

714 **SUPPLEMENTARY MATERIAL**

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716 Table S1. NeuroPsychological Motor coordination Test scores.

Variable	Levels	n	Min	1st Q.le	Mean	Median	3rd Q.le	Max	IQR	#NA
Luria Nebraska Task 1	VC	152	5.00	14.00	16.92	17.00	20.00	30.00	6.00	1
	GL	102	11.00	15.00	18.63	18.00	22.00	31.00	7.00	0
	all	254	5.00	14.00	17.61	17.00	20.75	31.00	6.75	1
Luria Nebraska Task 2	VC	152	6.00	14.00	17.30	17.00	20.00	30.00	6.00	1
	GL	102	9.00	16.00	19.00	18.50	21.75	32.00	5.75	0
	all	254	6.00	15.00	17.98	18.00	21.00	32.00	6.00	1
Luria Nebraska Task 3	VC	152	0.00	7.00	9.43	9.00	11.00	30.00	4.00	1
	GL	102	3.00	7.00	9.60	9.50	12.00	19.00	5.00	0
	all	254	0.00	7.00	9.50	9.00	11.00	30.00	4.00	1
Luria Nebraska Task 4	VC	152	2.00	3.00	4.30	4.00	5.00	9.00	2.00	1
	GL	102	1.00	4.00	4.88	5.00	6.00	11.00	2.00	0
	all	254	1.00	4.00	4.53	4.00	5.00	11.00	1.00	1
Luria Nebraska Task 5	VC	152	2.00	3.00	4.27	4.00	5.00	9.00	2.00	1
	GL	102	2.00	4.00	4.75	5.00	5.75	10.00	1.75	0
	all	254	2.00	4.00	4.46	4.50	5.00	10.00	1.00	1
Luria Nebraska Sum	VC	152	24.00	43.00	52.22	53.00	61.00	89.00	18.00	1
	GL	102	33.00	48.25	56.85	56.00	65.00	81.00	16.75	0
	all	254	24	45.00	54.08	54.00	63.00	89.00	18.00	1
Luria Nebraska Mean	VC	152	4.80	8.60	10.44	10.60	12.20	17.80	3.60	1
	GL	102	6.60	9.65	11.37	11.20	13.00	16.20	3.35	0
	all	254	4.80	9.00	10.82	10.80	12.60	17.80	3.60	1

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719 Table S2. NeuroPsychological cognitive assessment

Variable	Levels	n	Min	1st q.le	Mean	Median	3rd q.le	Max	IOR
CPM raw score	VC	153	11.00	21.00	24.74	24.00	28.00	35.00	7.00
	GL	102	11.00	22.00	25.61	25.50	30.00	45.00	8.00
	all	255	11.00	22.00	25.09	25.00	28.00	45.00	6.00
CPM percentile	VC	153	-2.91	-0.88	-0.10	-0.07	0.53	2.06	1.41
	GL	102	-2.70	-0.52	0.06	-0.04	0.53	1.95	1.05
	all	255	-2.91	-0.68	-0.03	-0.07	0.53	2.06	1.21
MMSE raw score	VC	153	22.00	27.00	27.64	28.00	29.00	30.00	2.00
	GL	102	19.00	27.00	27.61	28.00	29.00	30.00	2.00
	all	255	19.00	27.00	27.63	28.00	29.00	30.00	2.00
MMSE correct score	VC	153	23.49	28.20	28.86	29.20	30.03	33.24	1.83
	GL	102	20.27	27.86	28.66	29.02	30.03	32.03	2.17
	all	252	20.27	28.03	28.80	29.03	30.03	33.24	2.00
Story Recall raw score	VC	153	1.00	6.50	8.68	8.50	10.50	20.50	4.00
	GL	102	0.00	7.00	9.40	8.75	12.00	21.50	5.00
	all	255	0.00	6.50	8.97	8.50	11.00	21.50	4.50
Story Recall correct score	VC	153	5.00	9.50	11.73	11.50	13.50	22.00	4.00
	GL	102	0.00	9.50	11.79	11.50	14.00	20.50	4.50
	all	255	0.00	9.50	11.75	11.50	14.00	22.00	4.50
Story Recall equiv score	VC	153	0.00	1.00	2.20	2.00	3.00	4.00	2.00
	GL	102	0.00	1.00	2.24	2.00	3.00	4.00	2.00
	all	255	0.00	1.00	2.22	2.00	3.00	4.00	2.00
TMT-A corrected	VC	153	-2.00	18.00	29.68	26.00	38.00	104.00	20.00
	GL	102	-27.00	20.00	31.51	26.50	43.00	99.00	23.00
	all	255	-27.00	19.00	30.41	26.00	41.00	104.00	22.00
TMT-B corrected	VC	153	-39.00	1.00	62.40	30.00	72.00	342.00	71.00
	GL	102	-37.00	14.25	72.05	38.50	84.75	363.00	70.50
	all	255	-39.00	3.00	66.26	32.00	81.00	363.00	78.00
TMT B-A corrected	VC	153	-62.00	-18.00	33.64	3.00	37.00	309.00	55.00
	GL	102	-76.00	-15.25	40.30	14.50	54.00	331.00	69.25
	all	255	-76.00	-17.00	36.31	9.00	43.00	331.00	60.00
TMT-A Equiv score	VC	153	0.00	4.00	3.73	4.00	4.00	4.00	0.00
	GL	102	0.00	4.00	3.59	4.00	4.00	4.00	0.00
	all	255	0.00	4.00	3.67	4.00	4.00	4.00	0.00
TMT-B Equiv score	VC	153	0.00	4.00	3.48	4.00	4.00	4.00	0.00
	GL	102	0.00	4.00	3.42	4.00	4.00	4.00	0.00
	all	255	0.00	4.00	3.46	4.00	4.00	4.00	0.00
TMT B-A Equiv score	VC	153	0.00	4.00	3.46	4.00	4.00	4.00	0.00
	GL	102	0.00	4.00	3.38	4.00	4.00	4.00	0.00
	all	255	0.00	4.00	3.43	4.00	4.00	4.00	0.00

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722 Table S3. NeuroPsychological computerized Swedish Performance Evaluation System scores.

Variable	Levels	n	Min	1st q.le	Mean	Median	3rd q.le	Max	IQR	#NA
Reaction Time Mean (msec)	VC	152	213.00	270.75	330.91	305.00	362.75	708.00	92.00	1
	GL	99	222.00	273.00	319.70	305.00	339.50	569.00	66.50	3
	all	251	213.00	272.00	326.49	305.00	353.00	708.00	81.00	4
Reaction Time StdDev	VC	152	29.00	58.50	84.07	74.50	104.50	214.00	46.00	1
	GL	99	24.00	53.00	76.47	71.00	96.50	165.00	43.50	3
	all	251	24.00	56.00	81.07	73.00	102.00	214.00	46.00	4
FT mean domHand	VC	152	13.00	41.00	46.84	50.00	55.00	68.00	14.00	1
	GL	99	23.00	45.00	49.02	50.00	55.00	67.00	10.00	3
	all	251	13.00	42.00	47.70	50.00	55.00	68.00	13.00	4
FT mean non-domHand	VC	152	13.00	39.75	44.11	47.00	51.00	64.00	11.25	1
	GL	99	23.00	40.50	45.43	46.00	52.00	63.00	11.50	3
	all	251	13.00	40.00	44.63	46.00	51.00	64.00	11.00	4
Digit Symbol-Raw score	VC	153	10.00	27.00	35.54	34.00	43.00	71.00	16.00	0
	GL	99	6.00	26.00	37.27	37.00	47.50	65.00	21.50	3
	all	252	6.00	27.00	36.22	35.00	45.00	71.00	18.00	3
Digit Symbol Correct scores	VC	153	5.00	8.00	10.12	10.00	12.00	18.00	4.00	0
	GL	99	3.00	9.00	10.97	11.00	13.00	17.00	4.00	3
	all	252	3.00	8.00	10.45	10.00	13.00	18.00	5.00	3
Digit Span Forward	VC	153	3.00	5.00	5.35	5.00	6.00	9.00	1.00	0
	GL	99	3.00	5.00	5.25	5.00	6.00	8.00	1.00	3
	all	252	3.00	5.00	5.31	5.00	6.00	9.00	1.00	3
Digit Span Backward	VC	153	2.00	3.00	3.41	3.00	4.00	6.00	1.00	0
	GL	99	2.00	3.00	3.42	3.00	4.00	5.00	1.00	3
	all	252	2.00	3.00	3.41	3.00	4.00	6.00	1.00	3
Digit Span Correct Total Score	VC	153	3.00	6.00	7.45	8.00	9.00	14.00	3.00	0
	GL	99	3.00	6.00	7.49	8.00	9.00	12.00	3.00	3
	all	252	3.00	6.00	7.47	8.00	9.00	14.00	3.00	3

724 Table S4. NeuroPsychological Tremor assessment.

Variable	Levels	n	Min	1st q.le	Mean	Median	3rd q.le	Max	IQR	#NA
Tremor Intensity R	VC	132	0.040	0.090	0.128	0.115	0.153	0.300	0.063	21
	GL	101	0.050	0.100	0.140	0.120	0.150	0.440	0.050	1
	All	233	0.040	0.100	0.133	0.120	0.150	0.440	0.050	22
Central Frequency R	VC	132	3.70	5.55	6.78	6.60	7.68	11.90	2.13	21
	GL	101	4.10	5.70	6.72	6.50	7.50	11.20	1.80	1
	All	233	3.70	5.60	6.75	6.50	7.50	11.90	1.90	22
Tremor StDev R	VC	132	1.50	2.60	3.20	3.20	3.83	5.00	1.23	21
	GL	101	0.70	2.70	3.28	3.30	3.90	5.00	1.20	1
	All	233	0.70	2.60	3.24	3.20	3.90	5.00	1.30	22
Harmonic Index R	VC	132	0.750	0.850	0.883	0.880	0.920	0.980	0.070	21
	GL	101	0.740	0.840	0.879	0.880	0.920	0.980	0.080	1
	All	233	0.740	0.850	0.881	0.880	0.920	0.980	0.070	22
Tremor Intensity L	VC	132	0.060	0.090	0.129	0.120	0.150	0.420	0.060	21
	GL	101	0.060	0.100	0.179	0.120	0.160	2.590	0.060	1
	All	233	0.060	0.090	0.151	0.120	0.150	2.590	0.060	22
Central Frequency L	VC	132	3.20	5.70	6.81	6.50	7.53	11.80	1.83	21
	GL	101	4.10	5.90	7.00	6.70	8.00	10.70	2.10	1
	All	233	3.2	5.80	6.89	6.50	7.90	11.80	2.10	22
Tremor StDev L	VC	132	1.00	2.70	3.27	3.40	3.90	5.40	1.20	21
	GL	101	0.50	2.80	3.39	3.40	4.00	5.20	1.20	1
	All	233	0.50	2.70	3.33	3.40	3.90	5.40	1.20	22
Harmonic Index L	VC	132	0.750	0.840	0.872	0.870	0.900	0.980	0.060	21
	GL	101	0.750	0.840	0.867	0.870	0.900	0.980	0.060	1
	All	233	0.750	0.840	0.870	0.870	0.900	0.980	0.060	22

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728 Table S5 . NeuroPsychological Body Sway assessment.

Variable	Levels	n	Min	1 st q.le	Mean	Median	3 rd q.le	Max	IQR	#NA
Mean Sway OE	VC	132	1.90	4.20	5.33	5.30	6.13	11.20	1.93	21
	GL	101	1.70	4.10	5.39	5.10	6.80	9.60	2.70	1
	all	233	1.70	4.20	5.35	5.30	6.30	11.20	2.10	22
Transversal OE	VC	132	1.00	2.40	3.14	2.90	3.73	7.60	1.33	21
	GL	101	0.80	2.40	3.11	3.00	3.90	6.20	1.50	1
	all	233	0.80	2.40	3.13	2.90	3.80	7.60	1.40	22
Sagittal OE	VC	132	1.10	2.78	3.58	3.40	4.23	7.00	1.45	21
	GL	101	1.00	2.60	3.71	3.30	4.60	7.80	2.00	1
	all	233	1.00	2.70	3.64	3.40	4.40	7.80	1.70	22
Sway Area OE	VC	132	37.00	210.75	330.48	284.50	396.25	1558.00	185.50	21
	GL	101	23.00	184.00	338.41	260.00	427.00	1307.00	243.00	1
	all	233	23.00	190.00	333.92	279.00	407.00	1558.00	217.00	22
Sway Velocity OE	VC	132	3.00	9.25	12.05	11.20	14.33	38.00	5.08	21
	GL	101	2.70	8.90	11.99	11.20	14.50	39.50	5.60	1
	all	233	2.70	9.00	12.02	11.20	14.40	39.50	5.40	22
Sway Intensity OE	VC	132	1.57	4.01	5.68	4.83	6.11	48.00	2.10	21
	GL	101	1.13	3.73	4.93	4.85	5.75	11.34	2.02	1
	all	233	1.13	3.91	5.35	4.85	6.04	48.00	2.13	22
Mean Sway CE	VC	132	2.40	4.38	5.79	5.55	6.90	20.10	2.53	21
	GL	101	1.40	4.60	6.04	5.70	7.00	13.20	2.40	1
	all	233	1.40	4.50	5.90	5.70	7.00	20.10	2.50	22
Transversal CE	VC	132	1.00	2.58	3.56	3.35	4.33	14.50	1.75	21
	GL	101	0.90	2.70	3.71	3.50	4.40	8.50	1.70	1
	all	233	0.90	2.60	3.63	3.50	4.40	14.50	1.80	22
Sagittal CE	VC	132	1.20	2.80	3.78	3.65	4.33	10.90	1.53	21
	GL	101	0.90	2.90	3.96	3.80	4.70	9.30	1.80	1
	all	233	0.90	2.90	3.86	3.70	4.50	10.90	1.60	22
Sway Area CE	VC	132	57.00	211.25	467.40	357.50	565.25	5056.00	354.00	21
	GL	101	21.00	234.00	506.22	363.00	522.00	3770.00	288.00	1
	all	233	21.00	213.00	484.23	358.00	563.00	5056.00	350.00	22
Sway Velocity CE	VC	132	4.90	11.05	16.13	14.60	19.28	45.70	8.23	21
	GL	101	3.20	11.40	17.24	15.50	20.80	73.70	9.40	1
	all	233	3.20	11.20	16.61	15.10	20.10	73.70	8.90	22
Sway Intensity CE	VC	132	2.06	4.55	6.03	5.84	6.94	16.40	2.39	21
	GL	101	1.22	4.48	6.27	5.90	7.26	13.57	2.78	1
	all	233	1.22	4.53	6.13	5.88	7.16	16.40	2.63	22

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Table S6: NeuroPsychological Sniffin Stick test.

Variable	Levels	n	Min	1 st q.le	Mean	Median	3 rd q.le	Max	IQR	#NA
Tot proportion of correct identification	VC	151	0	7.50	8.60	9.00	10.00	12.00	2.50	2
	GL	102	0	9.00	9.30	10.00	11.00	12.00	2.00	0
	all	253	0	8.00	8.88	9.00	11.00	12.00	3.00	2

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733 Table S7: NeuroPsychological symptoms.

Variable	Levels	n	Min	1 st q.le	Mean	Median	3 rd q.le	Max	IQR	#NA
Neuro-tot SUM	VC	152	1.00	12.00	23.43	22.00	33.00	67.00	21.00	1
	GL	101	4.00	15.00	23.94	24.00	31.00	55.00	16.00	1
	all	253	1.00	13.00	23.63	23.00	32.00	67.00	19.00	2
Neuro-tot MEAN	VC	152	0.04	0.43	0.84	0.79	1.18	2.39	0.75	1
	GL	101	0.14	0.54	0.86	0.86	1.11	1.96	0.57	1
	all	253	0.04	0.46	0.84	0.82	1.14	2.39	0.68	2
Mood STRESS	VC	153	6.00	12.00	13.27	13.00	14.00	21.00	2.00	0
	GL	102	11.00	12.00	13.62	13.00	14.00	23.00	2.00	0
	all	255	6.00	12.00	13.41	13.00	14.00	23.00	2.00	0
Mood AROUSAL	VC	153	18.00	22.00	22.97	23.00	24.00	30.00	2.00	0
	GL	102	16.00	22.00	23.06	24.00	24.00	27.00	2.00	0
	all	255	16.00	22.00	23.01	24.00	24.00	30.00	2.00	0
PARK TOT	VC	153	0.00	0.00	0.57	0.00	1.00	4.00	1.00	0
	GL	102	0.00	0.00	0.49	0.00	1.00	5.00	1.00	0
	all	255	0.00	0.00	0.54	0.00	1.00	5.00	1.00	0
Sleep tot	VC	153	4.00	6.00	8.01	8.00	10.00	16.00	4.00	0
	GL	102	4.00	5.00	7.75	7.00	10.00	18.00	5.00	0
	all	255	4.00	5.00	7.91	8.00	10.00	18.00	5.00	0

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735 Table S8: GAM analysis using the CPM (Coloured Progressive Matrices) test score as
 736 dependent variable, e.d.f.= estimated degrees of freedom.

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Generalized (Linear) Additive Model			738
Dependent variable: CPM			739
Variable	Estimate (S.E.)	p-value	
(Intercept)	23.9 (1.51)	<0.0001	740
Plant (Darfo Vs GL)	0.60 (2.11)	0.7770	741
Plant (Breno Vs GL)	0.65 (2.39)	0.7860	742
Plant (Sellero Vs GL)	1.04 (3.13)	0.7415	743
Gender M Vs F	2.30 (0.81)	0.0003	744
Smoke (actual Vs never)	-0.18 (1.29)	0.8891	745
Smoke (ex Vs never)	0.10 (0.80)	0.9023	746
Alcohol (0,20] Vs no	-0.16 (0.89)	0.8541	747
Alcohol(20,50] Vs no	-1.66 (0.93)	0.0753	748
Alcohol(>50) Vs no	-1.65 (1.19)	0.1644	749
Non parametric (smooth) part			750
Variable	e.d.f.	p.value	
log ₁₀ (Soil Mn)	0.63	0.0970	751
log ₁₀ (Air Mn)	0.00	0.6544	752
log ₁₀ (Blood Mn)	0.90	0.1127	753
log ₁₀ (Urinary Mn)	0.00	0.7520	754
log ₁₀ (Blood Pb)	0.00	0.4788	755
Age	1.13	<0.0001	756
log ₁₀ (Distance from the nearest plant)	3.44	0.0025	757

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770 Table S9: GAM model: Trailmaking Test as dependent variable, e.d.f.= estimated degrees of
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Generalized (Linear) Additive Model
Dependent variable: TMT

Variable	Estimate (S.E.)	p-value
(Intercept)	32.8 (3.55)	<0.0001
Plant (Darfo Vs GL)	-9.32 (4.57)	0.0426
Plant (Breno Vs GL)	-1.90 (5.53)	0.7312
Plant (Sellero Vs GL)	-0.19 (6.88)	0.9784
Gender M Vs F	0.68 (2.95)	0.8177
Smoke (actual Vs never)	5.02 (4.60)	0.2762
Smoke (ex Vs never)	-1.42 (2.82)	0.6144
Alcohol (0,20] Vs no	4.05 (3.09)	0.1908
Alcohol(20,50] Vs no	-3.00 (3.31)	0.3655
Alcohol(>50) Vs no	-1.36 (4.22)	0.7475

Non parametric (smooth) part

Variable	e.d.f.	p.value
log ₁₀ (Soil Mn)	0.59	0.2304
log ₁₀ (Air Mn)	1.48	0.1094
log ₁₀ (Blood Mn)	1.02	0.0645
log ₁₀ (Urinary Mn)	0.86	0.0074
log ₁₀ (Blood Pb)	0.00	0.4856
Age	0.72	0.0598
log ₁₀ (Distance from the nearest plant)	0.00	0.3383

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783 Table S10: GAM model: PRL as dependent variable, e.d.f.= estimated degrees of freedom.

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Generalized (Linear) Additive Model

Dependent variable: PRL

Variable	Estimate (S.E.)	p-value
(Intercept)	1.01 (0.02)	<0.0001
Plant (Darfo Vs GL)	0.06 (0.03)	0.0702
Plant (Breno Vs GL)	-0.05 (0.03)	0.1042
Plant (Sellero Vs GL)	-0.10 (0.04)	0.0085
Gender M Vs F	-0.04 (0.03)	0.1847
Smoke (actual Vs never)	-0.13 (0.05)	0.0079
Smoke (ex Vs never)	0.02 (0.03)	0.4019
Alcohol (0,20] Vs no	-0.03 (0.03)	0.2874
Alcohol(20,50] Vs no	0.003 (0.03)	0.9371
Alcohol(>50) Vs no	-0.009 (0.04)	0.8447

Non parametric (smooth) part

Variable	e.d.f.	p.value
log ₁₀ (Soil Mn)	0.00	1.0000
log ₁₀ (Air Mn)	0.72	0.0610
log ₁₀ (Blood Mn)	0.00	0.4454
log ₁₀ (Urinary Mn)	1.76	0.0030
log ₁₀ (Blood Pb)	3.68	0.0303
Age	0.00	0.6326
log ₁₀ (Distance from the nearest plant)	0.00	0.4272

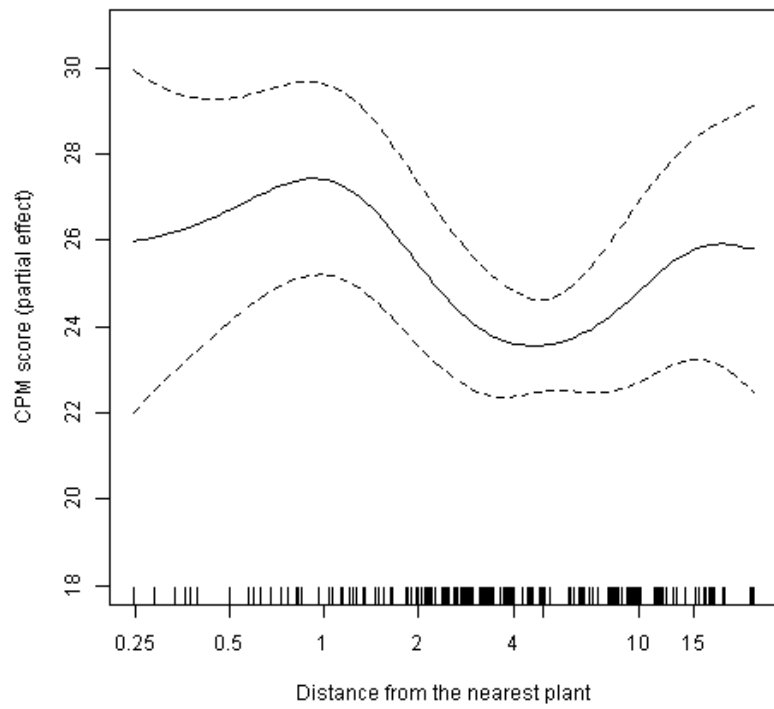
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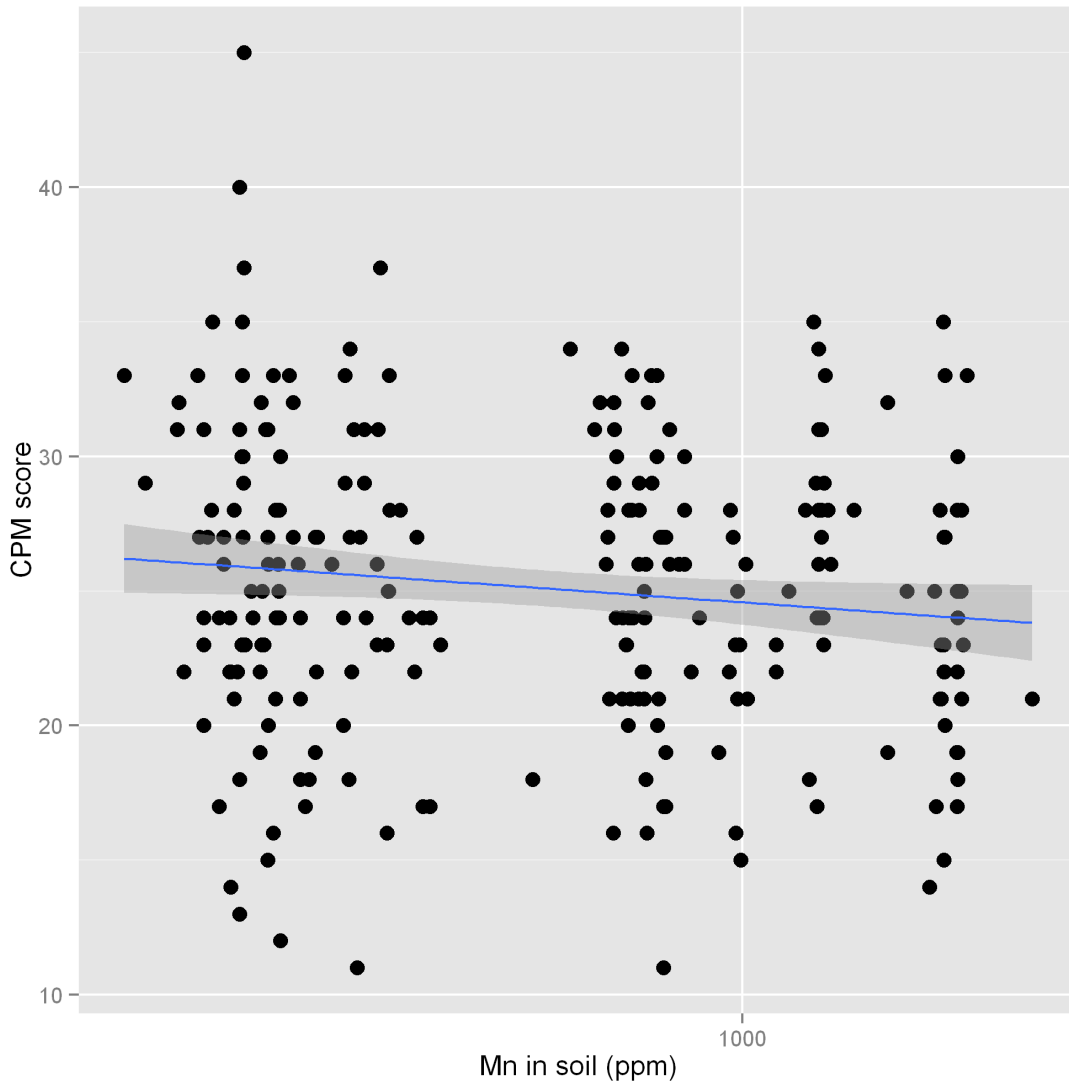
787 | Table S11” Correlation between the continuous variables (l is lor“log”, “A” is for air, “S “ is for
788 | soil, “B” is for blood and “U” is for urine).
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	Age	ldist	lMnS	lMnA	lMnB	lMnU	PbB
Age	1.000	0.163	-0.182	-0.053	0.088	0.095	-0.048
ldist	0.163	1.000	-0.669	-0.246	0.256	0.056	-0.193
lMnS	-0.182	-0.669	1.000	0.162	-0.166	-0.070	0.055
lMnA	-0.053	-0.246	0.162	1.000	-0.067	0.018	-0.055
lMnB	0.088	0.256	-0.166	-0.067	1.000	0.119	-0.158
lMnU	0.095	0.056	-0.070	0.018	0.119	1.000	-0.115
lPbB	-0.048	-0.193	0.055	-0.055	-0.158	-0.115	1.000

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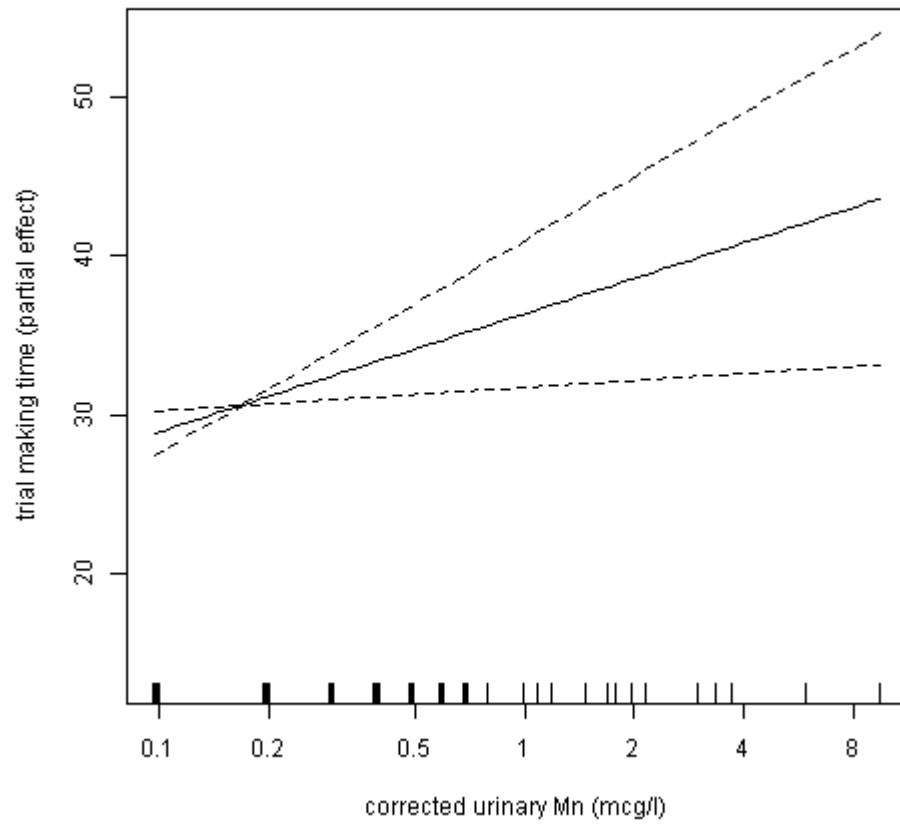


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798 | [Figure S12: GAM effect model of soil Mn on CPM performance-](#)
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Figure S13: Relationship of CPM score and Mn in soil represented as a smooth function. The blue line and the shaded area represent the smoothing spline estimate and its the 95% interval.



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807 | [Figure S14: GAM effect model of urinary Mn on TMT performance.](#)
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