

# Physical Exercise after Traumatic Brain Injury: Does the Timing and Type of Exercise Influence Cognitive Improvement?

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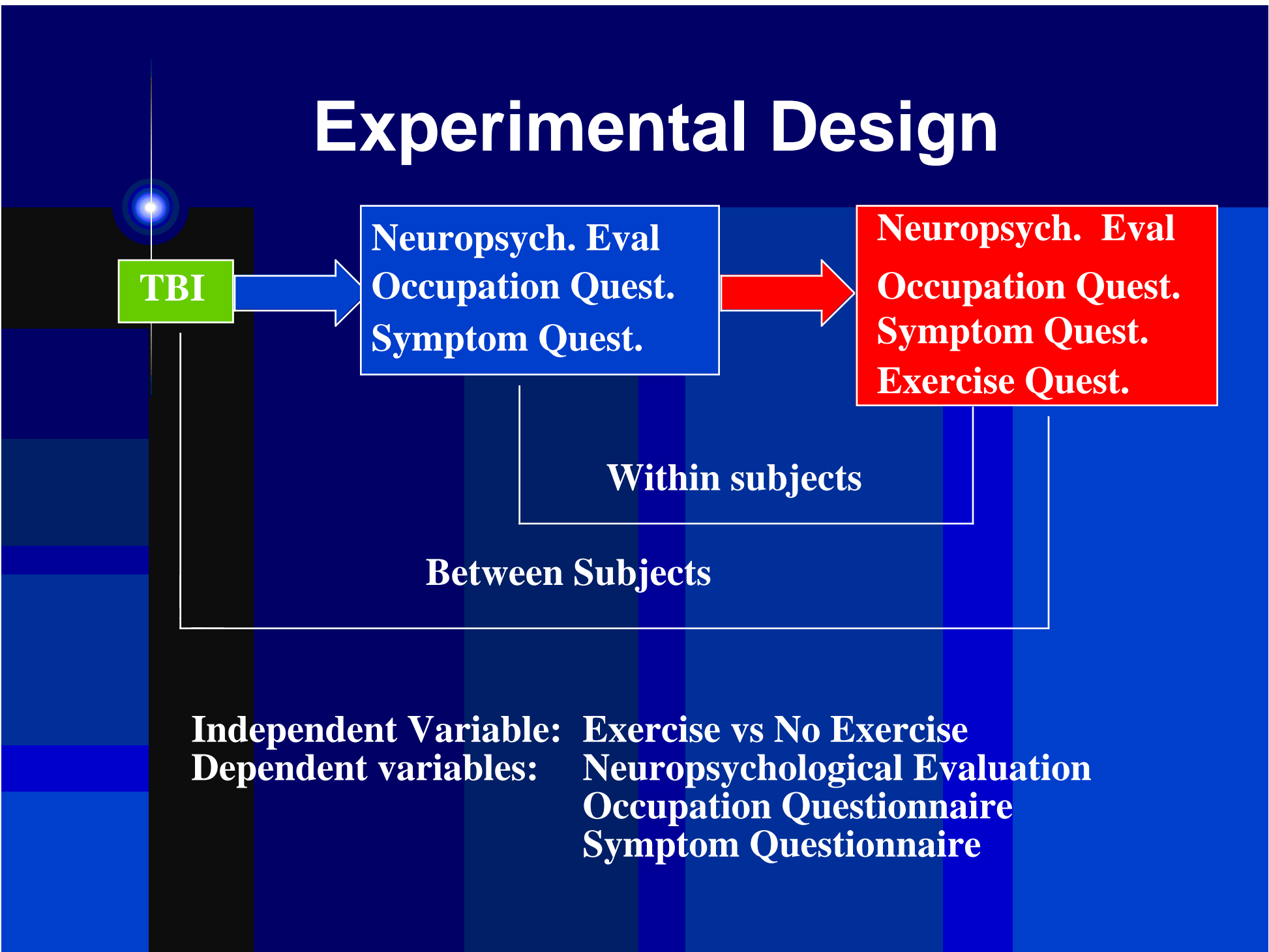
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## Introduction

Traumatic brain injury (TBI), though labeled a "silent epidemic", is anything but silent in its disruption of virtually all aspects of life. Though the majority of brain injuries are deemed "mild", the cognitive emotional, psychosocial and physical consequences are far from mild. Further complicating matters, functional recovery following TBI is variable, yet appears to be dependent on post-injury "critical periods" or windows of opportunity during which the recovery process is exquisitely vulnerable to intervention. Indeed, there is evidence to suggest that post-injury interventions such as exercise may be beneficial to the recovery process. Yet, the relevance of exercise timing and type has remained unclear. The present study was designed to delineate the windows of opportunity for post-injury exercise, with specific emphasis on *when* and *which types* of exercise exert the most impact. Defining the parameters within which post-TBI interventions are most effective at decreasing cognitive and functional deficits is an important step in reducing disability after brain injury.

## Experimental Design



## Influence of Timing of Post-Injury Exercise on Stroop Task Performance

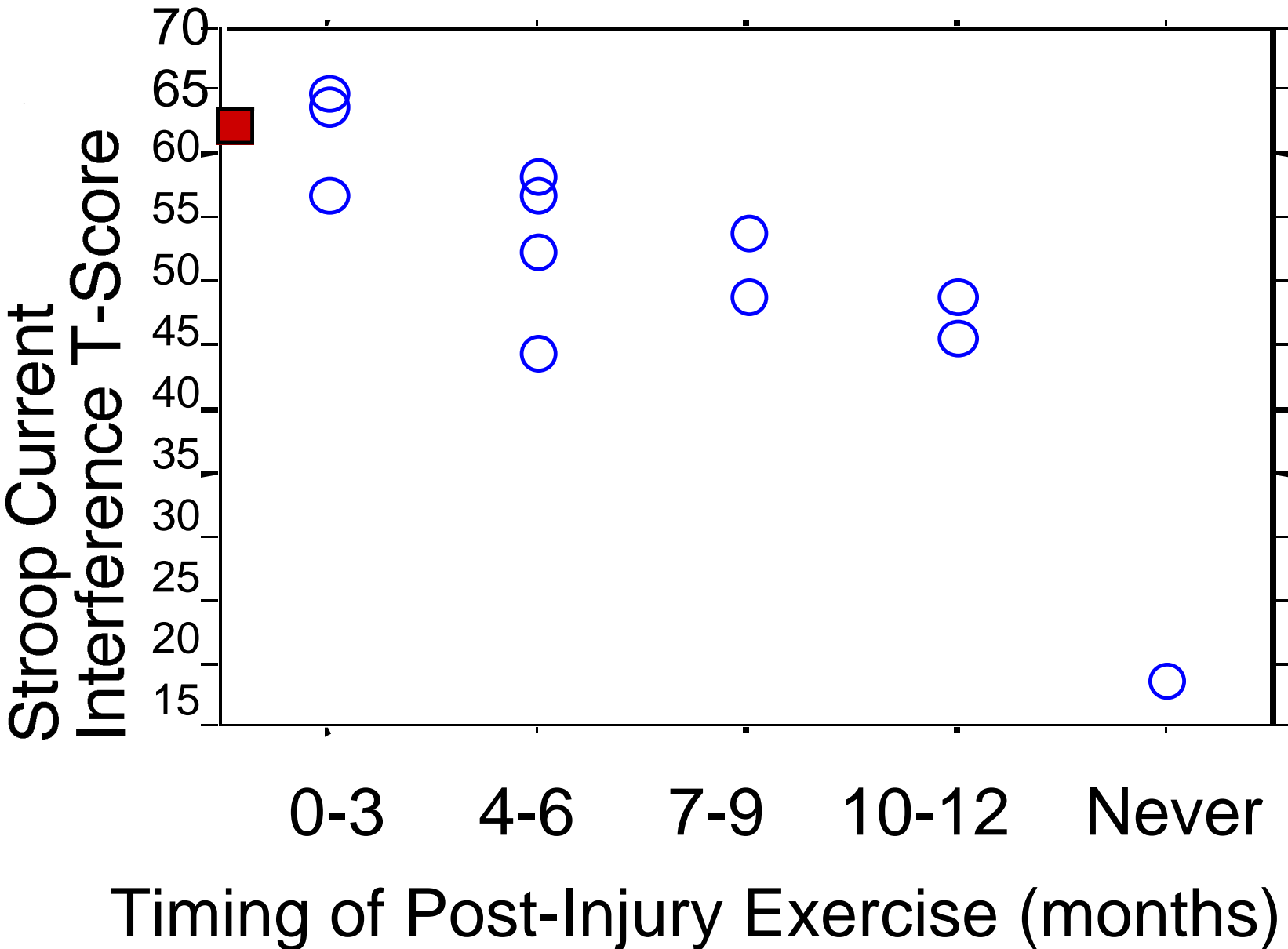


Table 1: Participant Demographics N=12

<b>Gender</b>		<b>Cause of Injury</b>	
Males=1		MVA=92%	
Females=11		Falls=8%	
<b>Avg. Current Age</b>		<b>Avg. Age at Time of Injury</b>	
45 yrs. (range=24-62)		39 yrs. (range=20-56)	
<b>Avg. Education Level</b>			
15 yrs.(range=12-20)			
<b>Avg. Time Between Injury and 1st Neuropsych. Exam</b>		<b>Avg Time Between Injury and Study Participation</b>	
12 mos. (range=4-29)		5 yrs. (range=3-7)	
<b>Employment (% Employed)</b>			
<b>Pre-Injury</b>	<b>Full-time</b>	<b>Post-Injury</b>	<b>Full-time</b>
77%	70%	77%	30%

Table 3: Symptom Questionnaire: Most Highly Endorsed Rating Category (% of Participants Endorsing)

Rating Scale: Never Sometimes Occasionally Frequently Always

<b>Attention &amp; Concentration Deficits:</b> Baseline: Frequently (47%) Current: Never (25%)	<b>Visual-Perceptual Deficits:</b> Baseline: Never (33%) Current: Never (73%)
<b>Executive Function Deficits:</b> Baseline: Frequently (29%) Current: Sometimes (40%)	<b>Language Deficits:</b> Baseline: Sometimes (40%) Current: Never (35%)
<b>Memory Deficits:</b> Baseline: Frequently (30%) Current: Occasionally (45%)	<b>Measurement Deficits:</b> Baseline: Never (29%) Current: Never (47%)
<b>Organization &amp; Concentration Deficits:</b> Baseline: Frequently (40%) Current: Sometimes (60%)	<b>Safety Concerns:</b> Baseline: Sometimes (35%) Current: Never (70%)
<b>Emotional Functioning Deficits:</b> Baseline: Frequently (22%) Current: Occasionally (38%)	

Table 2: Exercise Demographics (% of Participants)

<b>Pre-Injury</b> Exercisers: 100% Non-exercisers: 0%	<b>Types of Pre-Injury Exercise</b> Aerobic: 33% Resistance: 0% Aerobic + Resistance: 67%
<b>Current</b> Exercisers: 61% Non-exercisers: 39%	<b>Types of Current Exercise</b> Aerobic: 67% Resistance: 0% Aerobic + Resistance: 33%
<b>Initiation of Exercise Post-Injury</b> 0-3 months time: 31% 4-6 months time: 31% 7-9 months time: 25% 10-12 months time: 15% Did not Exercise: 8%	<b>Types of Post-Injury Exercise</b> Aerobic: 25% Resistance: 16% Aerobic + Resistance: 59%

## Conclusions

The earlier a participant initiates physical exercise after sustaining a mild TBI, the better the Stroop interference T-score, indicating a better ability to attend to competing stimuli. In addition, it appears that the type and duration of physical exercise are also contributed to this effect.

## Applications & Future Directions

It is hoped that the results of this study will inform survivors of brain injury and their physicians as to when specific interventions such as exercise, are the *most beneficial*. To this end, future studies will:

Replicate and expand on these findings using a prospective, multi-site design within which the impact of exercise will be assessed as it is introduced at distinct times within the recovery process. This will determine when *windows of opportunity* are most open to this intervention.