

Predicting and Preventing Falls in People with Parkinson's disease

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Disclosures

1. JLA is a consultant to Ceraxis Health
2. JLA is a consultant to Motion Med LLC
3. JLA is a consultant to Stabilis
4. JLA is supported by: NIH, MJFF, DoD & NFL-NFLPA
5. JLA has licensed technology to Stroll Limited



Goals for Today

1. Understand why Parkinson's disease increases fall risk
2. Review fall prediction models
3. Understand what can be done to prevent falls
4. Identify local resources to mitigate fall risk
5. Stay awake



Falls are a defining complication of PD

Falls mark a turning point in independence and a milestone of disease progression. Fear of falling then restricts activity, which further erodes mobility and quality of life.

58.5%

fell within one year (72 of 123)

1,521

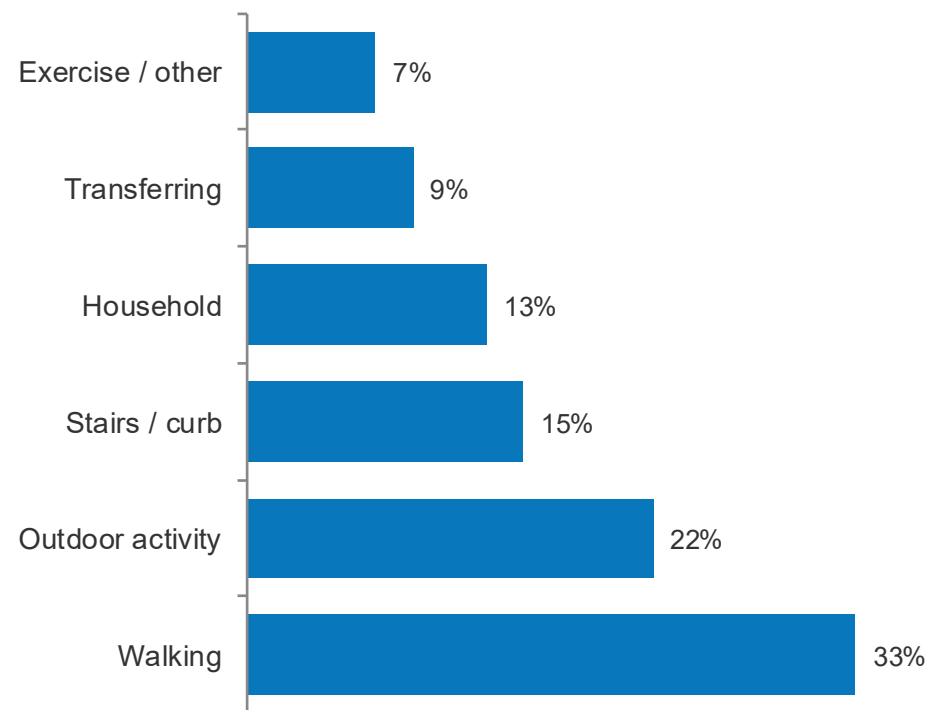
falls recorded over 12 months

~35%

of falls caused an injury

CYCLE-II cohort (Anis et al., Parkinsonism Relat Disord 2025). One-third of falls happened simply while walking.

Where the falls happened



A fall is rarely just a motor failure

Falls in PD emerge from motor, cognitive, and environmental interactions. When the brain is slow to process a hazard, the body cannot adapt in time, especially during complex, real-world walking.



Slowed processing speed

Delayed reaction to obstacles, uneven terrain, and sudden changes underfoot.



Executive dysfunction

Impaired planning and hazard avoidance, worsened under dual-task walking.



Our working hypothesis

Cognitive measures, collected routinely, could flag fall risk early, before a first fall.

Current Fall Prediction Models



Today falls are predicted by looking backward



The rearview mirror

- Most validated tools lean on prior falls.
- In the Paul motor model, prior-fall history carries an odds ratio of 8.58.
- 83% of patients who fell last year fell again.
- **To flag a patient today, that patient must already have fallen.**



The forward radar

- We need to identify the vulnerable, fall-naive patient.
- That means predictors that do not depend on a prior fall.
- Ideally drawn from data we already collect at every visit.

Iowa Farmer Best Practice

***Movement
Disorders***

CLINICAL PRACTICE

BRIEF REPORT

Closing the Gate *Before* the Horse is out of the Barn: A Model to Effectively Predict the *First Fall* in Patients with Parkinson's Disease

Saar Anis, MD,¹ Eric Zimmerman, MS,¹ Maxime Munyeshyaka, BA,² Hubert H. Fernandez, MD,¹ Anson B. Rosenfeldt, PT, DPT,³ and Jay L. Albers, PhD^{1,3,*}



Leveraging the Waiting Room of the Future

- Cognitive and motor assessments
- Gait evaluation
- **Standard of Care**



A real-world cohort from the WROTF

From platform to study cohort

1,640 completed a WROTF assessment



997 with documented
12-month fall status

Prior-fall status at baseline

570

no prior falls

367

prior fallers

60

unknown

Demographics

69.6

mean age, years

62.8%

male

3.6

mean disease
duration, years

The First Fall has Consequences



48.8%

required an
emergency visit



52.7%

underwent
diagnostic imaging



12.3%

were
hospitalized



7.4%

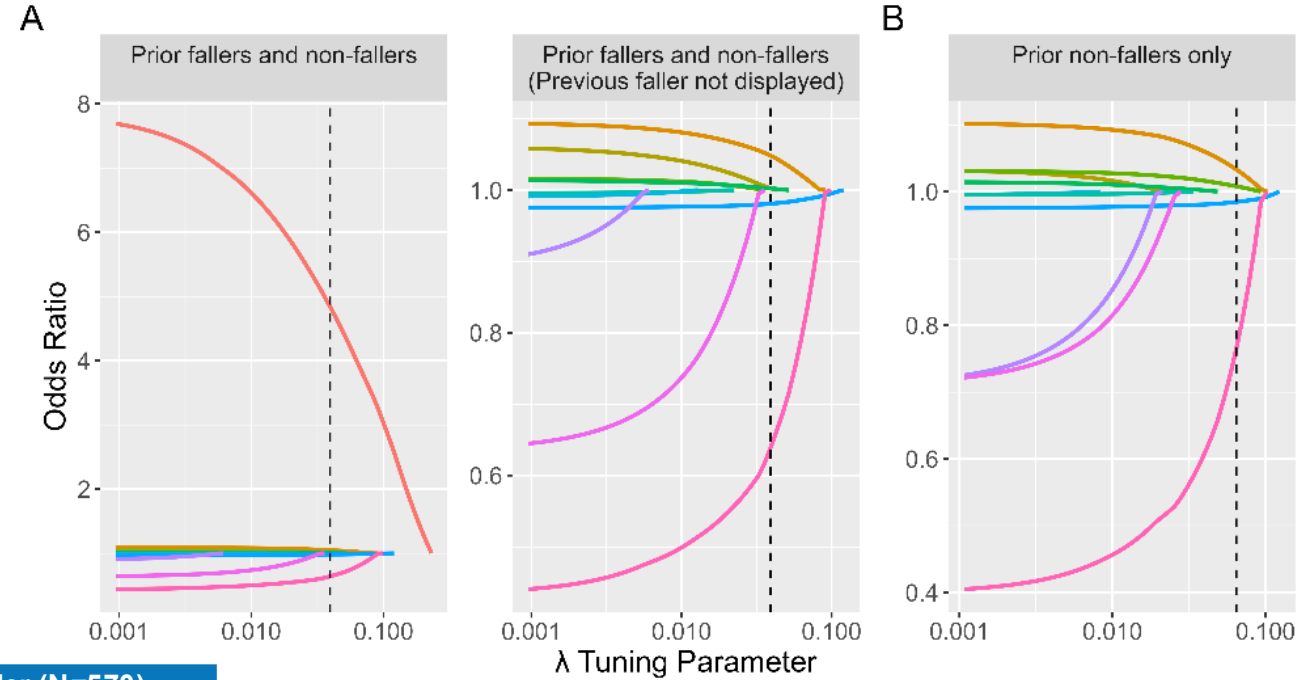
needed a new
assistive device



3.0%

discharged to
skilled nursing

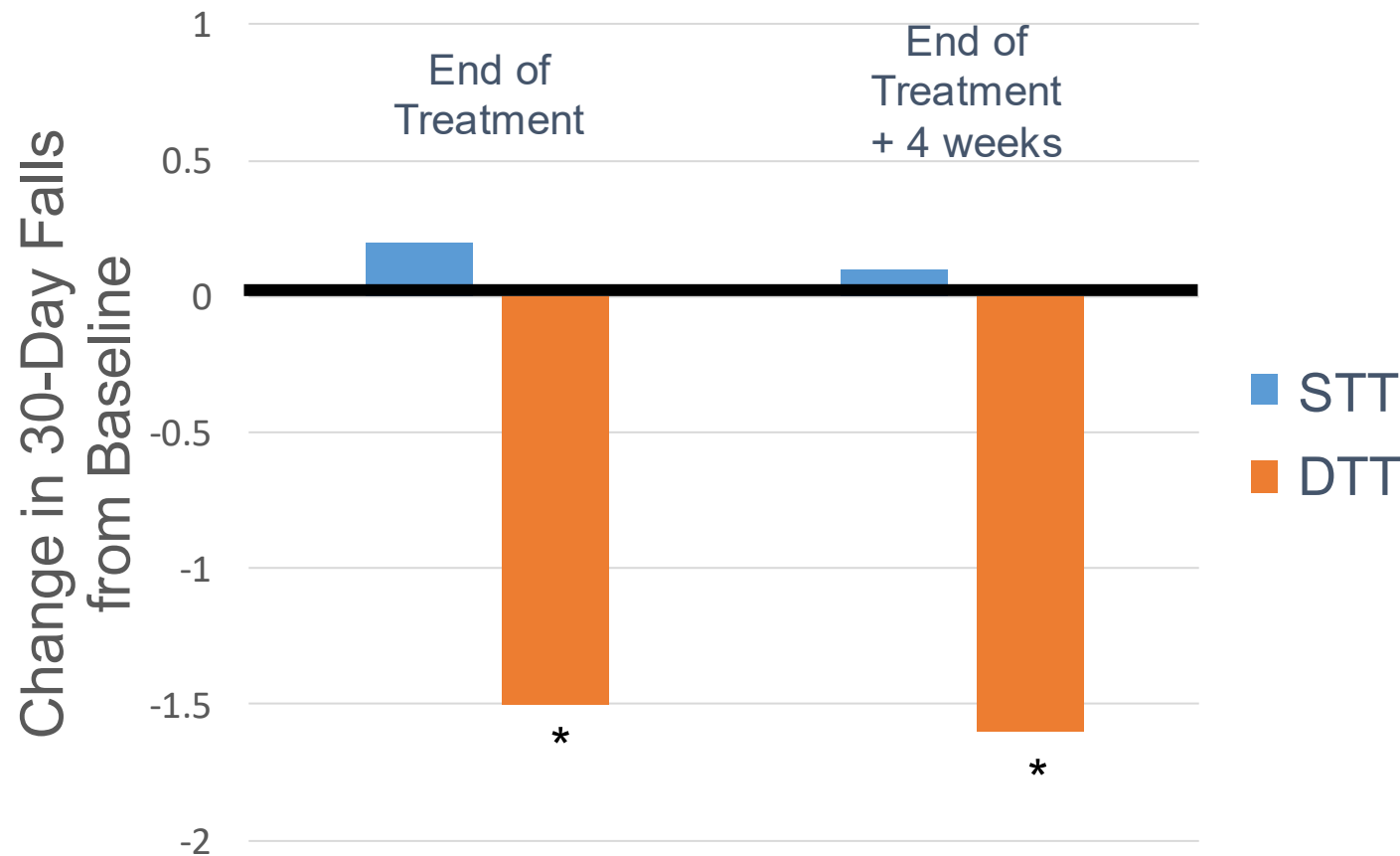
Important Variables Predicting the First Fall



	Previous non-faller (N=570)		
	Future faller (N=203)	Future non-faller (N=367)	Effect Size
Years since PD diagnosis			-0.44
Mean (SD)	4.40 (4.77)	2.67 (3.37)	
MDS-UPDRS III total score			-0.37
Mean (SD)	30.3 (13.9)	25.4 (13.2)	
Walking speed test (WST) average speed, m/s			0.39
Mean (SD)	0.96 (0.45)	1.11 (0.35)	
Processing speed test (PST), total correct			0.54
Mean (SD)	32.4 (11.8)	38.9 (12.0)	



Dual-task Training Reduces Falls in Individuals with Parkinson's



Journal of Physical Activity and Health, 2019, 16, 1085-1091
<https://doi.org/10.1123/pah.2018-0595>
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Human Kinetics
ORIGINAL RESEARCH

Multimodal Training Reduces Fall Frequency as Physical Activity Increases in Individuals With Parkinson's Disease

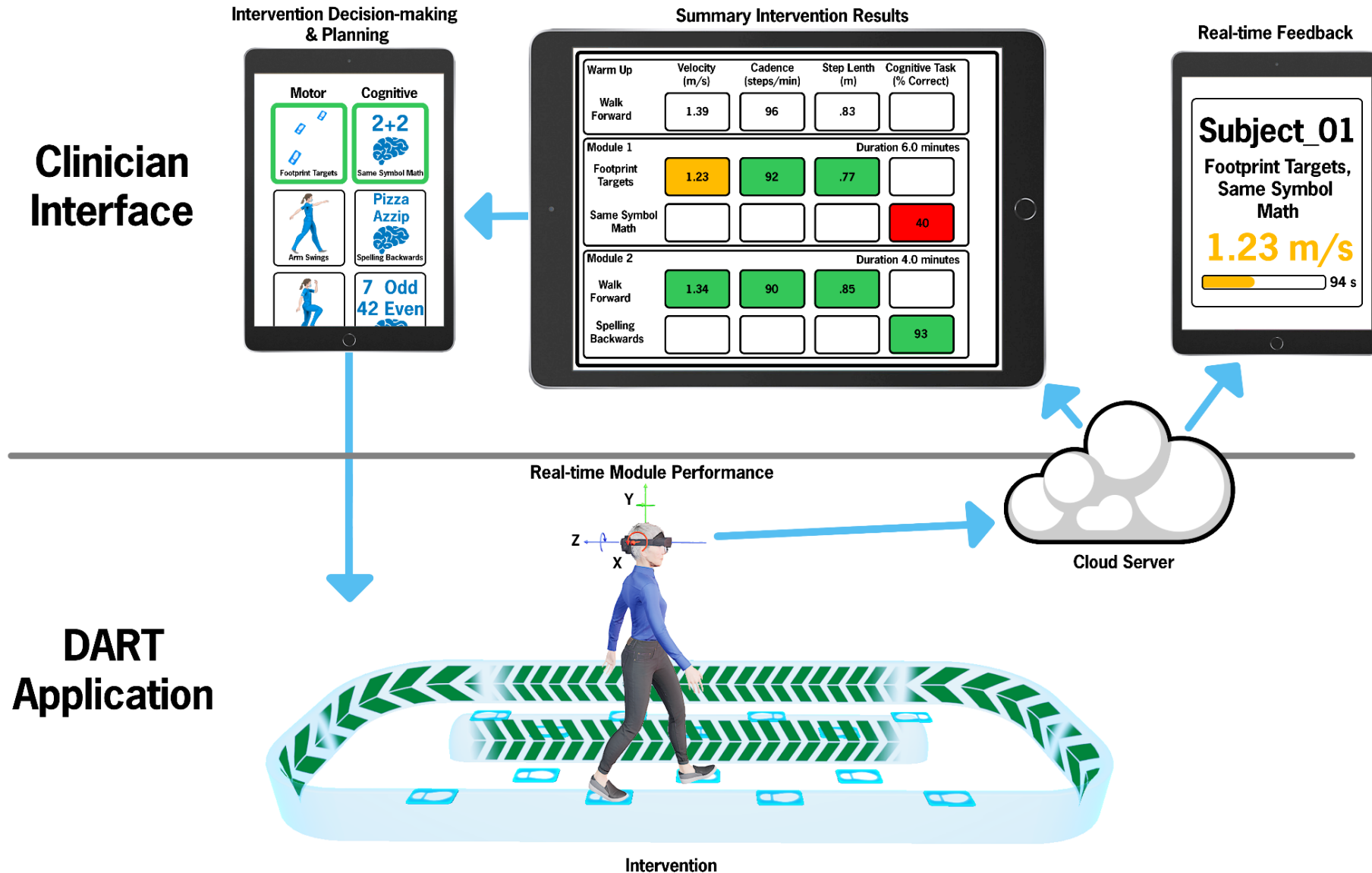
Amanda L. Penko, Jacob E. Barkley, Anson B. Rosenfeldt, and Jay L. Alberts

Using technology to broaden the delivery of DTT for PD

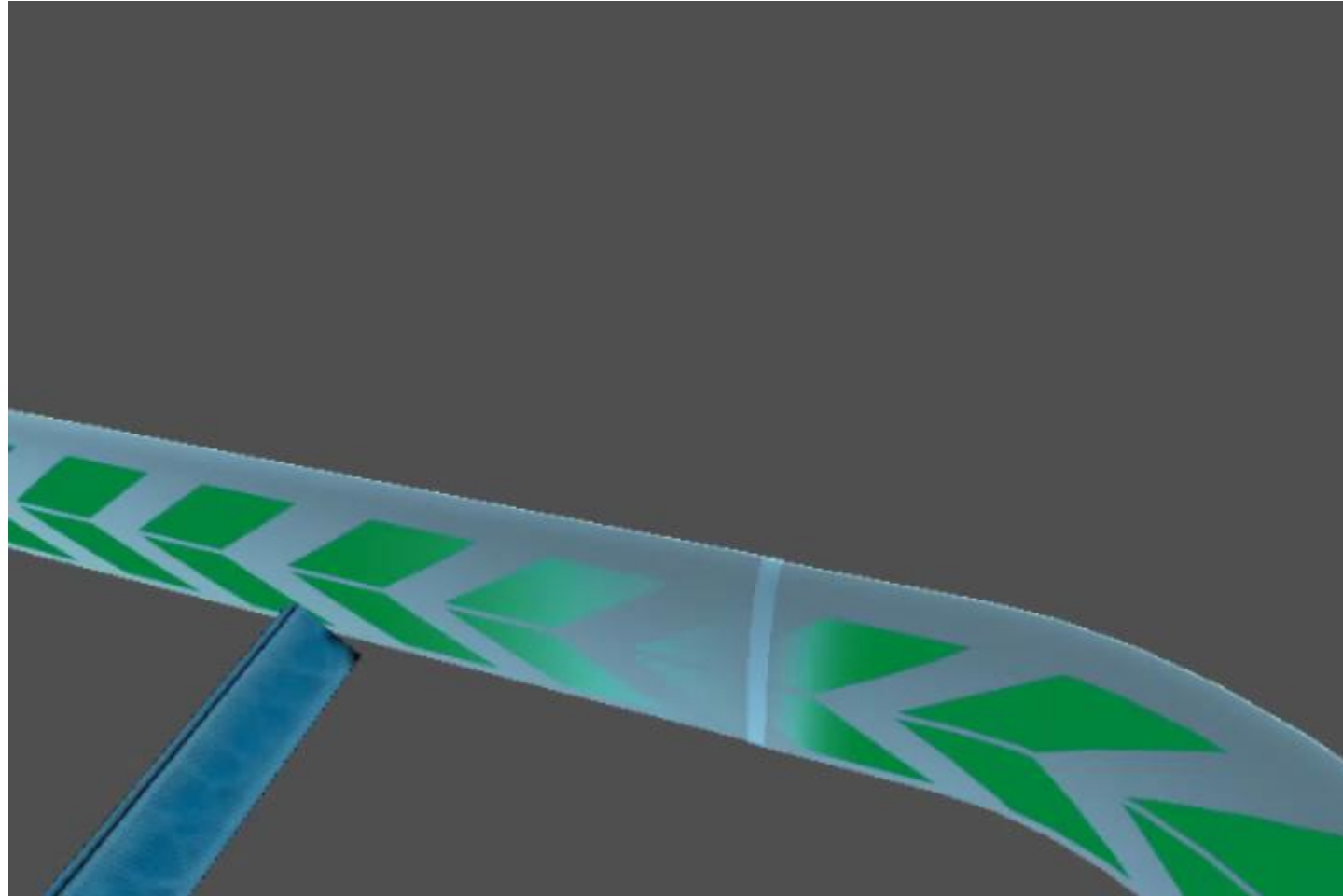
Dual-task Augmented Reality Treatment
(DART)



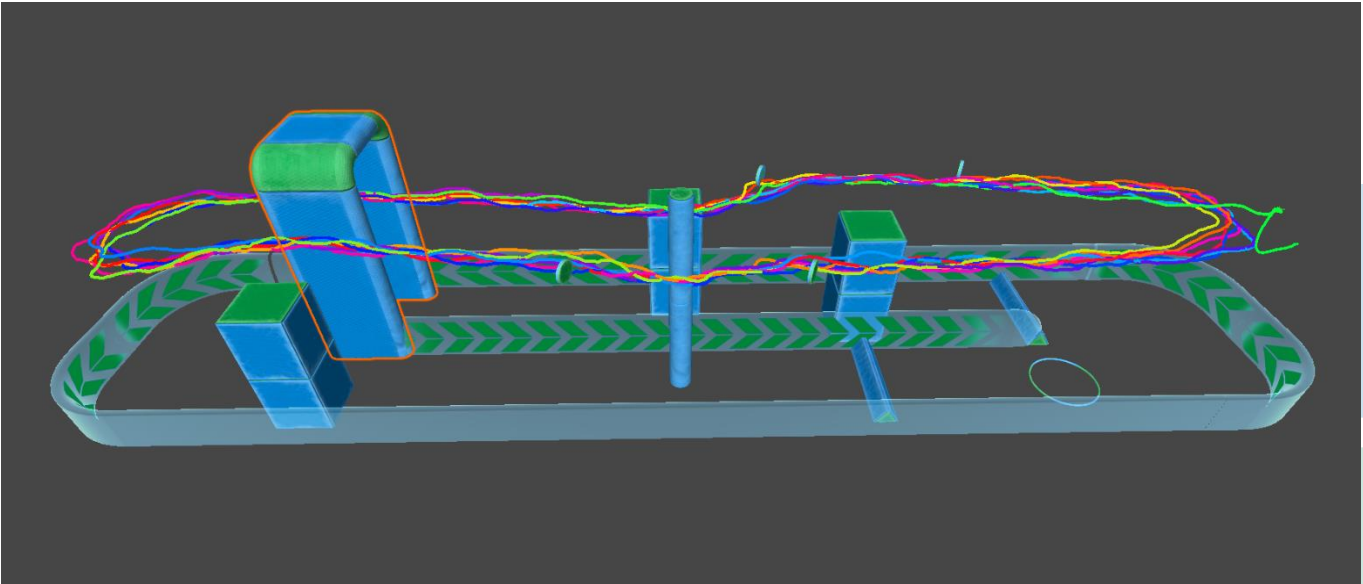
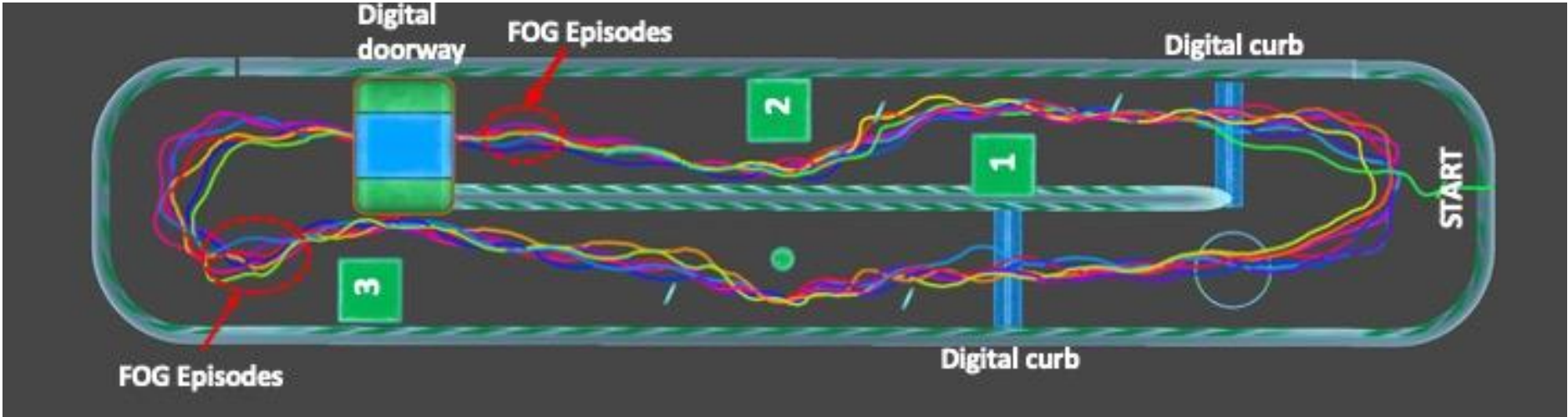
Dual-Task Augmented Reality Treatment Platform



Navigating a Digital Obstacle Course



Visualization of Performance



Donna, your digital provider



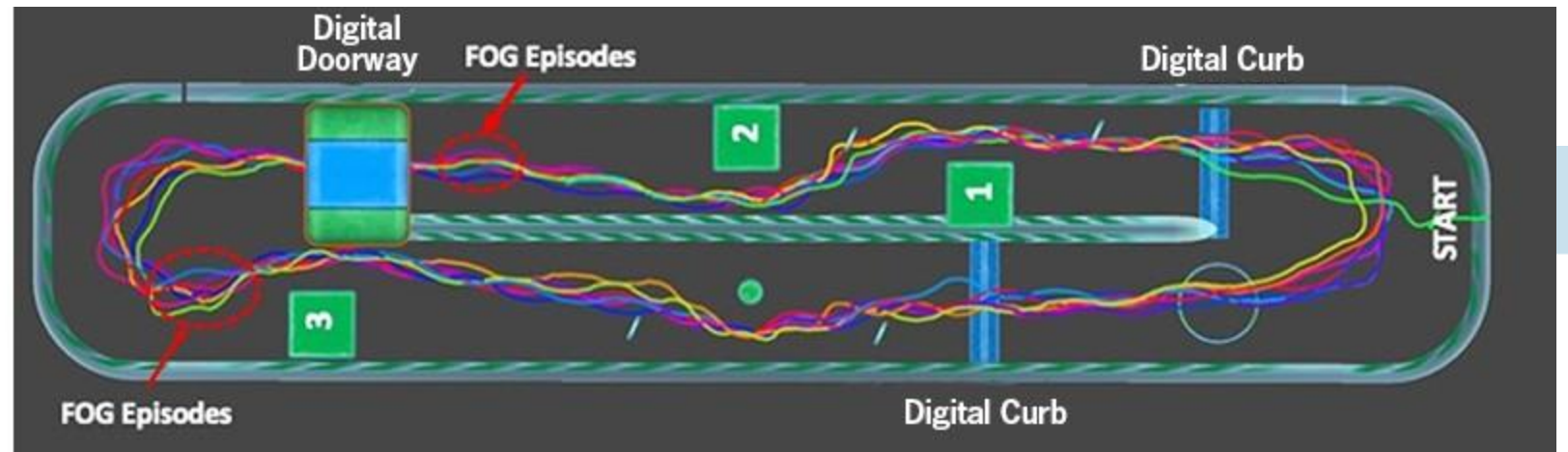
Article

Digitizing a Therapeutic: Development of an Augmented Reality Dual-Task Training Platform for Parkinson's Disease

Jay L. Alberts ^{1,2,*}, Ryan D. Kaya ², Kathryn Scelina ², Logan Scelina ², Eric M. Zimmerman ², Benjamin L. Walter ² and Anson B. Rosenfeldt ¹

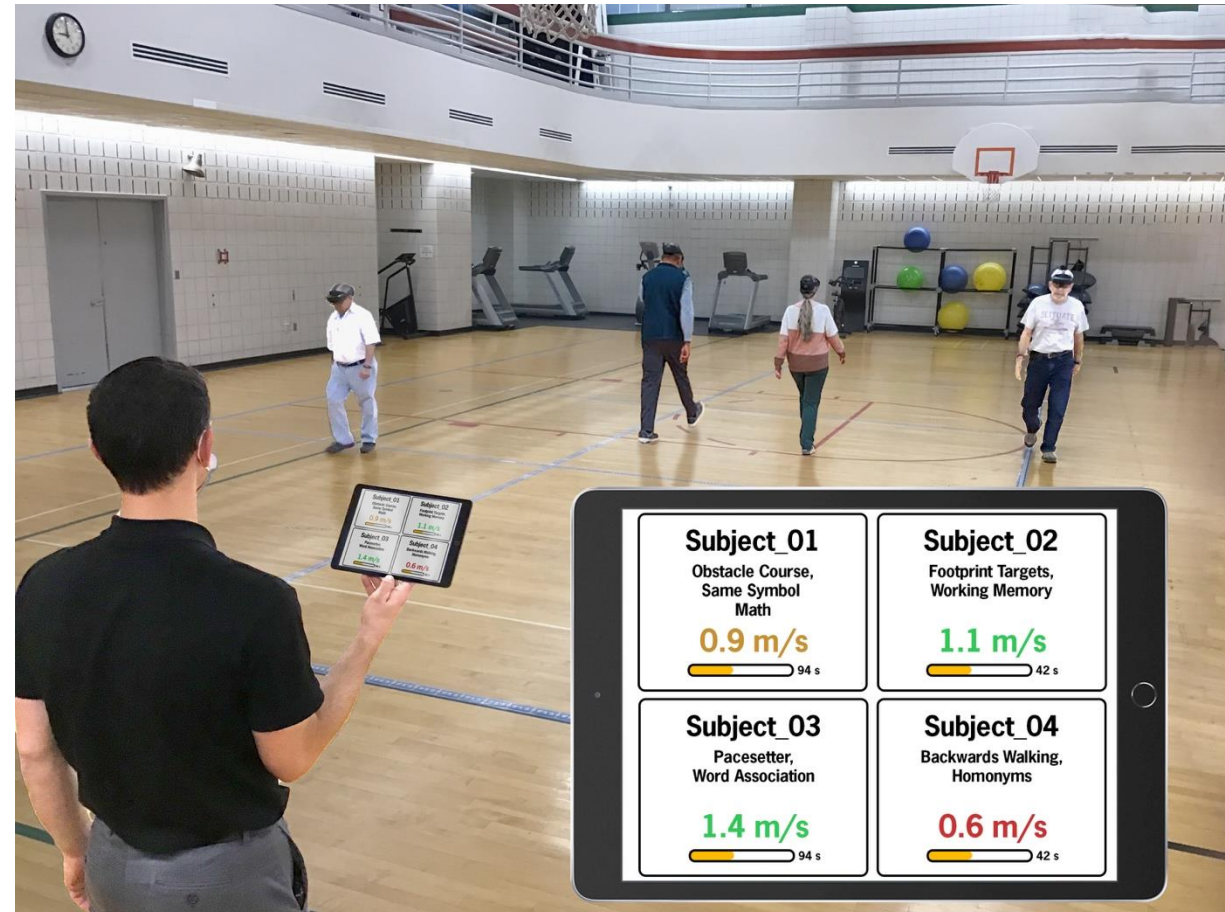


Patient Perspective



Connecting the Provider & Patient during the Intervention

- Self-directed by the patient
- Real-time tracking of patient progression (up to 10 HL2 devices) through programmed modules
- Real-time tracking of key biomechanical metrics (e.g. gait speed)
- Unique feature of using technology to deliver dual-task therapy



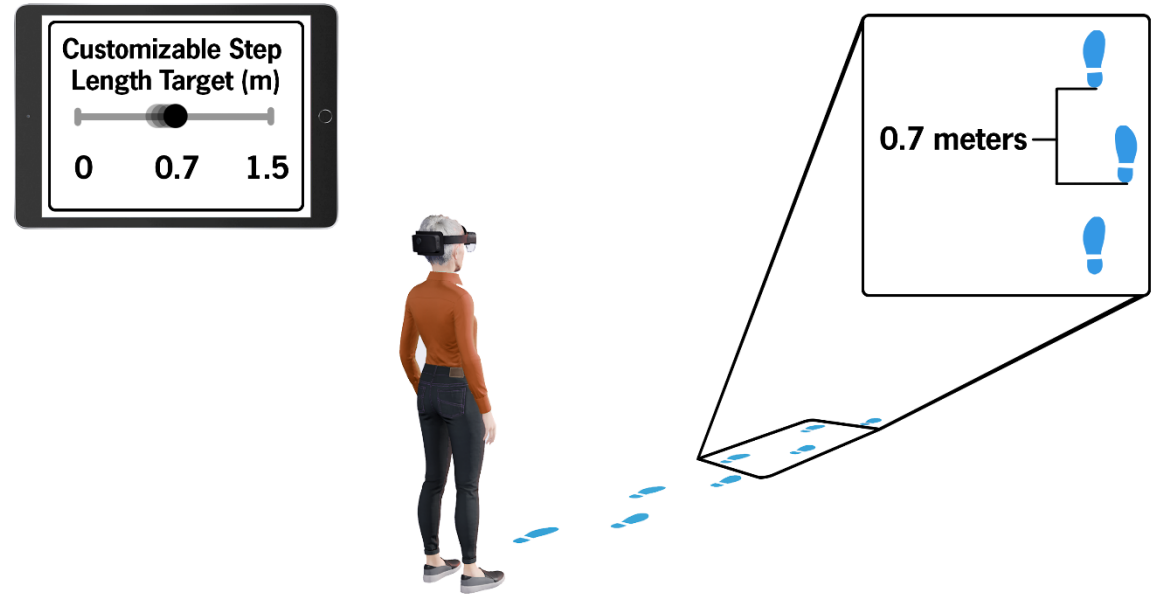
Therapy Progression

Week 1: Identified Gait Deficiency

	Velocity (m/s)	Cadence (steps/min)	Step Length (m)	Average Turn Velocity (deg/sec)	Peak Turn Velocity (deg/sec)	Turn Time (sec)	# of Turns	Cognitive Task
Walk Forward	1.19	105	.66	88.4	232.5	1.9	3	Backwards Spelling 82%




Targeted Intervention Programming



Week 8: Improvements Following Targeted Intervention


	Velocity (m/s)	Cadence (steps/min)	Step Length (m)	Average Turn Velocity (deg/sec)	Peak Turn Velocity (deg/sec)	Turn Time (sec)	# of Turns	Cognitive Task
Walk Forward	1.38	106	.76	113.3	291.3	1.8	4	Backwards Spelling 88%

A Randomized Clinical Trial to Evaluate a Digital Therapeutic to Enhance Gait Function in Individuals With Parkinson's Disease

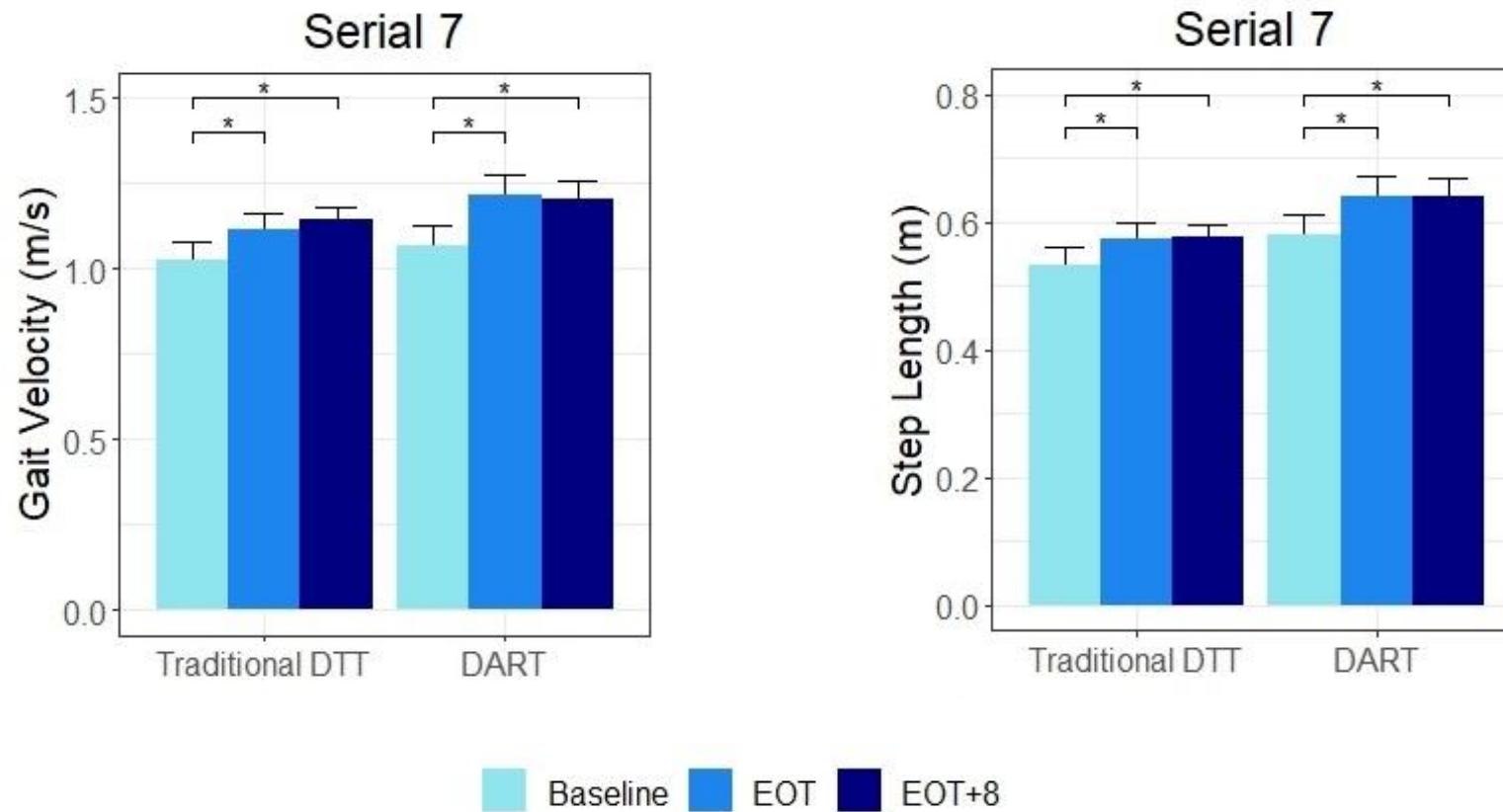
Neurorehabilitation and
Neural Repair
1–14
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DOI: 10.1177/15459683231184190
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Benjamin L. Walter, MD² , and Anson B. Rosenfeldt, DPT¹

Equivalence study design: To determine the effectiveness of the DART protocol compared to the traditional MMT intervention.

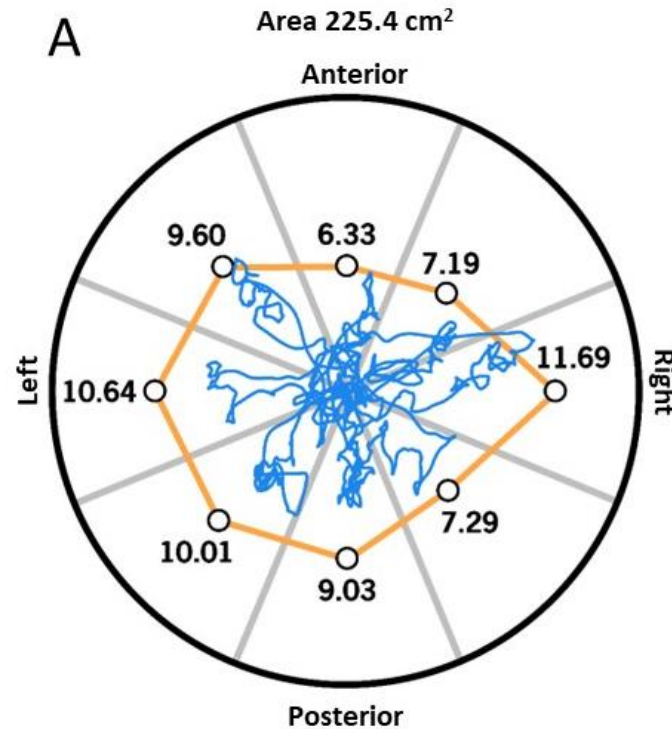


Dual-task Gait Speed Improves following Training

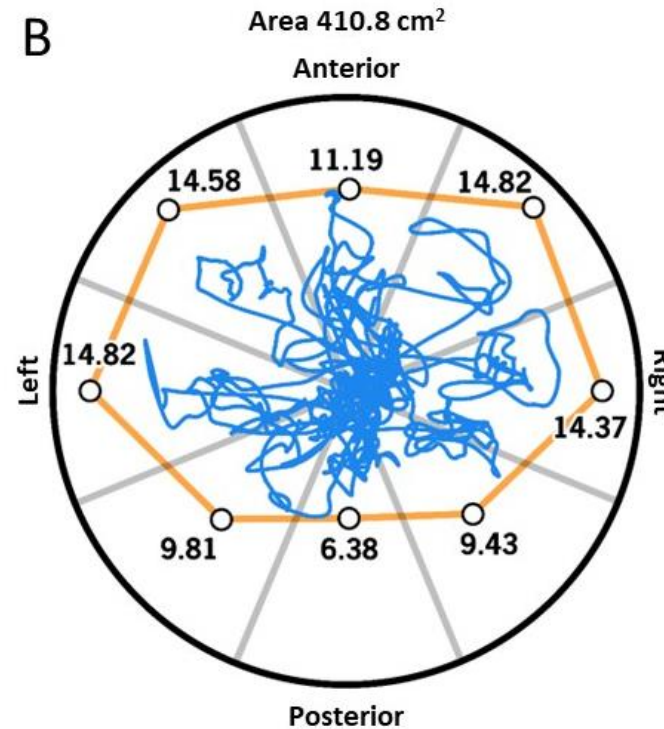


Postural aspects of gait improve following training

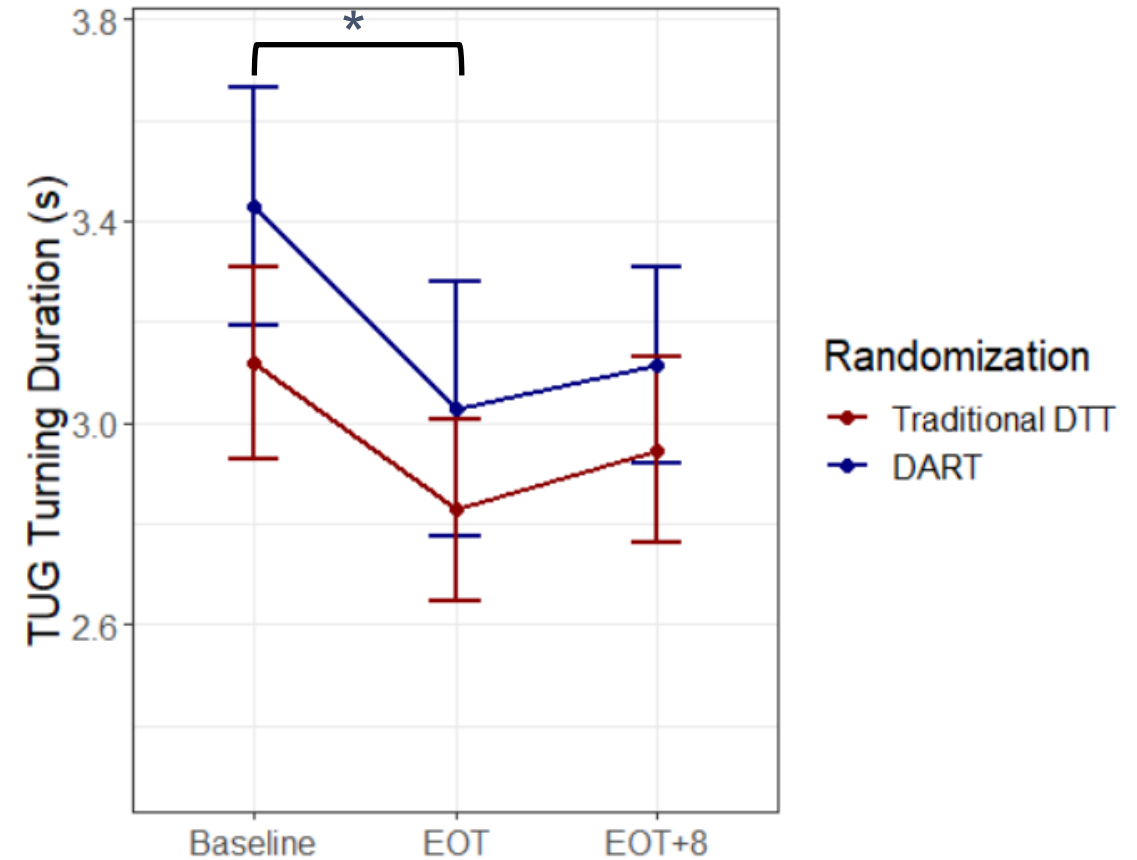
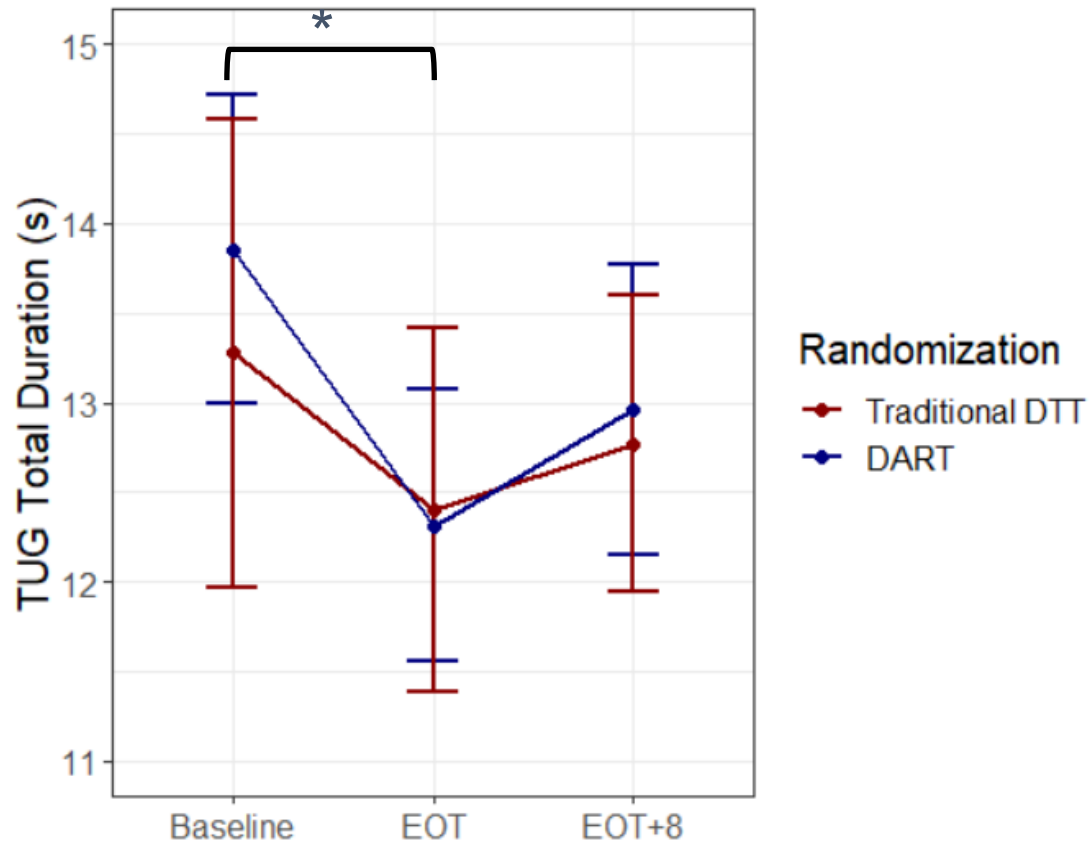
Baseline



End of Treatment



Improved Mobility and Turning during Dual-tasking

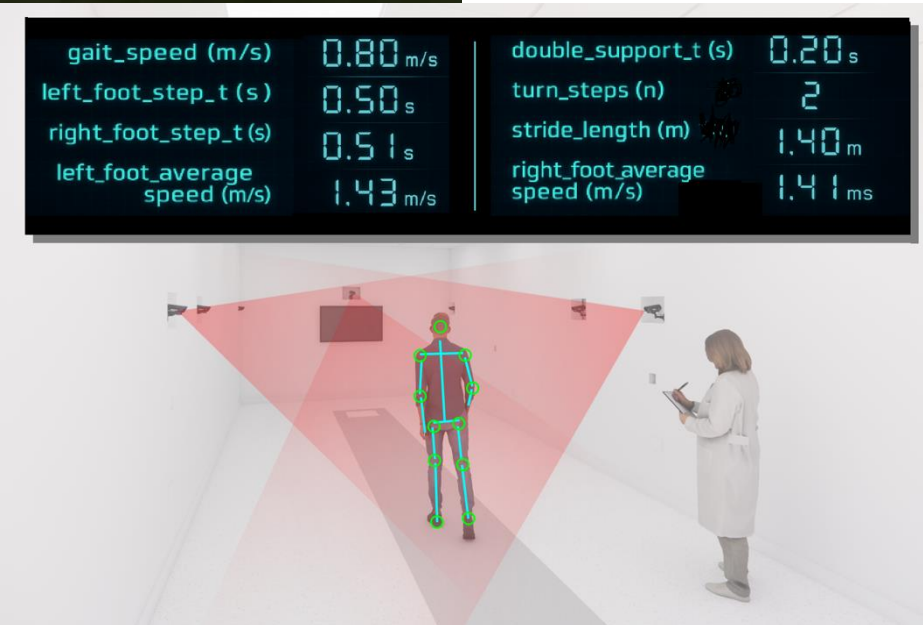


Gait Function can be Improved

- Evaluate with your care team the potential value of dual-task and balance training.
- Advocate for PD specific approach to improving gait and postural stability.
- Gait, mobility, and turning under single- and dual-task conditions can improve following AR training.
- Improvements will translate to real-world benefits.
- **InMotion Resources:** Better Every Day; Steady Together; Falls Education



NI Building of the Future



Funding Sources

- Funding been provided by the Davis Phinney Foundation, Michael J. Fox Foundation, Department of Defense, National Institute of Health & the Bell Family Chair.
- The CART and DART technologies have been licensed to Strolll.





Cleveland Clinic

Every life deserves world class care.