The effectiveness of the 'Drive-Fun' program in reducing driving risk factors adolescents with ADHD

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Background

- Driving is a key skill– transition to independence[1]
- Car accidents are the leading cause of death among adolescents[2]
- Adolescents with Attention deficit hyperactivity disorder (ADHD) are 1.2 to 4 times more prone to be involved in car accidents[3]

1- Le Roux et al,. 2019; 2 - Monahan et al., 2013; 3 - Pollak et al., 2023

Background

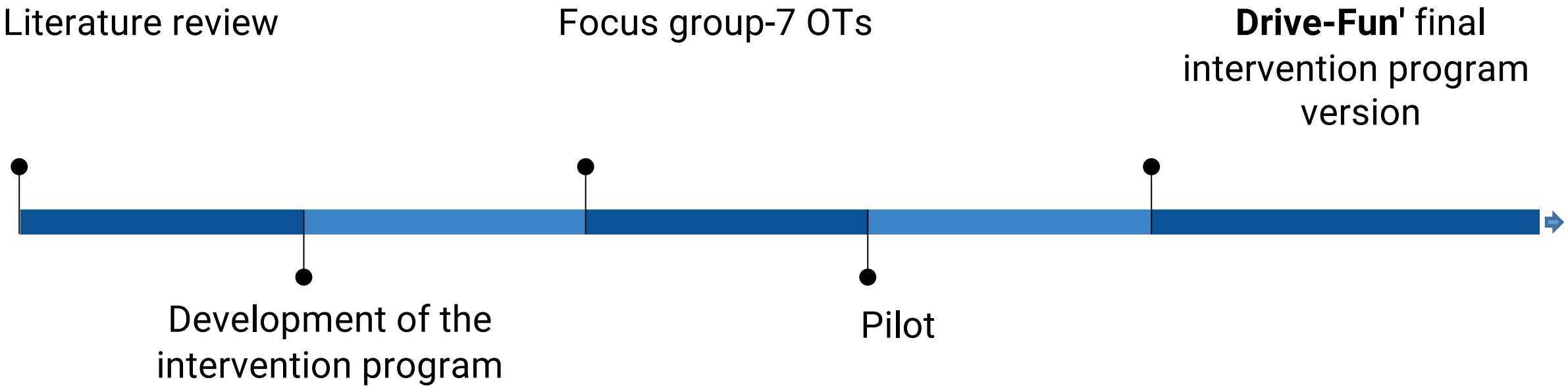
- The literature provides scant research-based evidence on effective interventions for adolescents with ADHD[4]
- One method that has been found to be effective for adolescents with ADHD is ‘Teen Cognitive-Function’ (Cog- Fun) [5]

Study Hypotheses

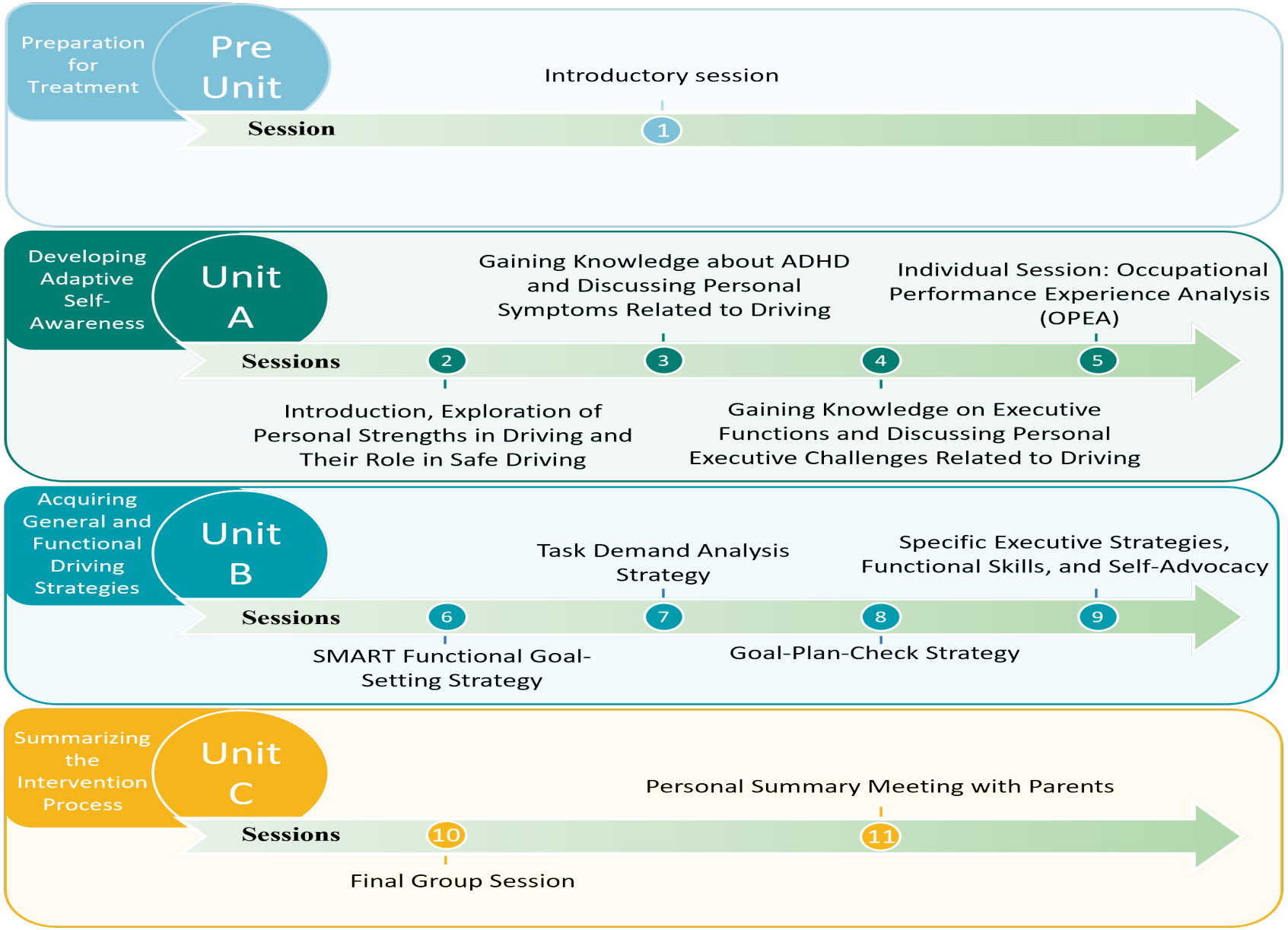
Using the principles of Cog-Fun alongside the developed program may be an effective intervention to reduce risk factors in driving among adolescents with ADHD

4 – Peterson et al, 2024; 5 - Levanon-Erez & Maeir, 2019

First Stage


Literature review
Development of the intervention program
Focus group-7 OTs
Pilot
Drive-Fun' final intervention program version

Drive- Fun


Preparation for Treatment
Pre Unit
Introductory session
Session
1
Developing Adaptive Self-Awareness
Unit A
Gaining Knowledge about ADHD and Discussing Personal Symptoms Related to Driving
Individual Session: Occupational Performance Experience Analysis (OPEA)
Sessions
2
3
4
5
Introduction, Exploration of Personal Strengths in Driving and Their Role in Safe Driving
Gaining Knowledge on Executive Functions and Discussing Personal Executive Challenges Related to Driving
Acquiring General and Functional Driving Strategies
Unit B
Task Demand Analysis Strategy
Specific Executive Strategies, Functional Skills, and Self-Advocacy
Sessions
6
7
8
9
SMART Functional Goal-Setting Strategy
Goal-Plan-Check Strategy
Summarizing the Intervention Process
Unit C
Personal Summary Meeting with Parents
Sessions
10
11
Final Group Session

Method

- Sample: 93 adolescents with ADHD (15-18 years old)
- Randomized controlled trial (random assignment method: "Drawing names from a hat“)
- Group Composition: 3 groups (31 participants each)

Method

- Inclusion Criteria:

-Diagnosis of ADHD by a psychiatrist (DSM-V)
-Completion of Conners 3-Parent Short Form questionnaire by parents
-No previous driving experience

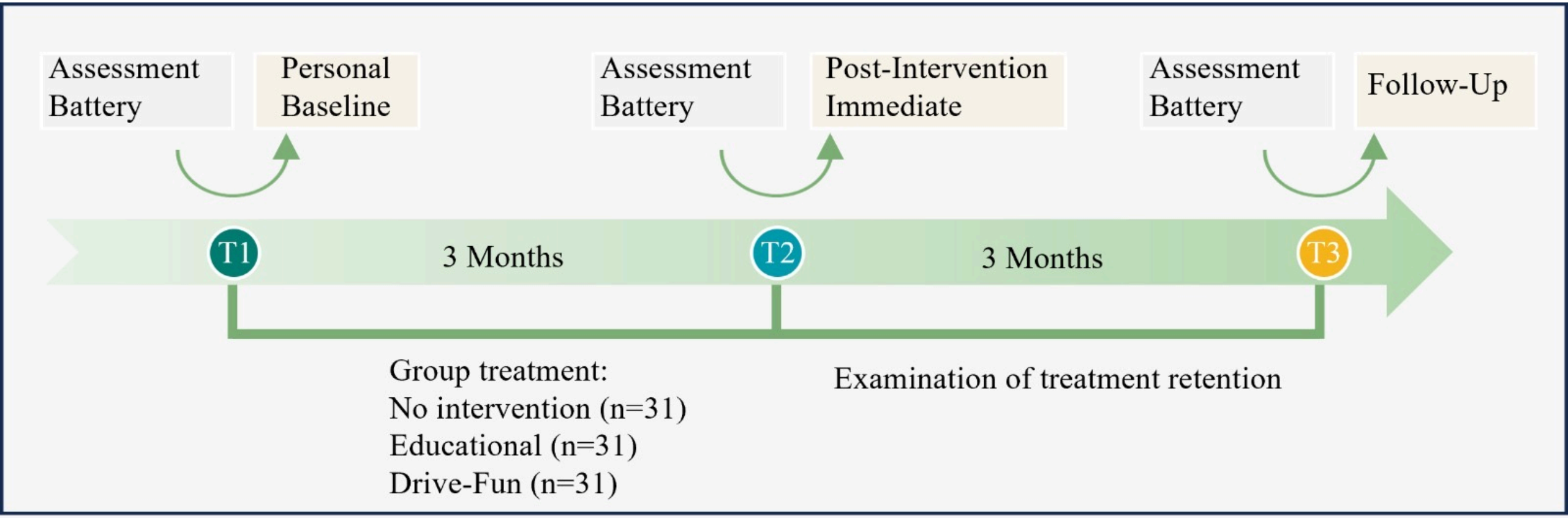
- Exclusion Criteria:

-Chronic primary psychiatric diagnosis
-Primary developmental disorder other than ADHD (e.g., ASD)

*Participants using amphetamine or methylphenidate were asked not to use them 24 hours before evaluation.

Method

Time Linel



Main Outcome Measures

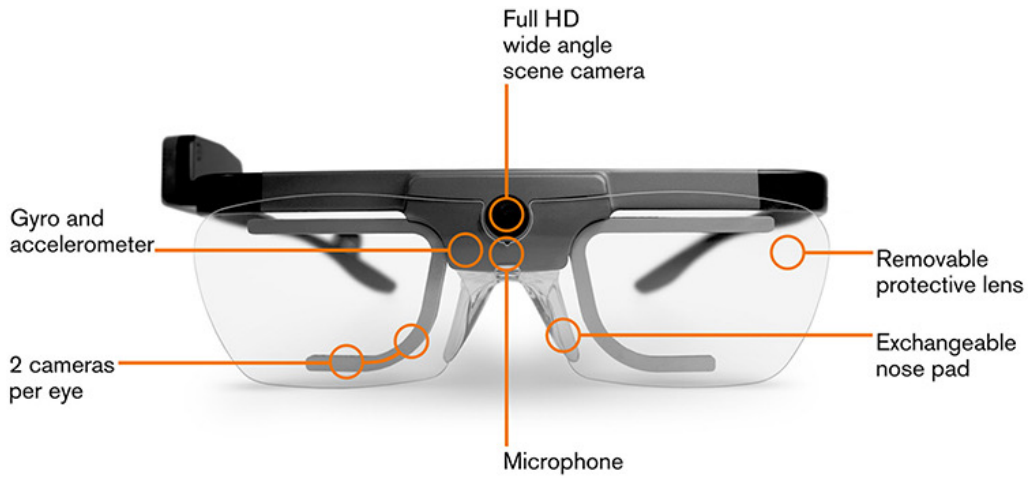
Driving simulator: the 3D-Fahrschule by Besier 3D-Edutainment

- Trains and examines different aspects of driving in various European countries
- Each scenario is awarded points according to the number of mistakes made
- The more mistakes participants make, the higher they are likely to score
- Test results are broken down into nine criteria of unsafe driving (we will present only the total score)

Outcome Measures

Eye screening: Tobii pro Glasses 2

- A mobile eye-tracking device
- Participant data are recorded via the controller, and can later be accessed through the Tobii Pro Lab software.
- Analyze measures of intervention outcomes: **fixation on traffic lights, fixation on pedestrians, and fixation on the dashboard.**



Visual Attention Patterns while Driving

ADHD

NON-ADHD

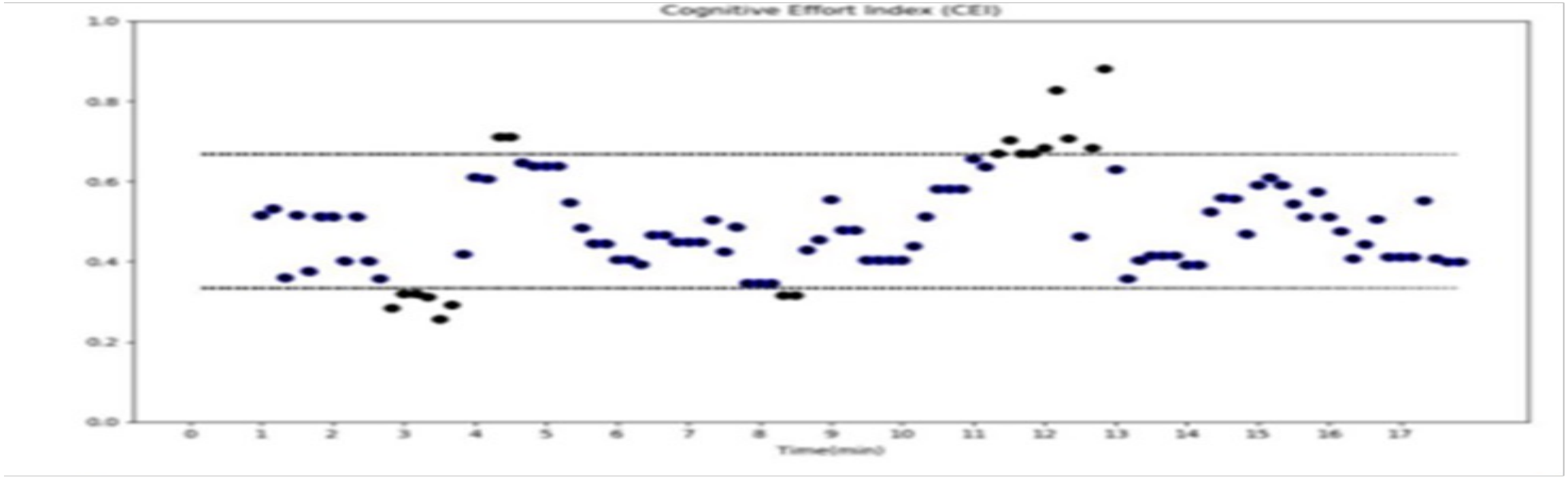
Outcome Measures

EEG: Cognitive Effort Index (CEI)[6]

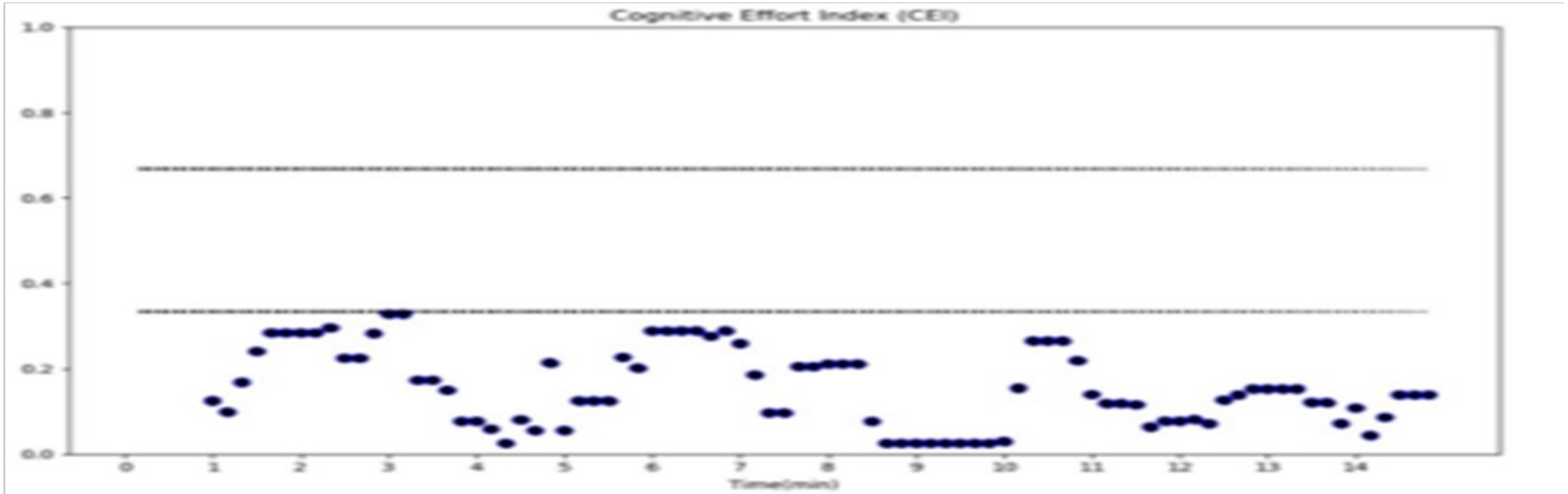
- Monitoring cognitive effort and provides real-time values from **one forehead EEG channel** every 10 seconds
- The CEI values are divided into three ranges: 0≤0.3/ [0.3-0.7]/ ≥0.7-1.00
- **CEI in the middle range (0.3-0.7) means effective patient attention**
- These markers are valid and easy to use for real-time monitoring of attention[7]

6- NeuroSky Inc., San Jose, CA, USA; 7-Shahaf et al., 2018

NON-ADHD (a)



ADHD (b)



Data Analysis

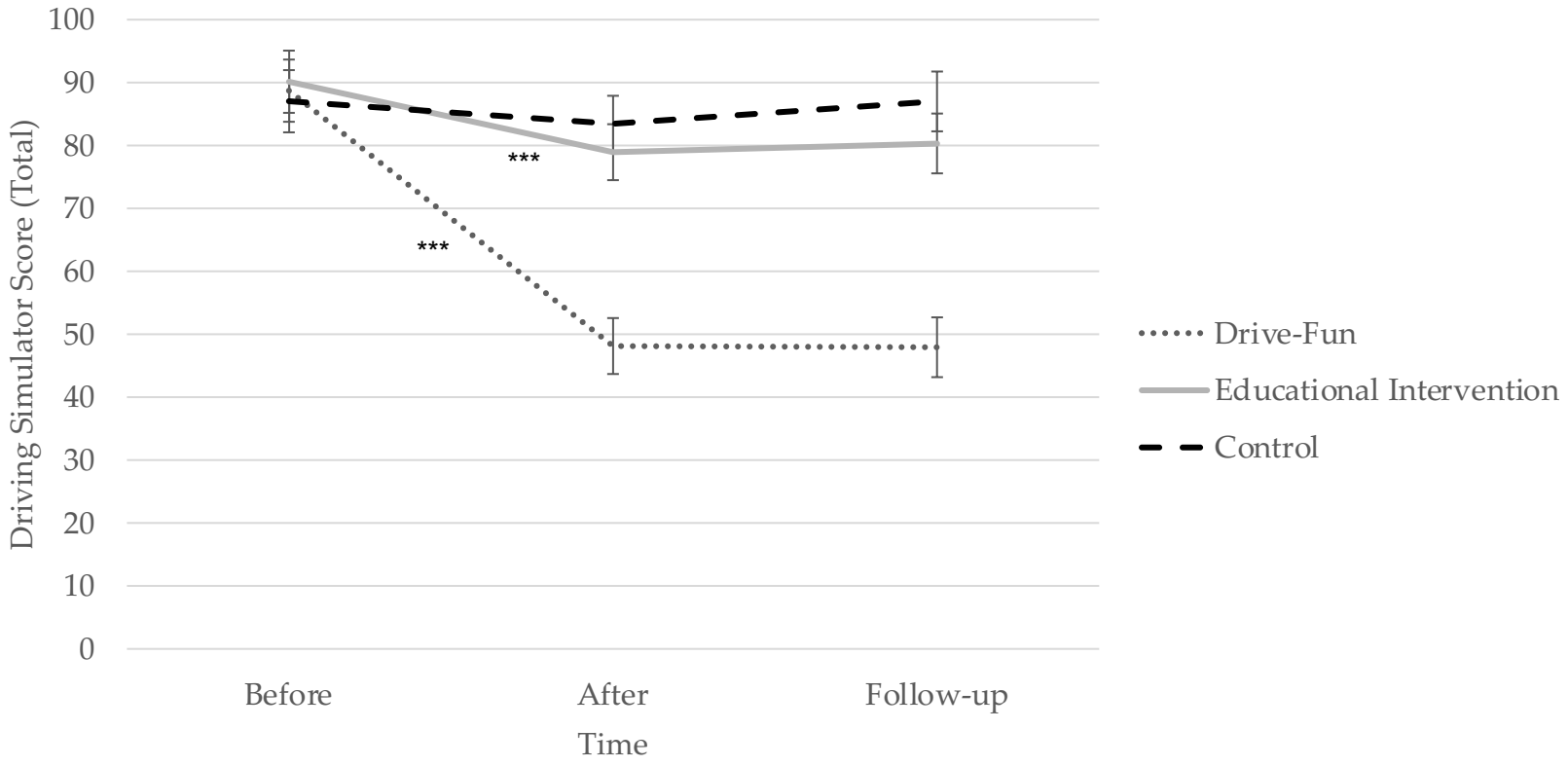
- Two-way ANOVAs for repeated measures were conducted, with study groups (Drive-Fun, Educational Intervention, Control) as a between-subjects variable and time (Before intervention, After intervention, Follow-up) as a within-subjects variable.

- Significant interaction effects were followed by simple effects analyses of time within each group, using Bonferroni correction and Cohen's d to assess

Results

Table 1					
Demographic Variables by Study Groups (N = 93)					
	Drive-Fun	Educational Intervention	Control	Statistic	p
Age, M (SD)	16.76 (0.55)	16.88 (0.45)	16.75 (0.56)	F = 0.64	.529
Male, n (%)	16 (51.6%)	15 (48.4%)	15 (48.4%)	χ^2 = 0.09	.958
Learning Disability, n (%)	8 (25.8%)	9 (29.0%)	9 (29.0%)	χ^2 = 0.11	.948
Taking Medication for ADHD, n (%)	27 (87.1%)	26 (83.9%)	25 (80.6%)	χ^2 = 0.48	.788
Playing Driving-Games, n (%)	13 (41.9%)	13 (41.9%)	13 (41.9%)	χ^2 = 0.00	1.000

Driving Simulator Score (Total) by Study Groups and Time



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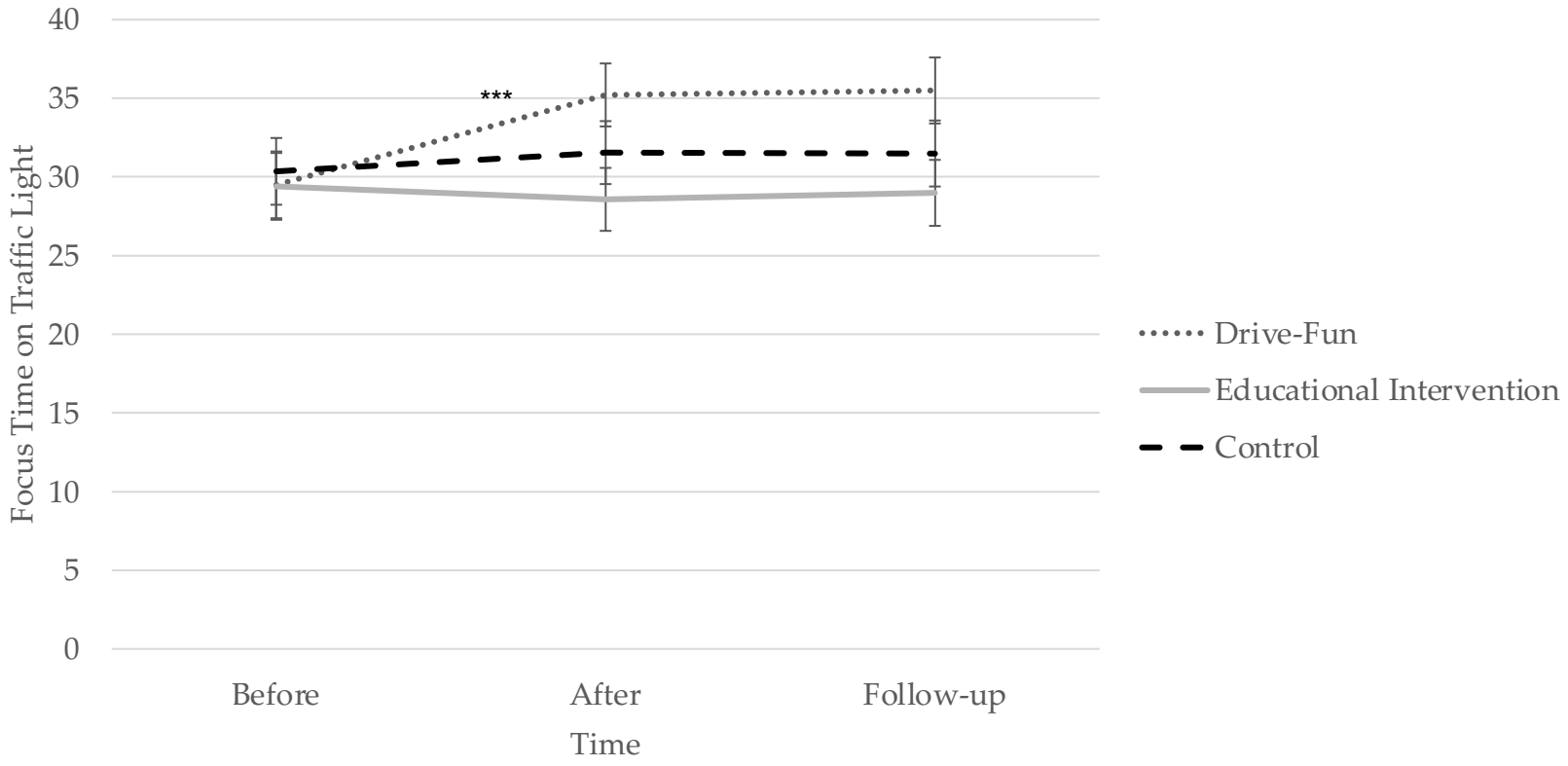
*** $p < .001$.

Notes. The error bars represent Std. Error.

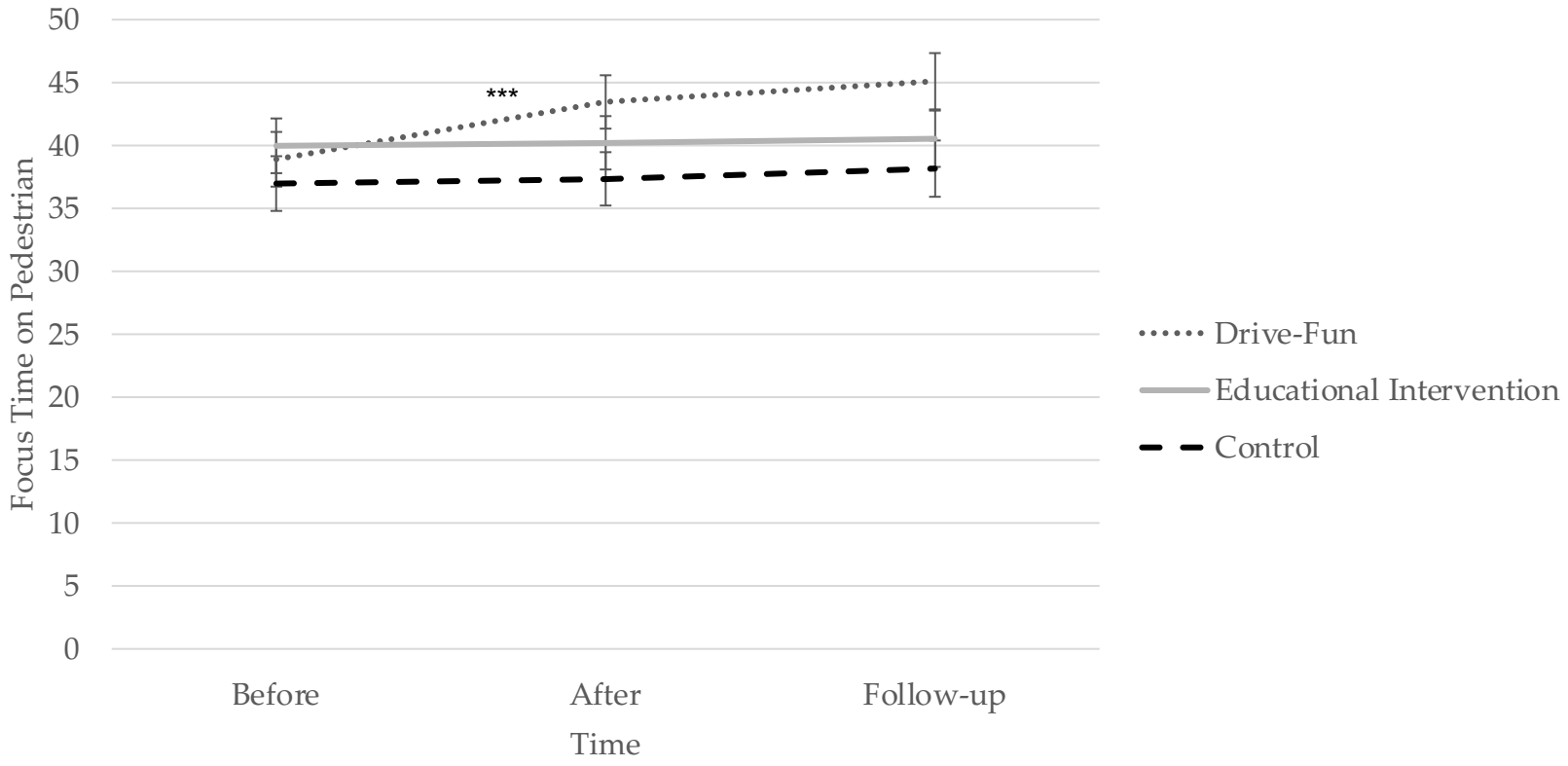
Focus Time on Traffic Lights by Study Groups and Time



*** $p < .001$.

Notes. The error bars represent Std. Error.

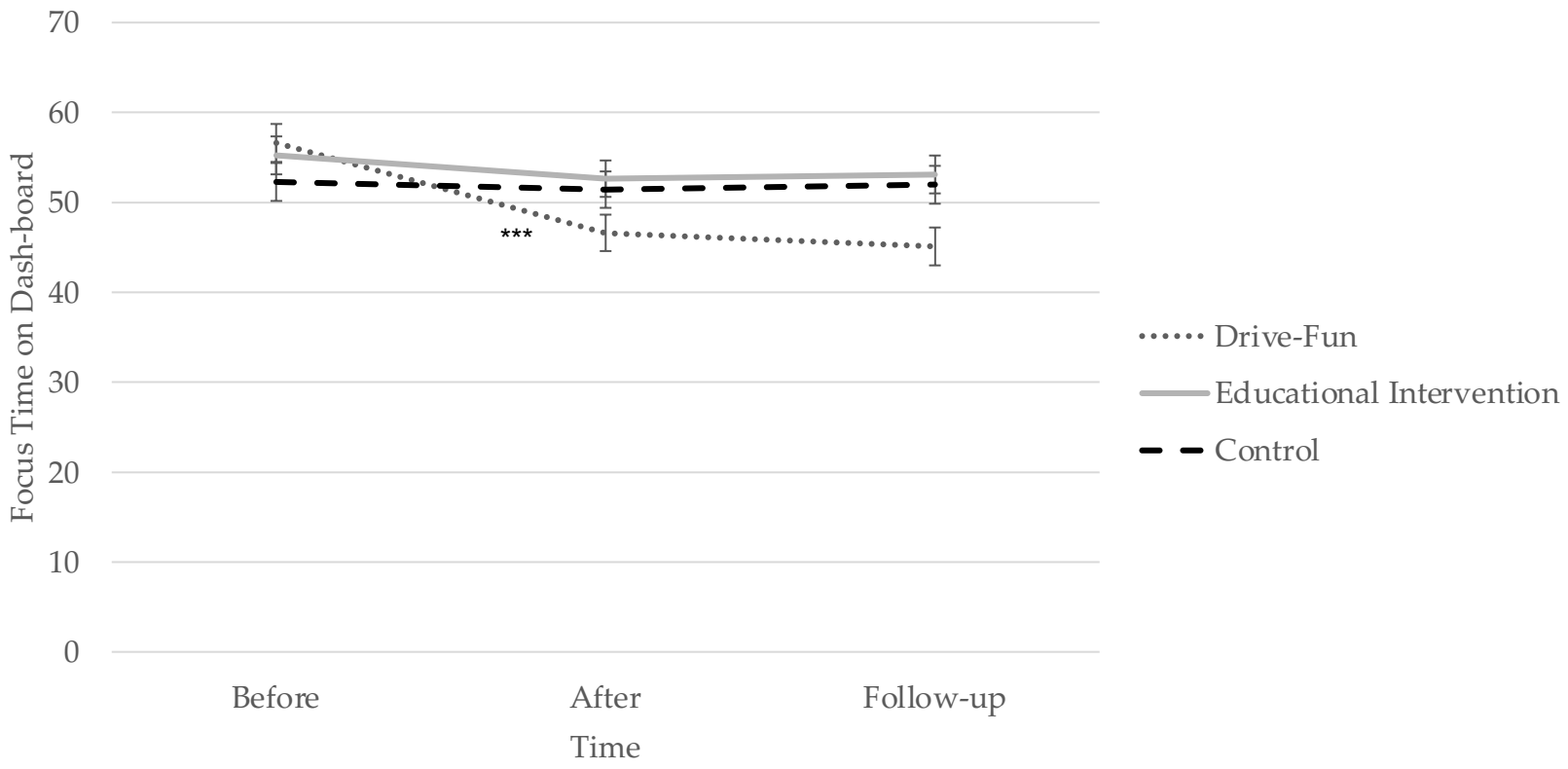
Focus Time on Pedestrian by Study Groups and Time



*** $p < .001$.

Notes. The error bars represent Std. Error.

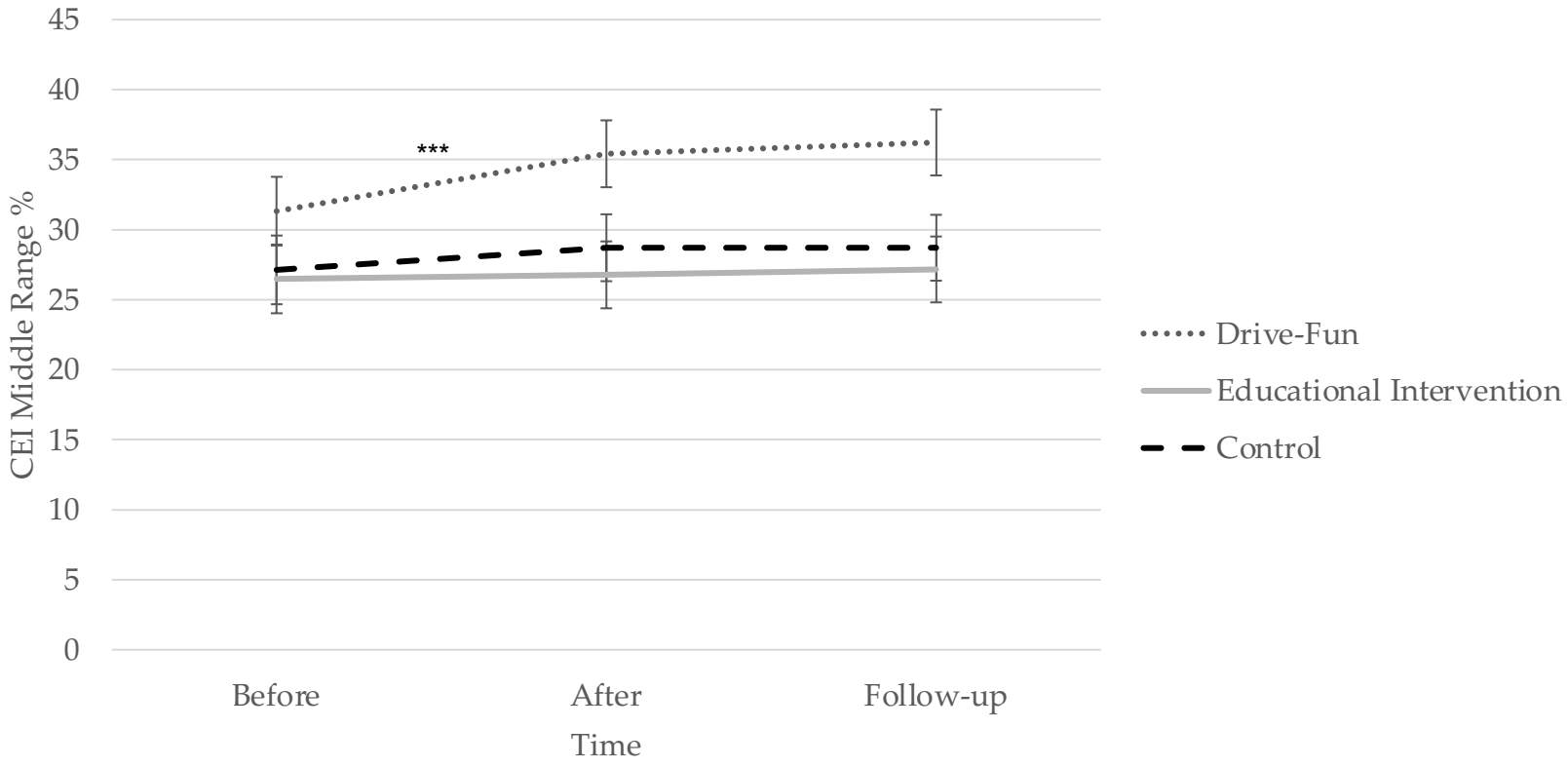
Focus Time on Dash-board by Study Groups and Time



*** p < .001.

Notes. The error bars represent Std. Error.

CEI Middle Range % by Study Groups and Time



*** $p < .001$.

Notes. The error bars represent Std. Error.

Limitations

1. **Potential for Experimenter Bias –** The intervention therapist knew the group assignments, which may have influenced implementation. However, two independent occupational therapists, blind to group allocation, conducted all participant assessments and a third OT did all the interventions.

2. **Use of the Same Driving Simulator for Training and Assessment –** though we were using different scenarios,

Conclusions

The Drive-Fun intervention effectively improves **driving performance on simulator** compared to the Educational and control group, it suggests that this approach may be a useful tool for **potentially improving road safety among adolescents with ADHD.**

Changes in focus time on relevant driving elements indicate improved attention allocation, helping participants prioritize critical road factors (Pedestrian, traffic lights etc).

The increase in Cognitive Effort Index (CEI) suggests that the intervention promotes **greater cognitive engagement** and the development of safer driving strategies.

References

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2. Monahan, M., Classen, S., & Helsel, P. V. (2013). Pre-driving evaluation of a teen with attention deficit hyperactivity disorder and autism spectrum disorder. Canadian journal of occupational therapy, 80(1), 35-41.

3. Pollak, Y., Shoham, R., Scheres, A., & Dekkers, T. J. (2023). ADHD and risk-taking behavior: Associations, mechanisms, and interventions. Clinical handbook of ADHD assessment and treatment across the lifespan, 295-332.

4. Peterson, B. S., Trampush, J., Maglione, M., Bolshakova, M., Rozelle, M., Miles, J., ... & Hempel, S. (2024). Treatments for ADHD in children and adolescents: a systematic review. Pediatrics, 153(4), e2024065787.

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Thank you

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