

# Six weeks of OBIE® Exergaming Improves Aerobic Capacity in Children & Adolescents with Attention-Deficit/Hyperactivity, Autism Spectrum & Fetal Alcohol Spectrum Disorders

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## Introduction

Children and adolescents with ADHD, ASD and FASD show deficits in cognitive function, specifically working memory, cognitive flexibility, response inhibition, planning, verbal fluency, and abstraction. In recent years, a growing body of literature has supported the growing role of exercise in improving cognition, notably executive function (EF). Standard of care behavioral and pharmacological treatments are meager and new or adjunctive approaches are therefore needed.

Many converging lines of research into the biological underpinnings of exercise-based improvements in EF have been elucidated. Currently, there is still a dearth of research examining the physiological effects of exercise on a neuro-anatomical level in this unique population; and this ancillary study will hopefully serve to narrow that knowledge gap. Understanding putative neurobiological mechanisms underpinning exercise-based improvements could potentially serve to guide future "exercise prescriptions" and other treatments for children with neurodevelopmental disorders such as ADHD, ASD and FASD.



Figure 1. Animation of OBIE® gameplay from the side of the mat with a 2D ceiling projector in the UC Fit-Digital Health Laboratory at UCLA.

## Purpose

This exploratory study aimed to determine if repeated exercise sessions (12 sessions; 2x/wk. @ 6 wks.) using the OBIE® Interactive exergaming platform will improve aerobic fitness in children and adolescents with neurodevelopmental disorders including ADHD, ASD and FASD. Through this novel, innovative gamified exercise it is hypothesized the participants will complete full training compliance and improve aerobic fitness since it will be engaging while fun, often difficult to achieve with this population.

## Methods



Figure 2. Fast Feet OBIE® gameplay - one of the more popular games amongst participants.

- A cohort of 8 participants (6 female; aged 9-13 years) were recruited from an ongoing clinical study with children and adolescents with neurodevelopmental disorders.
- Each supervised session was performed with between early evening at the UC Fit-Digital Health Laboratory at the David Geffen School of Medicine at University of California, Los Angeles (UCLA).
- Each participant completed a 6-minute walk test (6MWT) as a measure of their baseline and post-aerobic capacity.
  - A 30m walking course in length, marked every 3m, and participants were instructed to walk at their fastest pace for 6 minutes straight.
  - VO<sub>2</sub>max was determined using a validated, multiple regression analysis equation that required ending heart rate (Scosche heart rate forearm wearable) and total distance completed.
- The intervention included twelve, 1-hr sessions twice weekly for 6 weeks using the OBIE® Interactive exergaming platform while monitoring heart rate zones with an iPad iCardio® app (Figure 5)
- Two research associates would be present to encourage faster pace and change game difficulty (Figure 3) each session which resulted in progressive heart rate zone achievements



Figure 3. The participants got to play over 100+ games in their 12-session experience.

## Summary of Results

	All participants (n = 8)	Female (n = 6)	Male (n = 2)	
Age	Mean (SD)	11.4 (1.4)	11.3 (1.6)	11.5 (0.7)
	Range	9-13	9-13	11-12
Height (cm)	Mean (SD)	150.3 (12.0)	152.2 (13.4)	144.5 (3.5)
	Range	132-170	132-170	142-147
Weight (kg)	Mean (SD)	48.8 (12.9)	49 (15.0)	48 (5.7)
	Range	37-71	37-71	44-52
Bodyfat (%)	Mean (SD)	21.5 (3.9)	21.0 (4.1)	23.0 (3.9)
	Range	15.5-25.1	15.5-25.1	20.3-25.8

## Key Findings

- There was a 100% compliance rate among the 8 participants where all 12 sessions were completed.
- There was a 25% increase in aerobic capacity over the 6 wk.-training (Figure 4)
- The mean HR for each participant was 150 beats per minute and was maintained between 30-45 minutes for each session
- 85% of HR<sub>max</sub> was achieved in every session for all participants for at least 3-14 min
- On average, each participant increased by 10-20% the amount of time spent in higher HR zones as they progressed through each session.
- Participants reported that they felt "engaged" while it being "fun" and "feeling easy" for all sessions.
- Despite it "feeling easy", training intensity remained moderate-to-high for over two-thirds of every session session

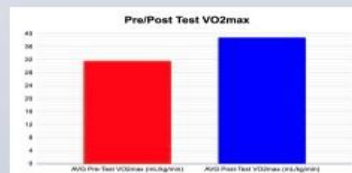


Figure 4. Average pre- and post-test VO<sub>2</sub>max values among the 8 participants.



Figure 5. Sample screenshot of iPad iCardio® app heart rate and % time in heart rate zone graphic after a 1-hr session of OBIE® gameplay

## Conclusion

- The OBIE® interactive exergaming platform is an emerging technology which has a potential role in improving physical fitness - aerobic fitness component measured in this study - and help with consistent exercise patterns in children with neurodevelopmental disorders such as ADHD, ASD and FASD.
- Many children and adolescents lack motivation when it comes to exercise. In particular, children with FASD/ADHD are often more prone to early exercise compliance, though there is typically an eventual dropout once they no longer 'enjoy' the activity. To combat the high dropout rates, exergaming such as OBIE® can be implemented to increase adherence and enjoyment among children and adolescents.
- Further investigations are needed to explore additional benefits of exercise such as body composition, muscular strength and endurance, and motor performance using the OBIE® Interactive exergaming platform.
- Finally, as this was an ancillary study to a bigger clinical trial, the effects of this small cohort 6-week exercise training on that trials endpoint outcome measure of Executive Function remains to be elucidated.

## References

References are available upon request.