correlation

	<i>r</i>	Sig.
<i>CS Working Memory Accuracy</i>	0.19	<i>p</i> =0.185
<i>CS Learning</i>	0.12	<i>p</i> =0.382
<i>CWI 3</i>	0.18	<i>p</i> =0.216
<i>CWI 4</i>	0.16	<i>p</i> =0.246