Use of stem cells for treatment after traumatic brain injury

Providence College Experimental Biopsychology Spring 2021
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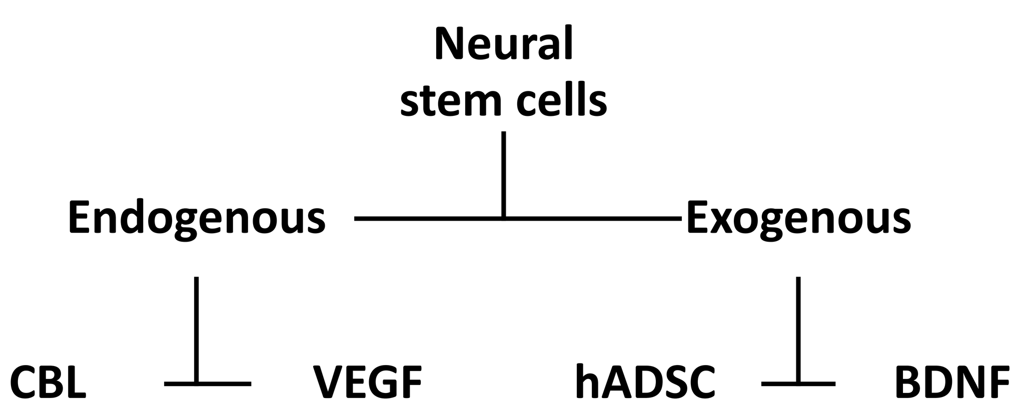
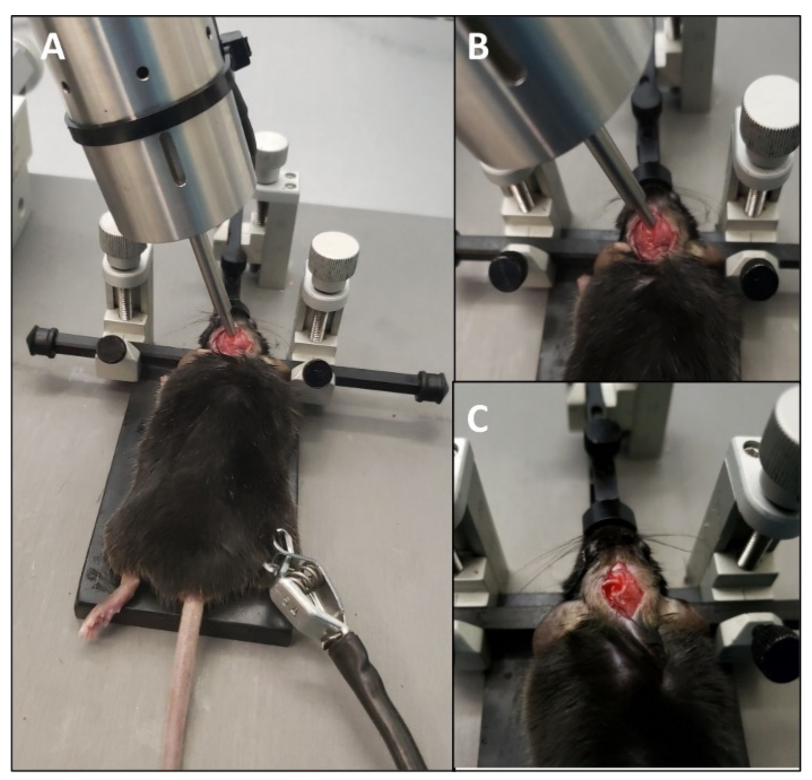


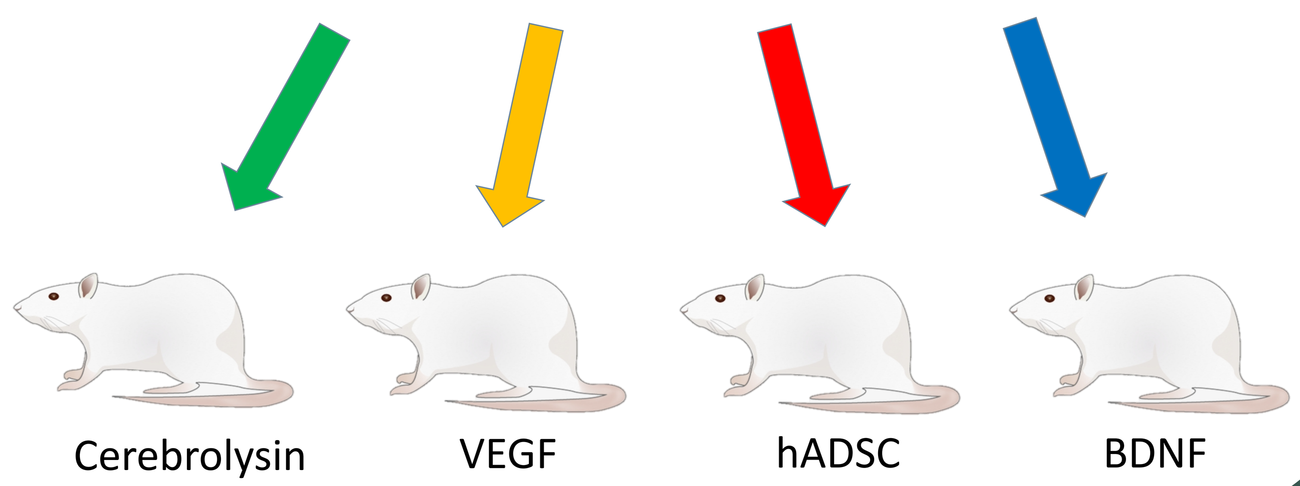
Categorization from *Weston, N. & Sun, D. (2018).*

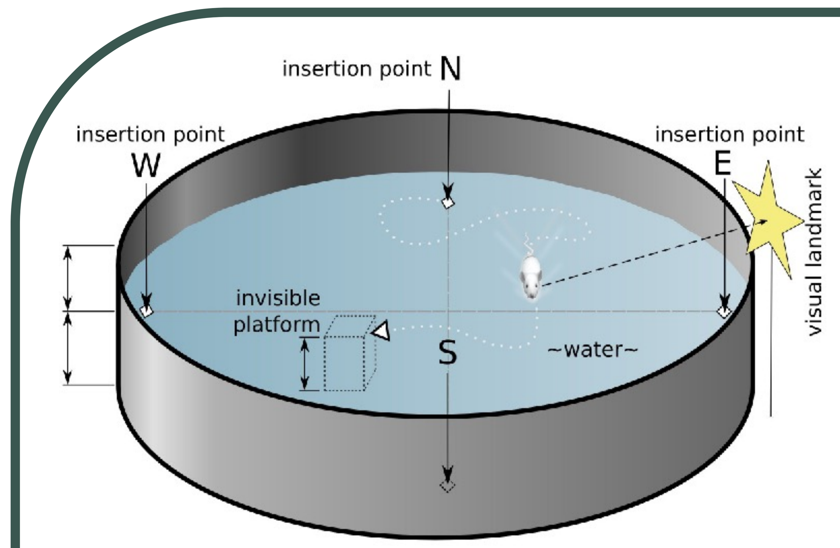
Traumatic brain injury (TBI) affects 2 million people each year but has limited treatment options to recover function and structure of the brain. Recent exploration of neural stem cells (NSCs) as a treatment shows promising results for functional recovery. NSCs can be categorized into endogenous injection and exogenous graft methods (left) (Weston & Sun, 2018). **A major goal of this study was to examine recovery of cognitive and motor function after stem cell treatment.**

Modeling TBI

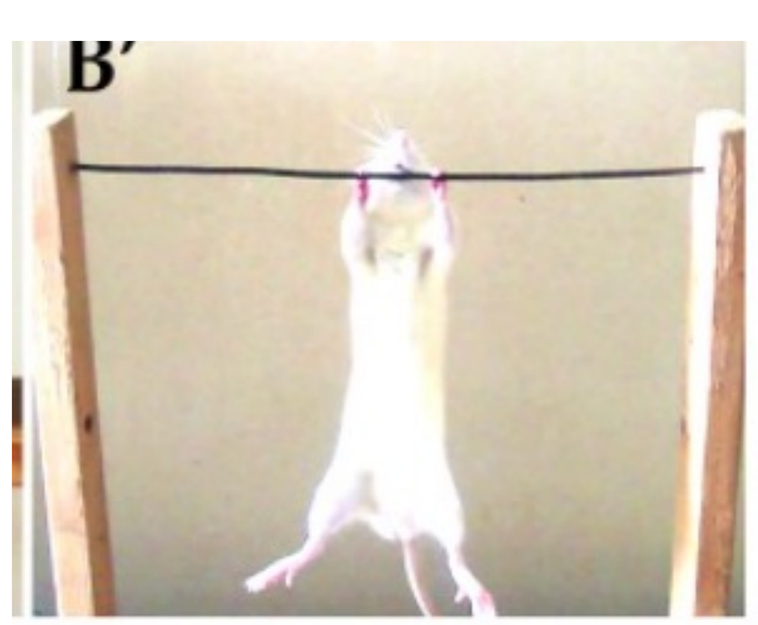
Closed cortical impact (CCI) was used to induce mTBIs using Pittsburg Precision Instruments (Tajiri, et. al (2014).







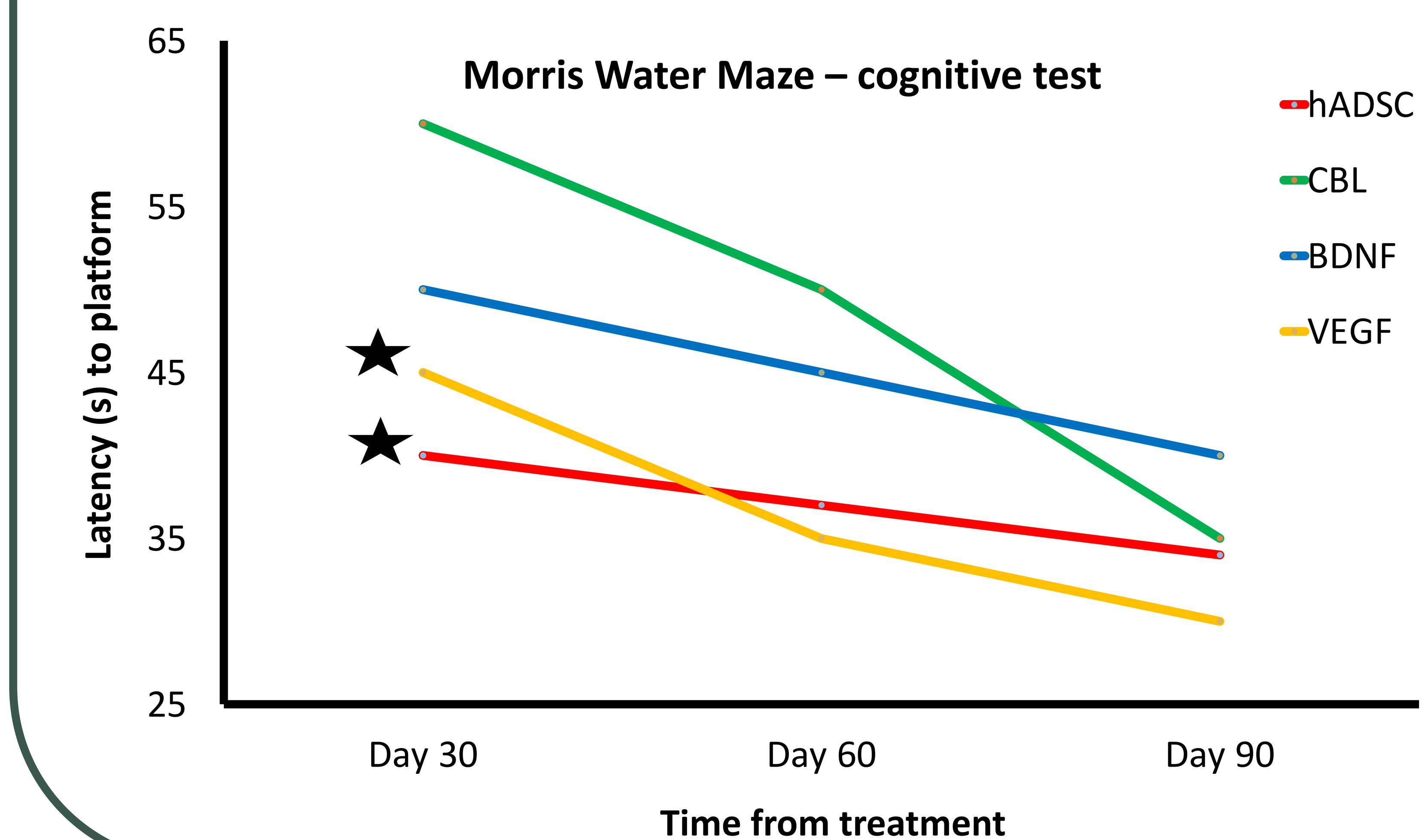
Morris Water Maze (MWM)
Measured by latency to find hidden platform



Paw-grip task
Scored on a 1-3 scale
1 = No impairment
2 = Moderate impairment
3 = Extreme impairment

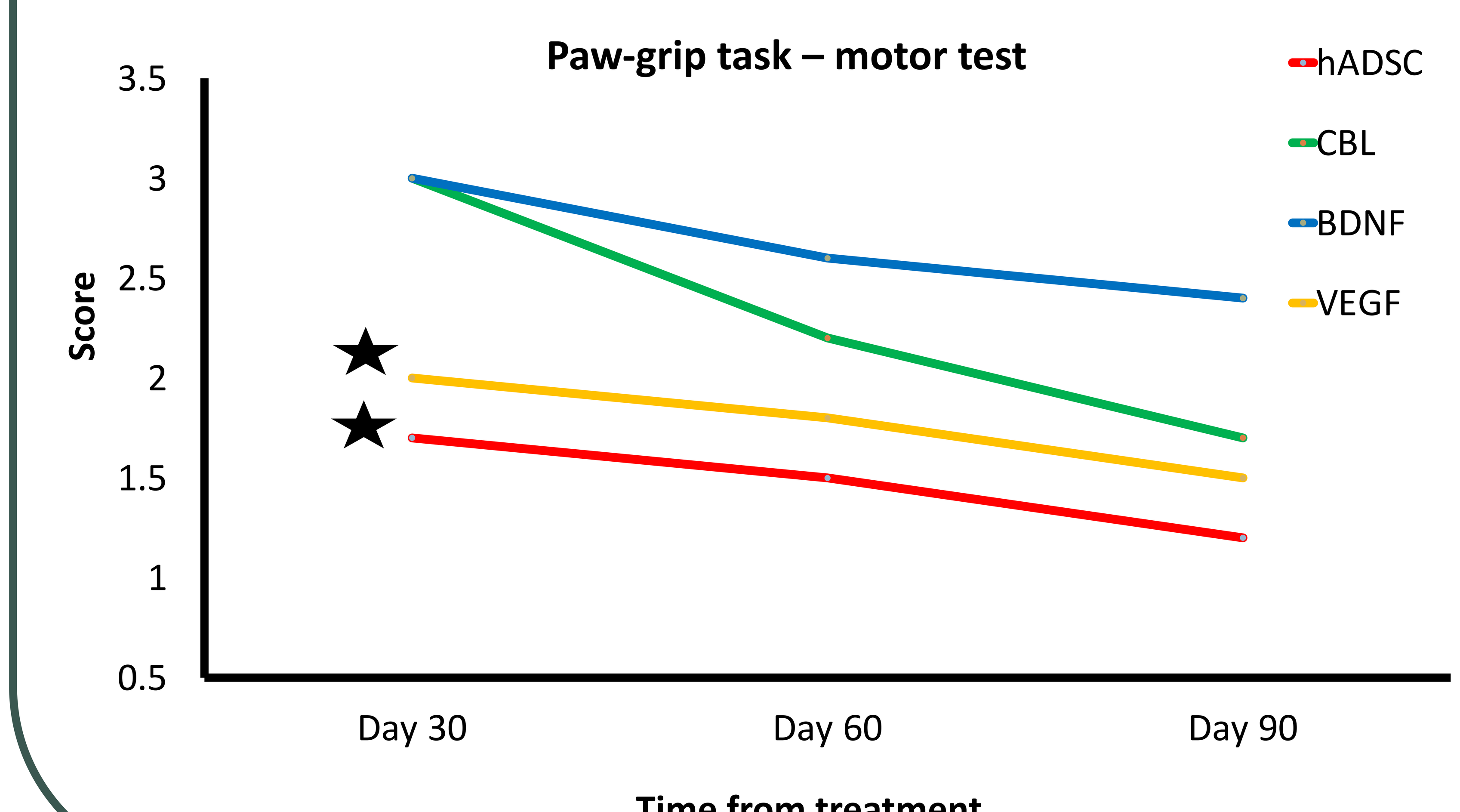
Experiment 1

- Cognitive, spatial improvement was measured through the MWM.
- hADSC and VEGF treated rats showed significant decreases in latency.



Experiment 2

- Motor, nonspatial improvement was measured through the paw-grip task.
- hADSC and VEGF treated rats scored significantly better.



Conclusions

Endogenous and exogenous methods improve cognitive and motor function.

- Improvements were seen in all treated rats, but **hADSC graft and VEGF treatment significantly improved cognitive and motor function**, showing successful use of both endogenous and exogenous methods.
- Two, one-`way ANOVAs (treatment x task) show main effect of treatment.
- Post hoc Tukey shows hADSC and VEGF treatments are significant.
- Stem cell treatment can be used to recover cognitive and motor function after impairment from TBI, offering a potential treatment with growing research

Treatment	Cognitive Recovery	Motor Recovery
CBL*	No	No
VEGF	Yes	Yes
hADSC	Yes	Yes
BDNF	No	No

*Cerebrolysin significantly improved cognitive and motor function after Day 90 of the experiment

- Cognitive and motor function was recovered in all treatments, however not all were significant.

References:

- Weston, N., & Sun, D. (2018). The potential use of stem cells in treatment of traumatic brain injury. *Current Neurology and Neuroscience Reports. 18*(1).
- Tajiri, et.al (2014). Intravenous transplants of human adipose-derived stem cell protect the brain from traumatic brain injury-induced neurodegeneration and motor and cognitive impairments: cell graft biodistribution and soluble factors in young and aged rats. *The Journal of Neuroscience. 34*(1), 313-326.