
**Clinical Bottom Line**

Individuals with intellectual disabilities are more likely than their same-aged peers to participate in lower levels of physical activity, have higher risk of obesity, and are at greater risk for developing chronic conditions in their lifetime. Young adults with intellectual disabilities face additional challenges due to limited opportunities for physical activity during their transition away from the school system and into employment. The current study examined the impact of moderate-intensity aerobic exercise on the cardiovascular fitness level and cognitive performance of young adults with intellectual disabilities.

Fourteen young adults (\(M = 19.4 \pm 1.3\) years) from a school for people with intellectual disabilities participated in this study, which examined the effectiveness of aerobic exercise on cognitive performance. Participants were involved in 45–60 minutes of aerobic exercise 3 days per week for 8 weeks. Participants were assessed for both cognitive functioning and aerobic fitness level before and after the aerobic exercise intervention. Results found that moderate levels of aerobic exercise increased aerobic fitness levels and cognitive functioning, in particular performance of cognitive tasks, discrimination among visual symbols, and processing speed. Participants had a 100% attendance rate for all sessions, which indicates their high interest level.

This study demonstrates that physical-activity interventions can increase cognitive performance and fitness levels for young adults with intellectual disability. As young adults transition away from the school system, employment becomes a main focus in their life. Cognitive performance and physical skills are essential for tasks required in the types of employment settings commonly attained by individuals with intellectual disabilities. Moderate physical activity can increase these skills, which may lead to an increased ability to gain future employment. Increases in cognitive ability may also increase independent living skills, such as money
management, cooking, safety, transportation, leisure participation, and more complex activities of daily living. Further studies regarding the impact of physical activity on cognitive performance are needed to determine the amount of activity needed to achieve increased cognitive performance. Additional research should also include control groups and randomization to allow for increased support for the influence of physical activity on cognitive abilities.

Occupational therapists are involved with the transition of young adults with intellectual disabilities from the school system into employment or other meaningful occupations. Clients who desire to gain and maintain meaningful employment can benefit from an increase in cognitive functioning and the ability to perform job-related tasks. Physical-activity interventions can be implemented as part of occupational therapy practice to increase cognitive ability and physical fitness, which are needed for many employment opportunities.

**RESEARCH OBJECTIVE(S)**

Determine whether an 8-week moderate-intensity aerobic exercise program will improve the cognitive functioning and cardiovascular fitness of young adults with intellectual disabilities

**DESIGN TYPE AND LEVEL OF EVIDENCE**

Level III: Quasi-experimental, pretest–posttest design

**PARTICIPANT SELECTION**

How were participants recruited and selected to participate?

Participants from a school serving children with intellectual disabilities in north central Florida volunteered to be involved with this study. Approval was obtained from teachers, physicians, and parents or legal guardians.

Inclusion criteria:

Participants in this study attended a school in north central Florida and had a mild to moderate level of intellectual disability. Participants needed to be physically able to perform activities included in the intervention, be able to communicate, and not have participated in organized exercise in the past 5 months.

Exclusion criteria:

Participants were excluded if they were unable to participate in the intervention. Problematic behavior in school also excluded participants from the study.
PARTICIPANT CHARACTERISTICS

N= 14

<table>
<thead>
<tr>
<th>#/ % Male:</th>
<th>#/ % Female:</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/64%</td>
<td>5/36%</td>
</tr>
</tbody>
</table>

Ethnicity: NR

Disease/disability diagnosis: Young adults (mean age = 19.4 ± 1.3 years) with mild to moderate intellectual disability (including Down syndrome, Prader–Willi syndrome, and autism spectrum disorders)

INTERVENTION AND CONTROL GROUPS

Group 1: Intervention group

Brief description of the intervention: Participants engaged in a wide range of resistance training and aerobic exercises aimed to maintain a moderate intensity level throughout the session. For the first 20 minutes of the session, participants performed four total-body circuit-training exercises, including two upper body, lower body, and core strength. The last 30–45 minutes included aerobic sport activities, such as noodle soccer, dance marathons, volleyball, and relay races.

The researchers monitored participants’ heart rate throughout each session to ensure that intensity of exercise was 60%–70% of maximum heart rate. Rest was individualized on the basis of participants’ fitness level and heart rate. Verbal cues and visual modeling by the exercise facilitator were used to grade the activities.

How many participants in the group? 14

Where did the intervention take place? At the participants’ school

Who delivered? Trained exercise facilitators

How often? Three times a week for 45–60-minute sessions

For how long? 8 weeks

INTERVENTION BIASES

Contamination:

YES □ There was no control group present; all participants received the intervention.
NO ☒

Co-intervention:

YES ☒
NO □

Participants also attended school programs, which might have influenced cognitive performance.

Timing of intervention:

YES □
NO ☒

The timing of the intervention was long enough to provide a noticeable effect but short enough that aging was not a probable factor in the results.

Site of intervention:

YES □
NO ☒

Intervention occurred at the school the participants were currently attending.

Use of different therapists to provide intervention:

YES □
NO ☒

Only one group was present in this study; therefore, all participants in that group received the intervention from the same therapists.

Baseline equality:

YES ☒
NO □

No control group in this study

**MEASURES AND OUTCOMES**

**Measure 1: Woodcock–Johnson III Tests of Cognitive Abilities**

<table>
<thead>
<tr>
<th>Name/type of measure used:</th>
<th>Three subtests of the Woodcock–Johnson III Tests of Cognitive Abilities: Visual Matching (Test 6B), Decision Speed (Test 16), and Pair Cancellation (Test 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What outcome is measured?</td>
<td>These three subtests examine broad cognitive ability and processing speed.</td>
</tr>
<tr>
<td>Is the measure reliable (as reported in the article)?</td>
<td>YES ☒ NO □ Not Reported □</td>
</tr>
<tr>
<td>Is the measure valid (as reported in the article)?</td>
<td>YES □ NO □ Not Reported ☒</td>
</tr>
<tr>
<td>When is the measure used?</td>
<td>Before and after intervention</td>
</tr>
</tbody>
</table>

**Measure 2: Young Men’s Christian Association Step Test**

<table>
<thead>
<tr>
<th>Name/type of measure used:</th>
<th>Young Men’s Christian Association (YMCA) Step Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>What outcome is measured?</td>
<td>Aerobic fitness, as measured by recovery heart rate</td>
</tr>
<tr>
<td>measured?</td>
<td>YES ☐</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>Is the measure reliable as reported in the article?</td>
<td>YES ☐</td>
</tr>
<tr>
<td>Is the measure valid as reported in the article?</td>
<td>YES ☐</td>
</tr>
<tr>
<td>When is the measure used?</td>
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</tr>
</tbody>
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**MEASUREMENT BIASES**

**Were the evaluators blind to treatment status?**

YES ☐

NO ☒

Evaluators were aware of the intervention, and no control group was evaluated in this study.

**Was there recall or memory bias?**

YES ☐

NO ☒

No measurements used recall of past experiences.

**Other measurement biases: (List and explain)**

**RESULTS**

**List key findings based on study objectives:**

- Participants had an average increase of 17.5% in aerobic fitness postintervention ($p < .002$).
- All three tests of cognitive functioning ($p < .002$) and processing speed ($p < .001$) significantly increased.
- Participants had a 100% adherence rate to the intervention, and there were no reports of injury or muscle soreness.
- Throughout the intervention, the mean exercise heart rate was 138 beats per minute (68% of the maximum heart rate), which confirms that the participants were involved in moderate-intensity exercise.

**Was this study adequately powered (large enough to show a difference)?**

YES ☐

NO ☒

The researchers did not complete a power analysis to determine the minimum number of participants required to assess the effectiveness of the intervention. Fourteen participants were included in this study.
Were the analysis methods appropriate?

<table>
<thead>
<tr>
<th>YES ☒</th>
<th>NO ☐</th>
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<tbody>
<tr>
<td>The appropriate statistical analysis was used.</td>
<td></td>
</tr>
</tbody>
</table>

Were statistics appropriately reported (in written or table format)?

<table>
<thead>
<tr>
<th>YES ☒</th>
<th>NO ☐</th>
</tr>
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<tbody>
<tr>
<td>Cumulative statistics were provided identifying changes in pre- and postintervention scores for aerobic fitness levels, cognitive functioning, and processing speed. Pre- and postintervention scores were also provided in written and table format for each participant in each cognitive performance test.</td>
<td></td>
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</table>

Was participant dropout less than 20% in total sample and balanced between groups?

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<tr>
<th>YES ☒</th>
<th>NO ☐</th>
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<tbody>
<tr>
<td>Sixteen participants were originally selected for the study; 2 participants were excluded after pretests but before the beginning of intervention because of behavior problems. Dropout rate was 12.5%.</td>
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</tbody>
</table>

What are the overall study limitations?

Limitations of this study included lack of a control group and a small sample size (n = 14). Because there was no control group included in this study, we are unable to determine whether the outcomes were due to the intervention or outside factors, particularly supports offered through the school environment. In addition to these limitations, 11 of the 16 participants had previously participated in a program similar in nature to this intervention, which might have influenced the results. The YMCA Step Test was chosen for its ease of use. Other measures might have more accurately determined aerobic fitness levels.

Selection bias might also have been present. Participants volunteered to participate in this study, and 2 participants were excluded because of problematic behavior. These concerns with selection limit the generalizability of this study to other people with intellectual disability—in particular, behavioral challenges. It is unclear whether young adults with intellectual disability and behavioral challenges would have had the same cognitive benefits from this intervention. In addition, participants were independently selected to be in the study. Participants who elected to participate might have been more interested in physical activity and therefore had a higher attendance rate.

This study also focused on young adults with intellectual disabilities. It is unclear whether these benefits would also have been present for younger or older people with intellectual disability. Further research is needed to determine the generalizability of the results to other populations or age groups.

CONCLUSIONS
State the authors’ conclusions related to the research objectives.
This study suggests that moderate-intensity exercise can improve the cognitive functioning of young adults with intellectual disability. Participants increased aerobic fitness levels with this intervention. Future studies should explore the dose–response relationship between exercise and cognition. Future studies should also examine the effectiveness of physical activity in helping people with intellectual disability in community integration. Moderate-intensity exercise programs are appropriate to implement because of participants’ ability to adopt them.

This work is based on the evidence-based literature review completed by Rachel Eggers, OTS, and Karla Ausderau, PhD, OTR/L, faculty advisor, University of Wisconsin, Madison.


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