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Introduction

- Traumatic Brain Injury (TBI): External force delivered causing impairment of brain structure or function
- Up to 60% of children who meet the clinical criteria for mild TBI, or concussion, are not diagnosed in the emergency department.
- Current clinical tools tests are limited and incomplete
- Virtual reality (VR) is emerging as an objective method to measure the physical, cognitive, and behavioral impairments in concussion patients
- Pediatric Display Enhanced Testing for Cognitive Impairment (PeDETECT) system: a comprehensive and multimodal tool that utilizes VR to detect mild TBI in pediatric patients





Assesses neuropsychological, balance, and oculomotor impairment using a series of tests that are gamified for easy child adaption

Objectives

Primary Objective:

Feasibility of PeDETECT VR use in the pediatric ED setting in patients with mild TBI

• Secondary Objective:

User subjective feedback on the device, complex choice reaction time, working memory recall accuracy, and ED length of stay

Methods

- Prospective observational feasibility study for the use of the PeDETECT VR module
- Comparison of completion % in ED patients with head injury vs control
- Enrollment Criteria: ED patients ages 9-17 presenting with chief complaint of head injury or non-head injury (control) at the Children's Healthcare of Atlanta (CHOA) Egleston campus
- Glasgow Coma Scale score of > 13
- Feasibility defined by ≥80% completion
- Mean ± SD, unpaired Student t-test, and chi-square used for statistical analysis

Feasibility of the Virtual Reality Based PeDETECT and Mild Traumatic Brain Injury Tool To Detect Concussion in the Pediatric Emergency Department

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Figure 1: PeDETECT Module Overview				
	Brain Function Test	Game Description		
Word Pop	Short-term recall (immediate assessment)	Learn a set of words that appear on a screen; throw a "yes" or "no" dart during recall phase		
Pie the Clown	Target tracking	Throw a pie at a clown's face when it is in front of the target		
Wild Ride	Non-postural balance	User must balance rider or top of a moving bull		
Ice Sizzle	Divided Attention	Drop ice cubes into the appropriate bucket		
Hammer Down	Reaction time & Go/no-go assessment	Use the game controller to pound the hammer		
Word Pop Again	Short-term recall (delayed assessment)	Throw a "yes" or "no" dart during recall phase		
Figure 2: Study Activities and Data Collection				
Patient Encounter Timeline				
Info	ormed Consent and Demog	raphics		
Post-Co	oncussion Symptom Check	list (PCSC)		
Child Sim	ulator Sickness Pre-Questic	onnaire (SSQ)		
	PeDETECT VR Module			
Child Simu	Ilator Sickness Post-Questi	onnaire (SSQ)		
	PeDETECT User Experien	ce		
	Post-ED Chart Review			

Adverse Event/Deviation Log

Preliminary Results

	Head Injury	Control	P-Value	
Patients Enrolled	18	61		
Gender % Male	61%	52%	0.5172	
Age	11.8 ± 2.7 years	12.0 ± 2.1 years	0.8052	
Percent Completion*	89%	87%	0.8222	
*Total percent completion 88%				
	Male	Female	P-Value	
Male vs Female Rate of Completion	95%	78%	*0.0193	





- Feasibility in both groups was above the target goal of 80% setting with a high rate of completion Headset use was not limited by head-injury

- Demonstrated feasibility of PeDETECT use in the pediatric ED
- Gender differences identified for rate completion
- No correlation between age and completion rate
- biomarkers

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(r= -0.1127, p= 0.3227, Pearson correlation test)

Conclusions

Future Directions

As enrollment is ongoing, future analysis will include secondary outcomes and the headset's ability to detect concussion Saliva will be collected for assessing concussion mRNA

Acknowledgements

Bibliography

1. Kazl C, Torres A. Definition, Classification, and Epidemiology of Concussion. Semin Pediatr

2. Dewan MC, Mummareddy N, Iii JCW, Bonfield CM. Literature Review Epidemiology of Global Pediatric Traumatic Brain Injury : Qualitative Review. World Neurosurg. 2016;91:497-509.e1.