



The Relationship Between Academic and Exercise Tolerance in Pediatric Concussion Cases

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Introduction

- ❖ Pediatric concussion cases can limit the academic abilities of the patient in the classroom.
- ❖ Patients can experience trouble focusing, sleep deprivation, and stress from being unable to play their sport.¹
- ❖ There is a lack of understanding how the progression of their participation in physical activity is associated with their ability to learn.
- ❖ Patients go through an active rehabilitation protocol (ARP) to ensure the patient has fully recovered from the concussion.
- ❖ The return to learn (RTL) stages are representative of the academic tolerance of the patient.

Purpose

The purpose of this study is to observe the correlation between The Five Step Active Rehab protocol (ARP) and 5th consensus return-to-learn (RTL) stages in typical concussion cases in pediatric patients.²

Hypothesis

We hypothesized that:

- ❖ the cases with higher ARP step also have higher RTL stages.

Materials and Study Design

- ❖ Retrospective cohort chart review at SPARCC sports medicine clinic from 5/1/2017 to 12/31/2017. Patients were included if they met the following criteria:
 - ❖ 12-22 years of age
 - ❖ Presented within 30 days of head injury
 - ❖ Symptoms resolved within 3 months
 - ❖ ARP and RTL could be analyzed at each visit
 - ❖ Excluded if they had any comorbidities such as learning disorders, primary migraine disorder, seizure disorders, and brain bleed or skull fracture with concussion
- ❖ Create database that includes date of injury, date of initial visit, days followed clinically, clearance to return to play, ARP step, and RTL stage.
- ❖ Divide patients according to the ARP step established by their physical activity intensity threshold.
- ❖ Determine distribution of RTL stages within each ARP step groups
- ❖ Find the correlation between RTL stage and ARP step utilizing a linear model.

Results

There were a total of 53 patients identified with 113 cases following the progression through ARP.

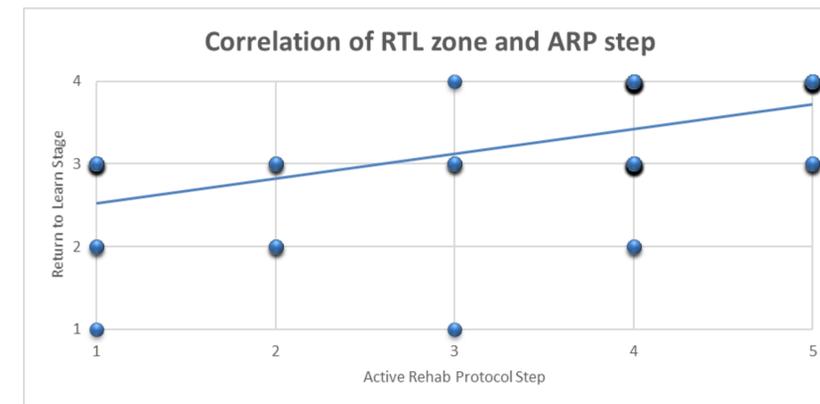


Table 1) displays a magnitude chart of the frequency of cases that were determined to be in the specific RTL stages. The larger dots represent a higher frequency.

Conclusions

- ❖ There is a trend between ARP steps and RTL stage, suggesting patients who have progressed through the ARP steps are most capable of returning to school full time without limitations.

Significance

There has not been much research done on the relationship of academic and exercise tolerance of patients. Patients who are working through the earlier steps of ARP will likely need adjustments to their academic workload utilizing RTL stages. The data also suggests that patients who have the neurophysiologic requirements to tolerate high intensity interval exercise are mostly capable of returning to school full time.

Acknowledgments

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1. Miller JH, Gill C, Kuhn EN, et al. Predictors of delayed recovery following pediatric sports-related concussion: a case-control study. *J Neurosurg Pediatr.* 2015;17(4):491–496. doi:10.3171/2015.8.PEDS14332
2. McCrory P, Meeuwisse W, Dvorak J, et al Consensus statement on concussion in sport—the 5th international conference on concussion in sport held in Berlin, October 2016 Br J Sports Med 2017;51:838–847.

Step 1

Return to Learn Stage	Frequency	Percentage (%)
1	1	14.29
2	0	0.00
3	5	71.43
4	1	14.29

Step 2

Return to Learn Stage	Frequency	Percentage (%)
1	1	6.25
2	3	18.75
3	12	75.00
4	0	0.00

Step 3

Return to Learn Stage	Frequency	Percentage (%)
1	0	0.00
2	4	44.44
3	5	55.56
4	0	0.00

Step 4

Return to Learn Stage	Frequency	Percentage (%)
1	0	0.00
2	3	5.36
3	25	44.64
4	28	50.00

Step 5

Return to School Stage	Frequency	Percentage
1	0	0.00
2	0	0.00
3	6	24.00
4	19	76.00

ARP Step	Level of Intensity	RTL stage	Level of Intensity
1	Low	1	No activities
2	Moderate	2	Limited school participation (2-4 hours)
3	Vigorous	3	Moderate school participation (4-6 hours)
4	Maximal	4	Return to full workload
5	Maximal (multidirectional)		