Exercise Training Effects on Cognition and Well-Being in Neurodivergent College Students

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Introduction

Emerging evidence shows marked neural and cognitive changes after moderate-to-vigorous physical activity (PA) training regimes. Particularly noted are improvements seen in cognitive processes critical to academics, such as executive function (EF) and memory. Promoting PA holds tremendous promise as an intervention to enhance cognition and well-being, especially for populations with increased risk of EF challenge. There have been positive initial results in studies with ADHD, and ASD youth, however, little is known about the effects in college students with learning differences. Additionally, few studies have examined effects in real-world settings.

Project Goals

1) Demonstrate feasibility of testing within an existing exercise training program for students with learning differences.
2) Assess changes in behavioral measures of Executive Function and Long-Term Memory.
3) Assess changes in self-reported well-being measures on stress, overall well-being, self-esteem, and executive function.

Method

Participants

- 45 college students with documented learning differences
  - ADHD, Autism Spectrum Disorder (ASD), Specific Learning Disability (SLD), and comorbidities
  - Age: Range = 18-29 years old; Mean = 20.7 (SD = 2.48)
  - 31 Male, 14 Female (matches institution’s demographics)

Exercise group (n = 22): recruited from a high intensity interval training (HIIT) physical education (PE) course
- HIIT: Combination of cardio, strength, and balance exercises
- 75 minutes, twice per week
- 30-50 seconds at one station; 15-20 stations; 2-3 rounds

Control group (n = 23): not currently enrolled in a PE course or part of an athletic team during testing semester
- Even split between males and females in each group
- Identical Pre/Post assessments given 8-weeks apart
- Each assessment took ~ 30 minutes

Primary learning difference(s):
- 42% ADHD
- 18% ADHD & ASD
- 13% SLD
- 13% SLD & ADHD
- 11% ASD
- 2% Chose not to disclose

Design

Example HIIT circuit

Pre-Post Assessment Battery

Flanker Task (EF measure)

"Is the center arrow pointing left or right?"

Group x Time: F(1,43) = 4.44, p < .05

Incongruent Trial

Long-Term Memory Task

Learning session: Passive viewing of 60 images of household objects
- Each image presented for 3 seconds
- Recognition test: given ~25 minutes later
- 27% previously seen objects and 73% new objects presented
- Participants judge whether each object is “new” or “old”

Questionnaires

<table>
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<tr>
<th>Construct</th>
<th>Instrument</th>
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<tr>
<td>Stress</td>
<td>Perceived Stress Scale (PSS)</td>
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<tr>
<td>Overall-Well-Being</td>
<td>Personal Well Being Index (PWI)</td>
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<tr>
<td>Self-Esteem</td>
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<tr>
<td>Executive Function</td>
<td>Executive Function &amp; Regulation (EFR)</td>
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<tr>
<td>Physical Activity</td>
<td>International Physical Activity Questionnaire - (IPAQ-S)</td>
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Results

1) Successful implementation of project embedded in existing college curriculum
   - 45 of 52 (87%) recruited participants provided usable data from both sessions
2) Modest EF improvement seen in Exercise group; no group differences in memory
   - Flanker Effect: Accuracy
     - Time effect: (1,43) = 5.80, p = .02
     - Control: x Group x Time: F(1,43) = 4.64, p < .05
   - Memory Recognition: Accuracy
     - Time effect: (1,43) = 4.64, p < .05
     - Control: x Group x Time: F(1,43) = 4.64, p < .05
3) No interactions in stress or well-being; suggestive effects for self-esteem & EF
   - Perceived Stress
     - Group x Time (F.42) = 4.76, p < .05
   - Self-Esteem
     - Group x Time (F.42) = 4.76, p < .05
   - Reported EF Regulation
     - Group x Time (F.42) = 4.76, p < .05

Discussion

- Results support the potential for exercise training as an EF bolster for college-students with LD
- Practical challenges remain, e.g., students less willing to engage in traditional forms of exercise
- Tips for improving engagement: drawing on interests; social; short duration (7 min. HIIT app)

Resources


Special thanks to Todd Miller, Assistant Professor and Physical Education Coordinator at Landmark College, for designing and teaching the physical education (HIIT) course, and for general consultation on the project.