Information Manual:
Antecedent Exercise for Individuals Diagnosed with Autism to Decrease Stereotypic Behaviors

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Exercise Benefits

Exercise is associated with a variety of physical and emotional health benefits including:

- Maintenance of a healthy body weight
- Improved fitness and cardiovascular health
- Increased strength
- Improved self-confidence
- Greater focus
- Feelings of happiness

Exercise can easily be incorporated into everyday life and is often a compulsory activity in daily school schedules. It has also been shown to have positive effects for individuals diagnosed with Autism Spectrum Disorder (ASD) who display severe stereotypic behaviors.

Antecedent Exercise

Some individuals with ASD may display stereotypic behaviors such as hand flapping or rocking that can negatively impact their learning and social interactions. Aerobic exercise has been shown to decrease these negative behaviors without reducing other, potentially appropriate, behaviors.

Antecedent refers to the exercise condition occurring before a session, such as seated schoolwork. A benefit is that the antecedent condition does not interrupt a given lesson or activity.

Potential Barriers to Exercise

Some types of exercise can be difficult for individuals with ASD due to the gross and fine motor coordination that may be involved and skill deficits may exist. It may be useful to consult with a Physiotherapist or Occupational Therapist if large deficits in these skills are observed. In addition, these individuals are often sedentary when compared to their peers and therefore may not be able to perform for the same durations or at the same intensity due to a lack of endurance. If the individual has been extremely sedentary, it is important to get exercise approval and recommendations from a physician. Low motivation can also be a barrier to exercise.

Skill Level

Choose an activity that requires minimal coordination and begin at the individual’s skill level. It would be ideal to begin with an activity that is already in the individual’s repertoire. Determine a baseline duration that the individual can perform successfully. Increase the skill level/duration required systematically.
Individual Activity

Choose an activity that does not require the individual to follow or understand the rules of a team sport but rather, can be done on their own.

Teach Skills

When an activity is not currently in the individual’s repertoire, teach the skills separately that would allow them to participate. Make adaptations or modifications as necessary. For example, strap the individual’s feet on the stationary bike if their feet constantly slip off while pedaling.

Setting Up a Reinforcing Exercise Environment

Reinforcement may be required initially for motivation and can occur in a variety of ways.

- Token economy: the individual receives a token for a certain amount of time or distance completed. They can then trade in these tokens for a reinforcer afterwards.
- Edible reinforcement: the individual receives a small piece of a preferred edible based on duration or distance completed.
- Social praise: Another individual can provide encouragement or motivation to the exercising individual in the form of clapping and/or verbal praise (ie., “good job”, “keep up the great work”).
- Other: In some cases, stationary bikes have been outfitted so that when pedaling occurs, music or flashing lights commence.

It is important that the reinforcement be thinned or decreased as the child progresses. It is also important to note that it has been found that a variable ratio of reinforcement produces higher rates of responding when compared to a fixed ratio. Therefore, it may be beneficial to provide reinforcement at different intervals rather than the same interval each time.

Prompts

The teacher, aide, or parent may need to take part in the activity with the individual in order for the exercise to occur and/or for it to be executed correctly.

- Visuals: When a session order or specific route is required, a visual representation of the order of events or direction in which the individual is expected to travel can be helpful. Cones or other markers signaling boundaries and/or when to change direction can also be used.
- Verbal Instructions: These can occur prior to or during the activity to provide direction or correction to the individual exercising.
- Partial Physical: This type of prompt may be required during the acquisition of a skill as it can help the individual to learn the motor movement required.
Type and Duration

Aerobic Exercise

Vigorous aerobic exercise is the prescribed antecedent exercise to decrease stereotypic behaviors. Aerobic exercise happens for a relatively long period of time and involves the large muscle groups. It targets the cardio-respiratory system, which is made up of the heart and lungs. Some research has shown that when antecedent exercise that requires the body parts the individual uses during stereotopy, greater positive effects are seen.

While the optimal duration of exercise is unclear, 10 to 20 min seems is common in the literature. Jogging has been conducted in the majority of the studies. The table below shows approximate equivalent durations for other aerobic activities that were calculated based on metabolic equivalents (METS). METS quantify the energy expended during an activity.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Duration (minutes)</th>
<th>Pre-Requisite Skills</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jogging</td>
<td>10-20</td>
<td>If correct form is required, contralateral (ie. Left leg and right arm) movement of the arms and legs</td>
<td>None</td>
</tr>
<tr>
<td>Cycling (stationary)</td>
<td>20-40</td>
<td>Ability to push down on the pedal with each leg continuously.</td>
<td>Stationary bike</td>
</tr>
<tr>
<td>Cycling (road/trail)</td>
<td>20-40</td>
<td>With training wheels: ability to push down on the pedal and steer the bike</td>
<td>Bicycle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Without training wheels: Balance, push down on the pedal, steer.</td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td>10-20</td>
<td>Have at least one swim stroke in their repertoire.</td>
<td>Swimming Pool</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Understand pool safety</td>
<td></td>
</tr>
<tr>
<td>Ice Skating/Roll erblading</td>
<td>30- 60</td>
<td>Ability to balance. Coordination of legs to push off of each foot.</td>
<td>Skating rink or Rollerblades</td>
</tr>
<tr>
<td>Soccer</td>
<td>15-25</td>
<td>Ability to kick a moving ball</td>
<td>Soccer ball</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coordination to dribble a ball</td>
<td>Open space</td>
</tr>
<tr>
<td>Jumping on a trampoline</td>
<td>15-25</td>
<td>Coordination of the legs to jump with two feet at the same time.</td>
<td>Trampoline</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Postural control to maintain position in the air.</td>
<td></td>
</tr>
<tr>
<td>Circuits</td>
<td>15-25</td>
<td>Potentially none if all activities in the circuit are in the individual’s repertoire.</td>
<td>Dependent on the circuit activities</td>
</tr>
</tbody>
</table>
Other Considerations

Individuals should begin with a minimum 2 to 3 minute low intensity warm-up. For example, a fast walk before jogging.

If a child does not have the endurance to exercise for the prescribed duration, short breaks of lower intensity can be done. For example, walk instead of jog or decrease revolutions per minute on the bike.

After the prescribed duration is complete, a 2 to 3 minute low intensity cool down is recommended.

Stretching

Inclusion of simple stretches of the muscle groups used during exercise is also recommended to ensure flexibility and range of motion and to decrease risk of injury. Holding the stretch for 30 seconds is suggested.

A stretch sequence can include:

- Calf stretch (back of lower leg)
- Hamstring stretch (back of upper leg)
- Quadriceps stretch (front of upper leg)
- Hip flexor stretch (upper thigh)
- Lower back stretch
- Shoulder stretch
- Neck stretch

See the “Stretching” section of the Appendix for resources.

Measurement

Studies have measured “vigorous” in different ways.

- Elevated heart rate
- Revolutions per minute
- Increased breathing rate, flushed face, sweating

Elevated breathing rate would require a reading of the individuals resting heart rate. In addition, calculations would need to be done in order to attain the individual’s working heart rate. A heart rate monitor that the exercising individual wears can make this process simpler as you do not need to rely on an individual to calculate the heart rate. It may be best to consult a physician, especially if the individual is mainly sedentary.

Revolutions per minute are the number of times the individual make a complete cycle in one minute. This can be counted automatically on a stationary bike.
Increased breathing rate, flushed face, and sweat are monitored directly. One would need to have some sense of the individual’s resting breathing rate and skin coloration.

Talk tests are also used to measure exercise intensity. Vigorous activity is measured when the individual is only able to say a few words at a time before need to pause for a breath.

**Changes Over Time**

It is important to note that the individual’s cardiorespiratory system will improve over time signally that the intensity or duration will need to be changed. The intensity can be increased a in a variety of ways including:

- Increase the distance given the same amount of time
- Increase the tension (on a bike)
- Require a greater number of revolutions per minute (on a bike)

It may be useful to incorporate some basic technology to assist the exercising individual track exercise performance.

- Pedometers: Clipped onto the individual, they measure the distance traveled by counting the number of steps of the individual.
- Timer: This can be used in conjunction with the pedometer to track distance traveled over time.
- Apps: Many apps can track exercise and then graph the data to show activity levels and progress. They can be used in conjunction with wristbands that the individual wears during exercise. See the appendix for more details.

**Lasting Effects**

The greatest effects are observed immediately following the exercise condition but it is unclear how long the effects produced by antecedent exercise persist. Some studies have found the duration to be 75 to 90 minutes while others found that the behavior returned in a shorter amount of time (ie., 30 minutes). Another study observed that while the maladaptive behavior did increase over time, it did not reach baseline levels after 40 minutes.
**Sample Schedules**

**Sample School Schedule (Elementary School):**

- Jog prior to bell ringing
- Concentrated seated work - ie., Math (9-9:40)
- Gym class (9:40 – 10:10)
- Concentrated seated work - ie., Social Studies (10:10- 10:30)
- Recess/Break – ie., playing soccer, running, climbing on jungle gym (10:30 – 10:45)
- Concentrated seated work – ie., Science (10:45 – 11:25)
- Unstructured activity – ie., Science experiment (11:25 – 11:45)
- Free time (11:45- 12:00)
- Lunch and lunch break/recess – (12 – 12:45)
- Concentrated seated work- ie., Language Arts (12:45 – 1:20)
- Unstructured activity – ie., Literacy practice on the computer (1:20-1:40)
- Circuits/Stationary Bike/Jog (1:40-1:55)
- Concentrated seated work – ie., One on one Direct Instruction  (1:55-2:35)
- Unstructured activity – ie., Art (2:35-3:00)

**Afterschool:**

Determine when it would be most beneficial for the individual’s stereotopy to be reduced and then pick some activities (look to the table to ideas) to do prior to these times. For example:

- Bike ride
- Homework
- Jump on trampoline/Run around back yard
- Dinner time

**Weekend Schedule**

Again, determine when a reduction in stereotypic behaviors would prove to be most beneficial during the day and plan aerobic exercise beforehand. For example:

- Swimming and then grocery shopping
- Skating and then a family meal at a restaurant
Appendix

Antecedent Exercise for Stereotopy Reduction


Exercise Promotion


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Fitness Apps

http://www.fitbit.com/home

http://runkeeper.com

https://secure-nikeplus.nike.com/plus/

General Exercise Information


http://www.participaction.com