

# ACQUIRED BRAIN INJURY AND EXERCISE

## PROFESSIONAL

### WHAT IS ACQUIRED BRAIN INJURY?

Acquired brain injury (ABI) is a term describing any damage to the brain that occurs after birth. Causes include trauma resulting from an external force (e.g. a direct blow to the head, crush injury or penetration injury), hypoxia (lack of oxygen to the brain), substance abuse (e.g. alcohol), and tumours or infections (e.g. meningitis). In 2009 in Australia, the incidence of moderate-to-severe traumatic brain injury – a sub-set of ABI – was 2500/year, almost nine times the incidence of spinal cord injury.

There are two other major causes of ABI – stroke and neurodegenerative conditions such as Multiple Sclerosis (MS) and Parkinson's disease (PD). However, these types of conditions have unique exercise implications and therefore are not addressed here.

The consequences of ABI vary considerably, but primary determinants are the area/s of the brain injured and the severity of the injury. Other determinants include age at the time of injury, time since injury and the social support systems available (e.g. family support, community resources). The consequences of ABI are more convoluted, including:

- Cognitive impairments, which affect nearly all people with ABI, most commonly; memory, attention and arousal (e.g. lethargy, fatigue, distractibility); language and communication (e.g. dysnomia and difficulty with high-level language); and planning/organisation (e.g. keeping appointments or goal setting).
- Physical impairments such as impaired strength, hypertonia (increased muscle tone), contracture, ataxia (impaired coordination and balance), seizure disorders and pain.
- Behavioural impairments including disinhibition (a lack of acceptable social restraint), impulsivity, reduced insight and egocentricity. These impairments frequently have significant social consequences.
- Social isolation, which can be profound even in mild ABI. For example, a high proportion of people with ABI have difficulty forming and maintaining close personal relationships and most families of people with ABI experience significant disruption. Unemployment among people with ABI is very high.
- Mental health consequences, the most common being clinical depression, which affects nearly 50% of people with ABI. The incidence tends to be higher among those with mild to moderate impairments, because these people are more likely to retain good personal insight.

The functional profile of a person with ABI varies enormously. From someone who, for example, mobilises with a motorised wheelchair, is non-verbal and depends on personal support for instrumental tasks of daily living, to someone who is fully independent and successful in employment, education, self-care, personal mobility and personal relationships.

It is important to note that the evidence presented in this factsheet is relevant for people with ABI who have been discharged from hospital and who undertake exercise similar to that undertaken by the general population. Evidence relating to inpatient rehabilitation and specific neurological rehabilitation techniques (e.g. body weight supported treadmill training, movement constraint therapy and Functional Electrical Stimulation) is not reviewed.

### HOW DOES EXERCISE HELP?

Evidence indicates that people with ABI are among the most physically inactive members of society. Furthermore, among people with ABI, those with high support needs are less active than those with mild to moderate impairments. This profound physical inactivity is very harmful for health, fitness and function, and compounds the consequences of ABI. Overall, scientific evidence indicates that:

- Aerobic exercise (e.g. walking, jogging, swimming or wheelchair pushing) enhances cardiorespiratory fitness. The quantity required for good health is similar to the general population.
- Resistance training improves muscular strength. The quantity required for good health is similar to the general population although, it should be noted that evidence indicates that many people with ABI are affected by spastic hypertonia, which may mediate responses to strength training.
- Regular exercise can improve measures of function, such as sit-to-stand, self-selected walking speed and walking duration. The most effective exercises are those that are task-specific. Exercise that is generic and not task specific may improve cardiorespiratory fitness and/or strength, but not enhance measures of function.
- Exercise can alleviate depressive symptoms as well as improve other aspects of mood and quality of life.

## WHAT EXERCISE IS BEST FOR PEOPLE WITH ABI?

Because the function of people with ABI population is extremely varied as well as the quantity and quality of research being limited, specific and prescriptive recommendations for exercise programs are not possible. However, some general recommendations can be made as people with ABI are particularly inactive therefore, health professionals should strongly encourage people with ABI to be as physically active as they can be. For optimal health, it is recommended that people with ABI accrue the same volumes of aerobic and strength exercise as the general population;

- Aerobic exercise: >30min of moderate-intensity aerobic activity on >5d/wk or >25min of vigorous-intensity on >3d/wk;
- Strength exercise: for major muscle groups, three sets of 8-10 repetitions resistance exercises at moderate intensity;

These recommendations will initially be unachievable for many people with ABI, particularly those with severe mobility impairments, multiple comorbidities and/or for those who have been inactive for extended periods. Therefore, it is recommended that an Accredited Exercise Physiologist is involved in the program design so that they may use their knowledge, skills and experience to ensure that initial training volumes and subsequent increases in training volume are individually tailored for the client.

Individuals with ABI who have moderate to profound disabilities should undertake exercise programs tailored according to;

- the type of impairment/s,
- the severity of impairment/s,
- their interests,
- and the available social support and community access.
- people with altered joint mechanics (e.g. resulting from contracture or altered muscle tone) can undertake strength training with weights, but joint health (e.g. pain, swelling) should be monitored.
- exercise programs for people with functional goals (e.g. improved sit-to-stand or walking speed) should incorporate functional activities.
- where possible, exercise which provides opportunities for social interaction should be encouraged.



## RELATED INFORMATION AND REFERENCES

Exercise is Medicine Australia [www.exerciseismedicine.org.au](http://www.exerciseismedicine.org.au)

Exercise Right [www.exerciseright.com.au](http://www.exerciseright.com.au)

Find an Accredited Exercise Physiologist [www.essa.org.au](http://www.essa.org.au)

Brain Injury Australia [www.bia.net.au](http://www.bia.net.au)

Synapse Inc [www.synapse.org.au](http://www.synapse.org.au)

If you have any concerns about the safety of your patient in commencing an exercise program, please consider referral to a Sport and Exercise Physician.

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