Gender Specific Hormonal and Cognitive Responses after tCMPS Induced Stress Reduction in Concussion Patients

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Introduction

This study was undertaken to determine the effect and magnitude that transcranially applied Microcurrent Point Stimulation (tCMPS) has on HPA cortisol stress, endocrine sex hormones, cognitive performance and Post-Concussion Syndrome (PCS) symptomology (total 20 scientific markers) to a N=35 sample of severely concussed patients.

Markers included: Cortisol, Progesterone, Melatonin, Estriol, Estradoil, Estrone, Dihydrotestosterone (DHT), Dehydroepiandrosterone (DHEA), Androstenedione, 17 Hydroxyprogesterone (17-OHP), Progesterone-Estradoil Ratio, ImPACT (Immediate Post-Concussion Assessment and Cognitive Test) and King-Devick (KD-concussion management test).

Methods

35 medically diagnosed concussion patients were recruited, 20 female and 15 male. *Average female age 41.95, 3.26 years PCS suffering 3.26. Average male age 49.20 and 4.24 yrs PCS suffering.* tCMPS was applied in 45 minute sessions to each patient with all markers collected pre-post tCMPS. Study treatment sessions and testing took place in a quiet clinic setting in Midland Ont. Six (6) therapists spent four (4) days to collect data, and all therapists were separated during collection. Statistical analyses was performed by 3rd party freelance statistician using SPSS software

Results

The N=20 female group reported a statistically significant pre-post improvement in 5 out of the 20 markers (>95% CI). The N=15 male group reported 2 out of 20 makers with statistically significant improvements.

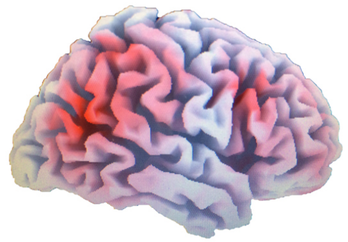
Female tCMPS outcomes:
HPA/endocrine markers reported a 49.2% decrease in post Cortisol [p=0.000] and a significant increase in Testosterone levels (16.9%, p=0.043]. Cognitive markers King Devick (KD) Score [18.7% p=0.021], and ImPACT Reaction Times [8.5%; p=0.005] improved with women but not men. ImPACT Symptom Scores (52.2% p=0.000] improved 26% more in women.

Male tCMPS outcomes:
Cortisol (48.8% decrease, p=0.002] coupled with a decrease in post ImPACT Symptom Scores [41.3%; p=0.001].

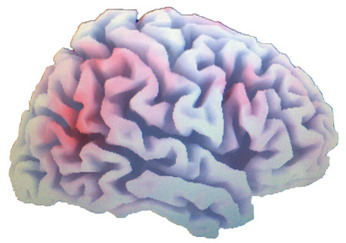
Conclusion

Study confirms stress/cortisol as key inhibitors to concussion recovery and tCMPS as a statistically significant stress reduction intervention. Both sexes reduced cortisol/stress in tandem, but women significantly outperformed men in cognitive functioning and endocrine markers, confirming the female stress sensitivity response.

LORETA Neuroimaging
EEG Pre TCMPS



LORETA Neuroimaging
EEG Post TCMPS



Cognitive Marker	*Women N=20*	*Men N=15*
Cortisol	***-49.2% P=0.000***	***-48.8% P=0.002***
King Devick (KD)	***-18.7% P=0.021***	-5.6% P=0.40
ImPACT PCS Symptoms	***-52.2% P=0.000***	***-41.3% P=0.001***
ImPACT Reaction Time	***-8.5% P=0.005***	-0.8% P=0.766
ImPACT Cognitive Functioning Index	+27.3% P=0.231	+31.1% P=0.268
ImPACT Impulse Control Composite	+1.8% P=0.922	+56.7% P=0.126
ImPACT VMS	+2.7% P=0.451	+2.3% P=0.437
ImPACT Visual Memory	-1.7% P=0.727	+7.6% P=0.338
ImPACT Verb Memory	+3.1% P=0.215	-2.3% P=0.551

Endocrine Marker	*Women N=20*	*Men N=15*
Cortisol	***-49.2% P=0.000***	***-48.8% P=0.002***
Testosterone	***+16.9% P=0.043***	-8.9% P=0.089
Progesterone	+33% P=0.067	-15.7% P=0.583
Estradoil	+214.4% P=0.164	+8.9% P=0.268
Estroil	+2804.8% p=0.169	+2.4% P=0.902
Estrone	+23.8% P=0.175	+13.3% P=0.195
DHT	-1.4% P=0.331	-15.5% P=0.166
DHEA	+16.3% P=0.371	-10.9% P=0.495
Melatonin	-39.4% p=0.131	-12.9% P0.052
17-OHP	-8.2% P=0.497	-5.8% P=0.652
Androstenedione	-2.7% P=0.637	-5.7% P=0.602
Progesterone-Estradoil Ratio	-41.2% P=0.347	-83.8% P=0.262

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tCMPS/Concussion Descriptive Statistics: N=20 Female and N=15 Male

Marker	Mean	Minimum	Maximum	Std. Deviation
Female Age N=20	*41.95*	*21.00*	*81*	*14.88*
Female PCS yrs	*3.26*	*.50*	*10*	*2.53*
Male Age N=15	*49.20*	*16.00*	*65*	*12.45*
Male PCS Yrs	*4.24*	*.30*	*16.00*	*4.82*