

# Uncovering Windows of Opportunity after Traumatic Brain Injury: Implications for Recovery from Cognitive and Functional Disabilities

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## Introduction

Traumatic brain injury (TBI) has been referred to as the “silent epidemic”, because of the way in which it creates neurobehavioral deficits, particularly cognitive impairment, without necessarily imparting a physical scar. While the majority of brain injuries are deemed “mild”, the functional consequences are far from mild. Indeed, mild TBI impacts most life dimensions including cognitive (see Table 1), emotional, psychosocial and physical.

TABLE 1: Cognitive Impairments Following TBI

- \*Memory
- \*Attention & Concentration
- \*Language
- \*Organizing & Planning
- \*Initiating/Completing Tasks

Functional recovery following TBI is variable and appears to be dependent on post-injury “critical periods” or *windows of opportunity* during which the recovery process is exquisitely vulnerable to intervention. For example, anecdotal evidence suggests post-injury interventions such as exercise may be most beneficial when introduced at certain times during the recovery process. The present study was designed to delineate the *windows of opportunity* for several post-injury interventions (including exercise and cognitive rehabilitation).

To this end, a retrospective study of survivors of “mild” TBI who are within 3-6 years of their injury, is being conducted. We are assessing memory, attention, concentration, multi-track thinking and reasoning, and comparing current functional level on these measures with initial post-injury performance. Independent variables of interest are the timing, type and frequency of post-injury interventions such as exercise and cognitive rehabilitation.

## Experimental Design

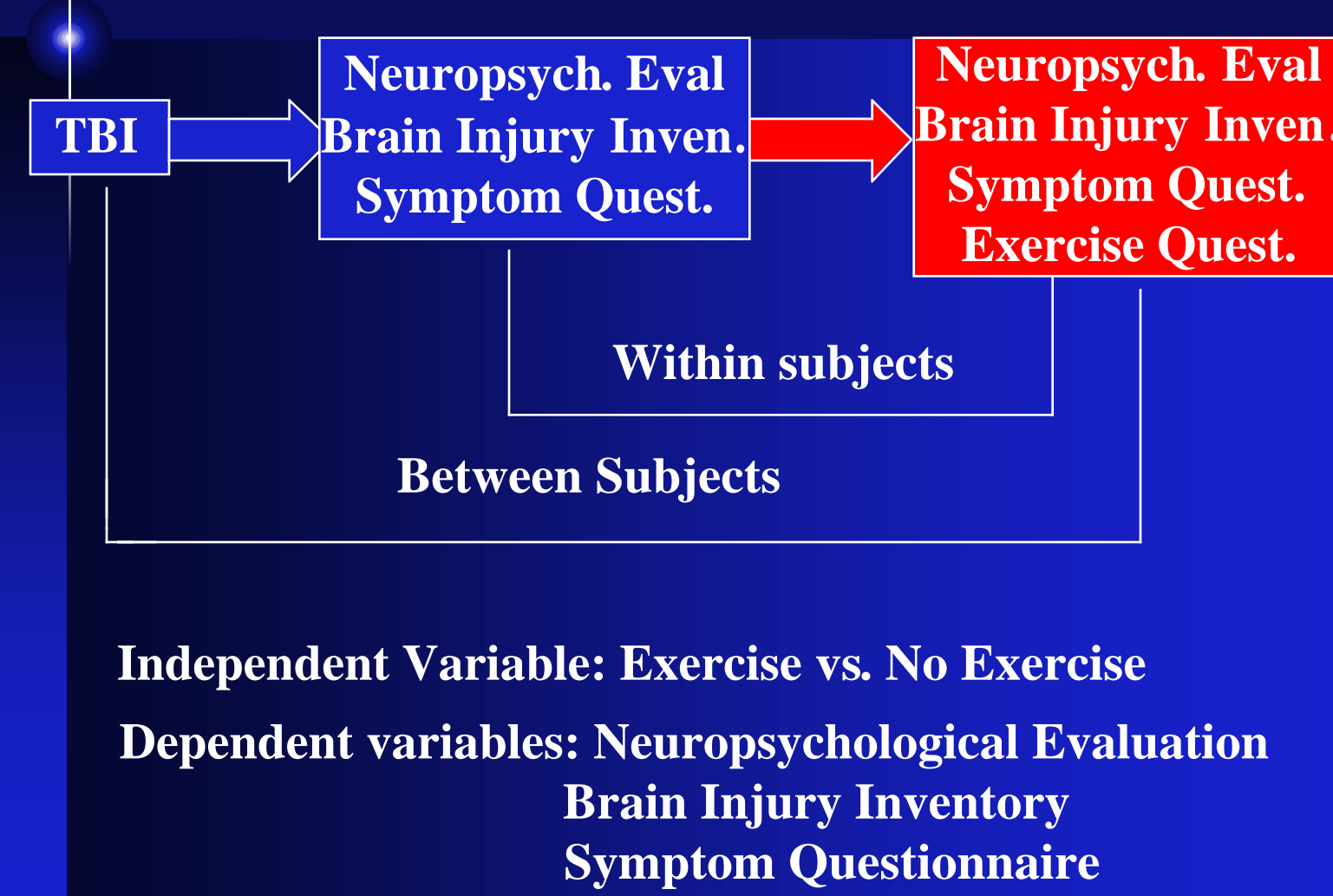


TABLE 2: Neuropsychological Measure

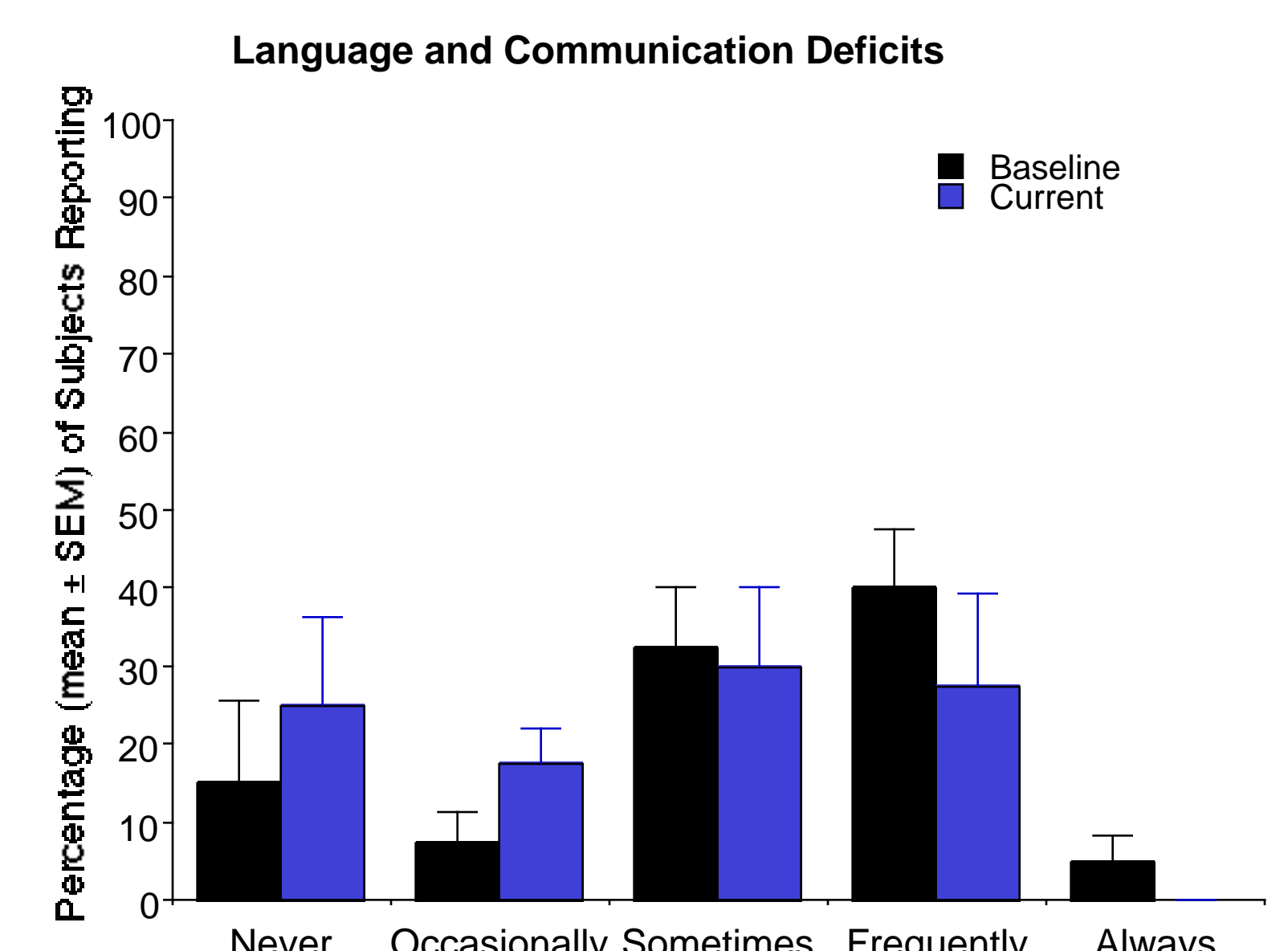
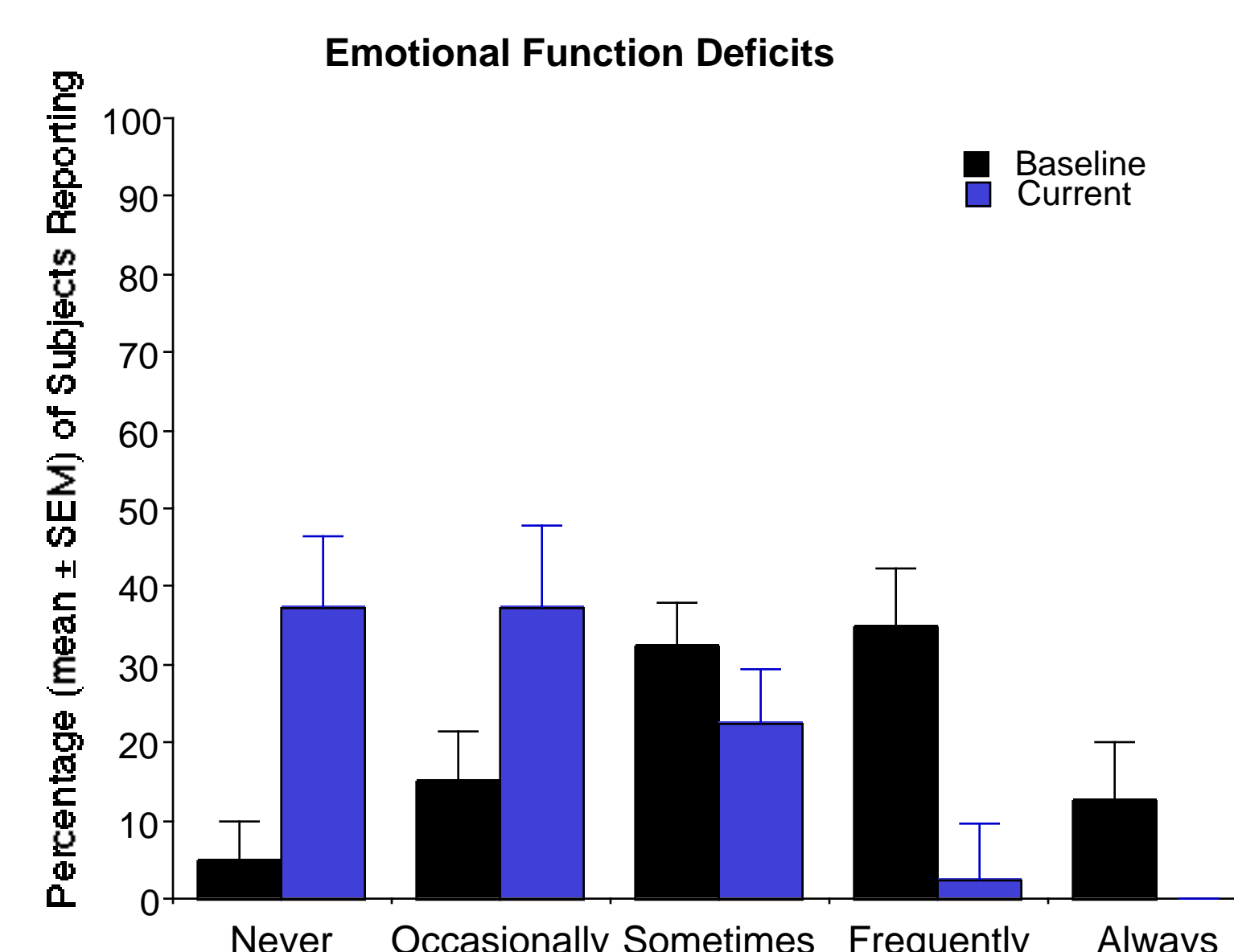
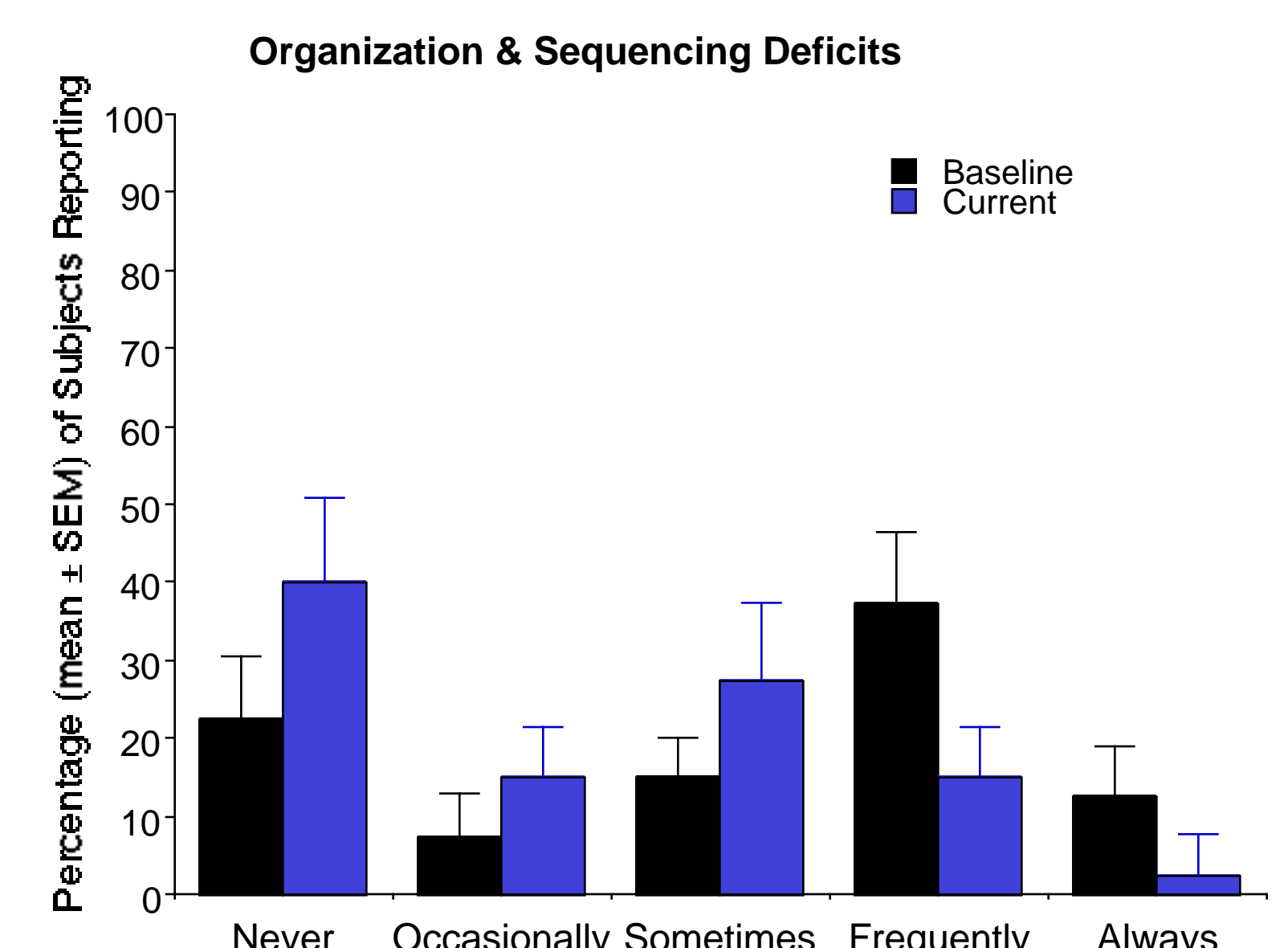
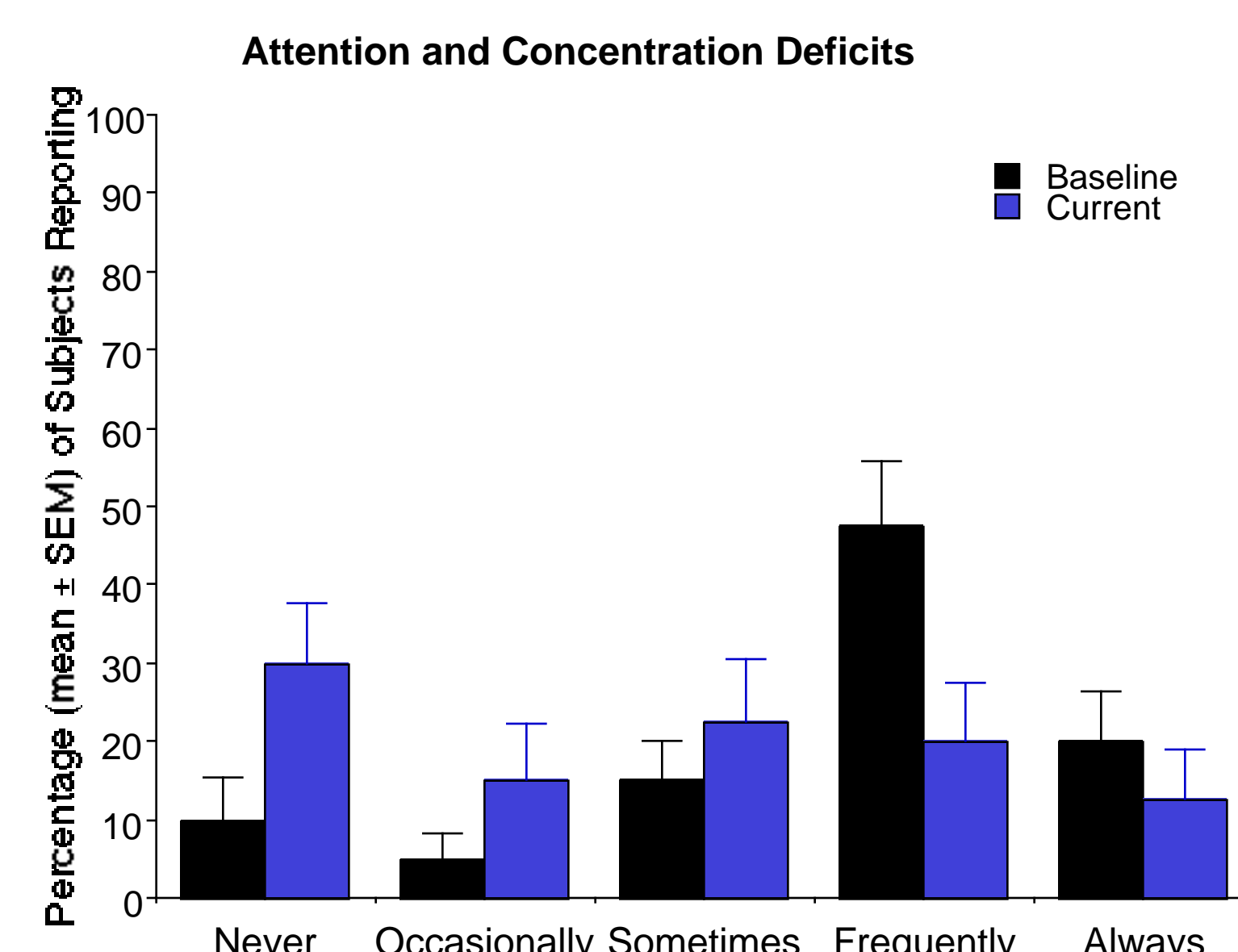
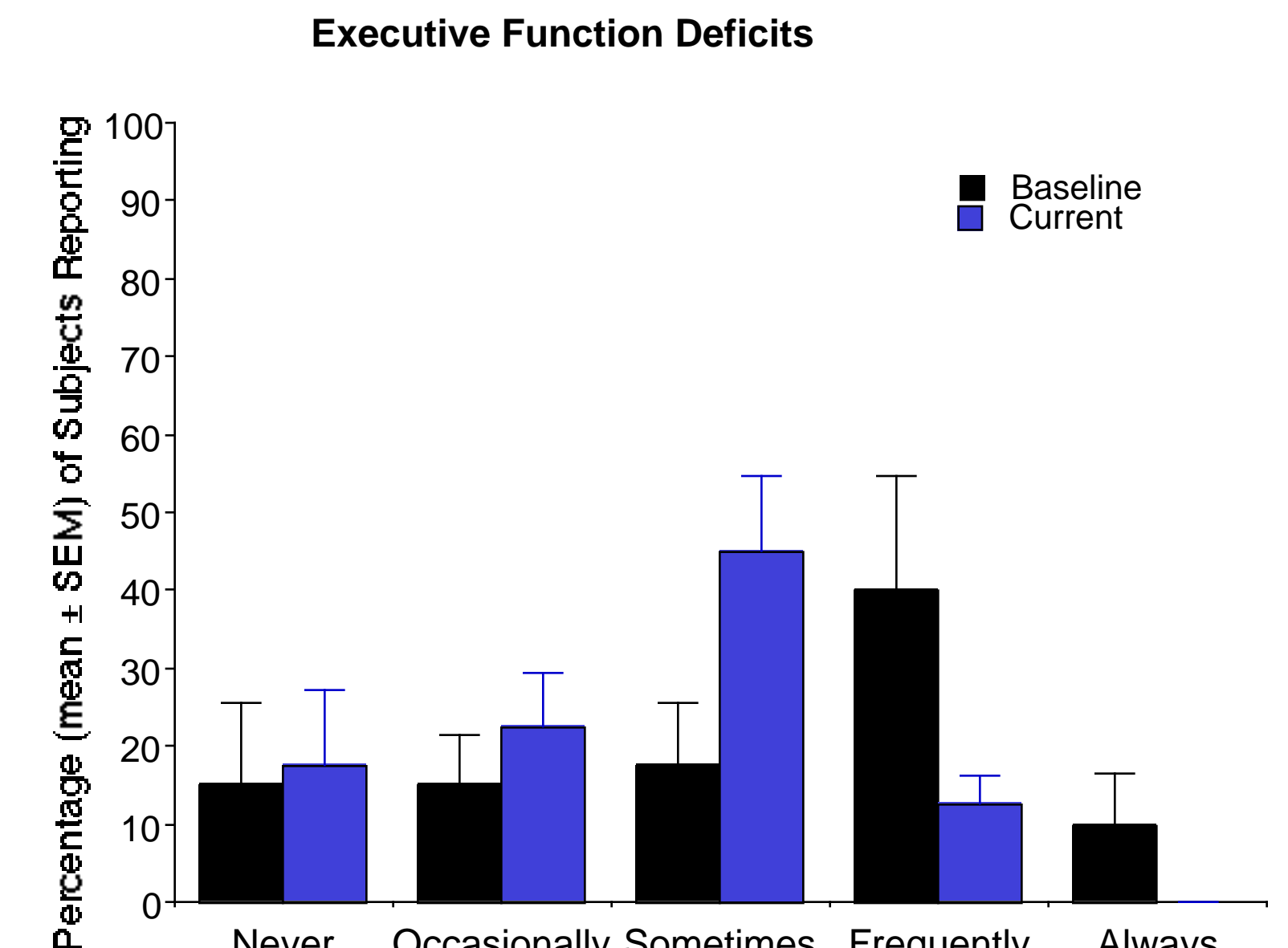
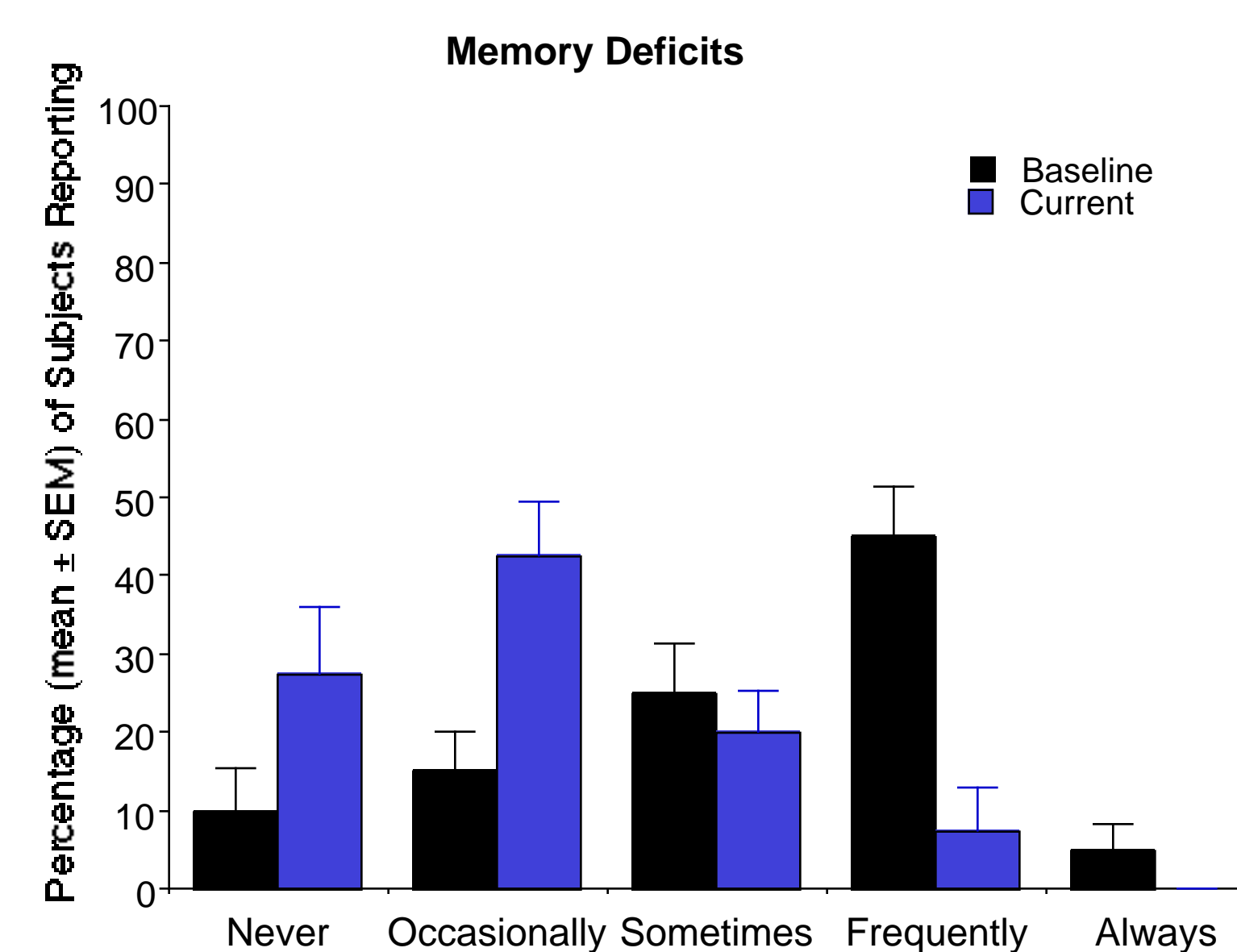
PASAT	COWAT
Hayling Sentence Completion	WAIS-R:
Paragraph Memory	digit span
Auditory Consonant Trigrams	digit symbol
Dodrill Stroop	block design
Letter Cancellation	Stroop Color & Word
Behavioral Dyscontrol Scale	

Table 3: Participant Demographics N=8

Gender	Cause of Injury
Males=0	MVA=90%
Females=8	Falls=10%
Avg. Current Age	Avg. Age at Time of Injury
49 yrs. (range=39-61)	44 yrs. (range=33-56)
Avg. Education Level	
15 yrs.(range=12-20)	
Avg. Time Between Injury and 1st Neuropsych. Exam	Avg Time Between Injury and Study Participation
14 mos. (range=6-27)	5 yrs. (range=3-7)
Pre-Injury	Employment (% Employed)
100%	Full-time
	Post-Injury
	75%
	88%
	Full-time
	38%

Table 4: Exercise Demographics N=8

Pre-Injury	Post-Injury	Current
Exercisers: 100%	Immediately: 38%	Exercisers: 50%
Non-exercisers: 0%	3-6 mos.: 25%	Non-exercisers: 50%
	9-12 mos.: 25%	
	Did not: 12%	



## Conclusions

1. Based on Symptom Questionnaire data, some recovery from functional deficits occurs after mild traumatic brain injury.
2. With complete data available from *only* 8 subjects, it is not possible to delineate cognitive improvement using standardized neuropsychological measures.
3. As well, with complete data available on *only* 8 subjects it is not possible to determine the impact of the intervening variables of exercise and cognitive rehabilitation.

## 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 cognitive rehabilitation and exercise, are the *most beneficial and cost effective*. To this end, future studies should:

1. Replicate and expand on the current study using a prospective, multi-site design within which the impact of exercise and/or cognitive rehabilitation will be assessed as each is introduced at distinct times after injury. This will *determine* when the *windows of opportunity* are most open to these interventions.
2. Replicate and expand on the results obtained in #1 using a prospective, intervention, multi-site design within which exercise and/or cognitive rehabilitation will be introduced at distinct times after injury. This will *confirm* when the *windows of opportunity* are most open to the positive impact of these interventions.

## Acknowledgments

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