

Special populations

Principles of anatomy, physiology and fitness

Body types (somatotypes)

Ectomorph

Tall and thin.
Low body fat.
Low muscle tissue.
Find it difficult to gain weight.
Typical distance-runner physique.

Mesomorph

Lean and muscular.
Low body fat.
Naturally athletic.
Typical sprinter physique.

Endomorph

Apple- or pear-shaped.
High body fat.
Low muscle tissue.
Typical shot-putter physique.



Key role boundaries for special populations

- Any medical conditions must be signposted to a GP for clearance prior to participation, and work with a specialist instructor may be required.
- Apparently healthy special populations with no medical conditions can participate with appropriate adaptations.
- To work with any special population on a regular basis requires additional qualifications.



Physiological considerations for young people

Hormone production in puberty leads to muscle mass increases (25% at birth to 40% BW in adulthood).

A growth spurt may affect the child's ability to coordinate as a result of the time taken for the NM system to adapt.

Anaerobic capacity does not fully develop until approx. 20.

Growth spurts in girls occur between 12 and 13, and in boys between 14 and 15.

Girls tend to stop growing by approx. 18, and boys by approx. 20.

Growth-plate fractures may be a concern during growth-spurt period.

Cardiac output and BP is lower.

Heart rates are higher.

Guidelines for young people

Key areas for consideration include:

- Growth-related issues.
- Flexibility.
- Stage of anatomical and physiological development.
- Suitability of equipment.



Can develop for no apparent reason.

- Overuse of the quadriceps muscles may be a common cause.
- Repeated strain on the attachment of the patellar ligament to the growing tibia.
- The growing tibia isn't quite strong enough to withstand the strain
- Can cause redness and soreness where the ligament attaches. In some cases, a small flake of bone is pulled off the tibia by the pulling ligament.
- Healing bone (callus) then forms which may cause a hard bony bump to develop.



Sever's Disease



Usually occurs during the growth spurt of adolescence
8 and 13 for girls and 10 and 15 for boys.
Sever's disease rarely occurs in older teens

Growth-related issues

Avoid:

- Excessive training, for example, playing too much of one sport.
- Playing the wrong sport for their body type.
- Using weights that are too heavy in resistance training.
- Inappropriate size matching in pairs.
- Excessive stationary high-impact moves.

Always:

- Teach an appropriate warm-up and cool-down.
- Provide appropriate equipment for the activity (correct size, weight, etc.).
- Focus on technique before intensity or complexity.

Flexibility

The aim should be to stretch only to the point of mild tension and to avoid overstretching.

- During growth spurts, muscle growth does not keep up with bone growth rates.
- The soft tissue around the joints is already stretched, so the risk of injury is increased.



Cardiovascular and respiratory systems

Avoid high-intensity training, because of:

- Lower cardiac output and stroke volume.
- Higher heart rate and respiratory rate.
- Lower blood pressure.

Avoid increased risk of heat stress and dehydration, by:

- Ensuring adequate hydration.
- Low-intensity, varied warm-up.
- Incorporating active rests in between bouts of vigorous activity.

Exercise guidelines for young people

Frequency

Aerobic – every day.

Strength – three days a week.

Bone strengthening – three days a week.

Intensity

Moderate-to-vigorous-intensity aerobic exercise.

Time

60 minutes.

Type

Cardio – swimming, dancing, cycling, running, walking.

Strength – climbing trees, games (tug of war), as well as resistance exercises.

Bone strengthening – jumping, running, skipping, hop scotch and games (basketball, tennis, etc.).

Physiological considerations for pre and postnatal clients

Relaxin softens connective tissue, affecting joint stability.

Pelvic floor and abdominal muscles may be weakened during and after pregnancy.

Heart rate, stroke volume and cardiac output increases.

Changing shape during pregnancy may affect the ability to coordinate as a result of the time taken for the NM system to adapt.

Posture may be hyperlordotic and hyperkyphotic.

Woman may be fatigued, nauseous or dizzy, particularly in the first few months of pregnancy.

Contraindications for pre and postnatal clients

Relative

- Severe anaemia.
- Unevaluated cardiac dysrhythmia (irregular beating of the heart).
- Chronic bronchitis.
- Poorly controlled type 1 diabetes.
- Extreme morbid obesity.
- Extreme underweight.
- History of extremely sedentary lifestyle.
- Growth restriction in current pregnancy.
- Orthopaedic (skeletal) limitations.
- Poorly controlled seizure disorder.
- Poorly controlled hyperthyroidism.
- Heavy smoking.

Absolute

- Heart disease.
- Lung disease.
- Incompetent cervix.
- Risk of premature labour.
- Persistent second- or third-trimester bleeding.
- Placenta previa (low-lying placenta) after 26 weeks' gestation (into pregnancy).
- Premature labour during current pregnancy.
- Ruptured membranes.
- Preeclampsia (pregnancy-induced hypertension).

Active iQ

ACSM, 2017

Guidelines for pre and postnatal clients

- Guidelines relate to normal, healthy, adult women experiencing a normal, healthy, single pregnancy.
- In most cases exercise is safe for both mother and baby.
- Exercise at appropriate intensity is not associated with adverse pregnancy outcome.



Changes through pregnancy

Trimester 1	Trimester 2	Trimester 3	Post birth
Increase in weight + 1-3kg	Increase in weight + 6-8kg	Increase in weight + 3-4 kg	Avoid physical stress for 2 weeks (ACOG)
Breasts and uterus start to enlarge	Postural changes	Tired more easily	Return to activity normal birth (6 weeks)
Hormonal changes commence, e.g. increased relaxin affecting ligaments	Possible low back pain	Venous return may be reduced	caesarean birth (12 weeks)
Morning sickness	Abdominal muscles lengthen and stretch as baby grows	Weight of baby presses on pelvic floor	Hormone levels still high (up to one year)
Possible fatigue	Change in centre of gravity	Pelvic girdle less stable	Weaker pelvic floor
		Increased lordotic curve	Diastasis rectii

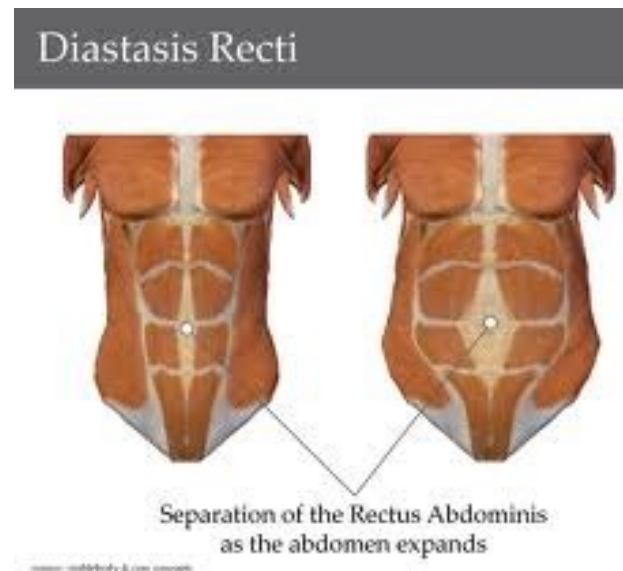
Pre natal considerations

- Is client new to exercise? (if so suggest a defer until after the birth)
- Consider a specialist qualification for pre and post natal
- Extra caution if client has previously miscarried or had a prem baby
- Internal pressure can result in a feeling of core strength
- Diastasis recti means caution against (i.e. eliminating for L2)
 - oblique or rotation work
 - no head raised, no leg lowering –
 - advise to see GP
 - can offer splinting for rotation (**with specialist qual**)

https://www.youtube.com/watch?v=I_16JnO3aHw

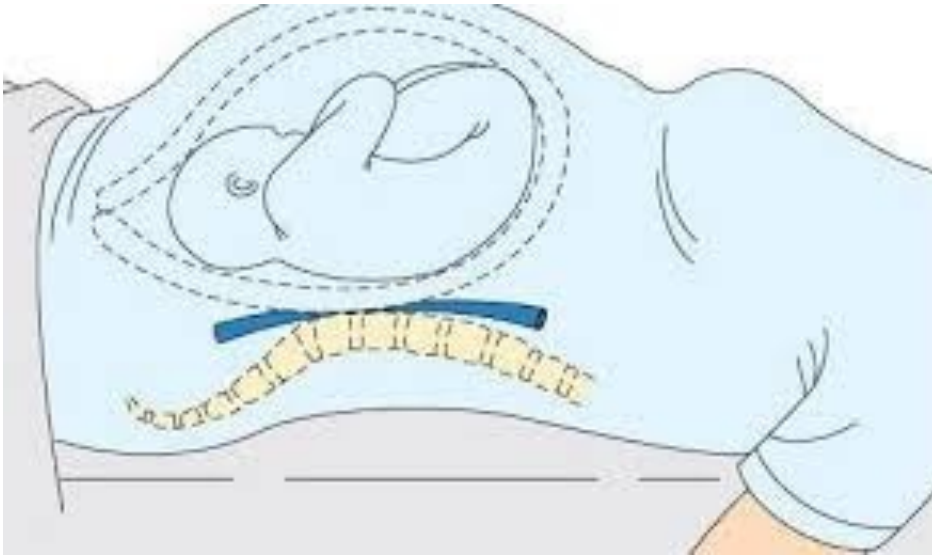
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Supine work

- Eliminate after the 1st trimester



Dizziness and a drop in blood pressure

Supine hypotensive syndrome

Caused when the weight of the uterus, infant, placenta, and amniotic fluids compress the inferior vena cava, reducing return of blood to the heart and cardiac output.

Postnatal guidelines

- Avoid physical stress for two weeks (ACOG).
- Return to activity:
 - Normal birth (six weeks).
 - Caesarean birth (12 weeks).
- Hormone levels still high (up to one year).
- Weaker pelvic floor.
- Pelvic girdle less stable.
- Check for diastasis recti.
- Rectus abdominis is mechanically weaker for at least 12 months.



Guidelines for pre and postnatal clients

AVOID

- Exercising in the supine position after 16 weeks.
- Prolonged, motionless standing.
- Heavy, uncontrolled, isometric or prolonged resistance work above the head.
- Leg adduction and abduction against a resistance.
- Loaded forward flexion.
- Rapid changes of direction, position and uncontrolled twisting.
- Exercise with a risk of falling or abdominal trauma.
- Excessive and uncontrolled de-stabilisation techniques.
- Abdominal exercises (focus on posture and pelvic floor).



Guidelines for pre and postnatal clients

- Emphasise correct posture.
- Make movements slower and more controlled.
- Use full range of motion mobility exercises to warm the muscles up.
- Build up intensity of movements much more gradually to avoid sudden increases in blood pressure.
- Use supported stretch positions and move to a comfortable range of motion.
- Use low to moderate intensity and low impact.
- Use more gradual build-up and lowering of intensity.
- Women who are unused to exercise should start with shorter durations (begin with 5 minutes and increase to 30 minutes).
- Maintain adequate hydration.
- Avoid exercising in very hot or humid conditions.
- Avoid heart-rate monitoring – use the talk test.

Guidelines for pre and postnatal clients

- Include exercises for the pelvic floor muscles.
- Avoid supine and prone lying (second trimester onwards).
- Select comfortable starting positions.
- Avoid exercises that place too much pressure on the pelvic girdle.
- Use movements related to everyday life.
- Perform fewer repetitions.
- Use lower and less intense exercises.
- Do not use heavy abdominal exercises; sit-up, crunch or oblique cross-over exercises are not an appropriate choice for abdominal muscle re-education post-birth.
- Include specific relaxation work.
- Avoid positions that may over-stretch the ligaments.
- Select balanced and comfortable positions for passive stretching.
- Use shorter-hold stretches to maintain rather than develop flexibility.

Physiological considerations for older adults

Heart muscle and blood vessels become less extensible and blood pressure increases.

Proportion of fast twitch muscle fibres decrease.

Muscle mass is lost (sarcopenia).

Joint structures degenerate (osteoarthritis).

Ligaments and connective tissue thickens and loses elasticity.

Tidal volume decreases and residual volume increases.

Bone density decreases and may lead to osteoporosis.

Considerations for older adults

- Reduced muscular strength and endurance.
- Reduced coordination and movement speed.
- Reduced flexibility and range of motion.
- Reduced balance, coordination and postural stability.
- Bones less resilient to stress and more susceptible to fracture.
- Stiffer, less mobile joints and reduced shock absorption.
- Lower MHR and THR and lower anaerobic threshold.
- Slower recovery rate.



Osteoporosis

- One in every 2 women and 1 in every 4 men will suffer an osteoporosis-related hip, spine or wrist fracture during their lives.
- 1 in every 2 women has low bone density and is at risk for fracture
- Fractures can occur spontaneously or through such e.g. opening a stuck window, lifting a light object from the floor with a rounded thoracic spine or even just coughing or sneezing.

National Osteoporosis Foundation [NOF] 2005)
Cummings & Melton 2002; Keller 2003

Active iQ

Guidelines for older adults

- Longer, more gradual warm-up and cool-down.
- More mobility.
- Slower, controlled and simpler movements.
- Focus on posture and correct technique.
- Lower impact and intensity.
- Longer, more gradually tapered cool-down after the aerobic training component.
- More time for transitions, for example, floor to stand.
- Avoid extreme spinal flexion.
- Strengthen postural muscles, pelvic floor and potential fracture sites.



Disability

‘An umbrella term covering impairments, activity limitations and participation restrictions.’

(World Health Organization)

- **Impairment:** a problem in body function or structure.
- **Activity limitation:** a difficulty encountered by an individual in executing a task or action.
- **Participation restriction:** a problem experienced by an individual in involvement in life situations.



Active iQ

Who?

- Wheelchair users.
- Blindness or partial sightedness.
- Deafness or partial hearing.
- Down's syndrome.
- Stroke.
- Obesity.
- Arthritic conditions.
- Mental health conditions (e.g. depression).
- Cancer.
- HIV.
- Limb amputation.
- Fibromyalgia.
- Cerebral palsy.



Equality Act (2010)

Service providers must anticipate the needs of disabled clients and make reasonable changes to accommodate these.



Active iQ

Exercise selection

This will be determined by specific needs, and may include:

- Simplifying some exercises.
- Reducing intensity (fewer repetitions, lower resistance, appropriate range of motion, controlled rate).
- Modifying exercise positions and modalities, for example, using wheelchair-based activities for wheelchair users or chair-based activities for individuals with physical or functional limitations or issues with balance.

Teaching style

Teaching styles and methods will need to accommodate specific needs, and may include:

- Clarity of verbal instructions for the blind or visually impaired.
- Clarity of demonstrations; facing the person and speaking clearly when instructing the deaf or those with partial hearing (e.g. to enable lip reading).
- Finding appropriate ways to engage and encourage people with learning disabilities, for example, Down's syndrome.

Health and safety

This will include:

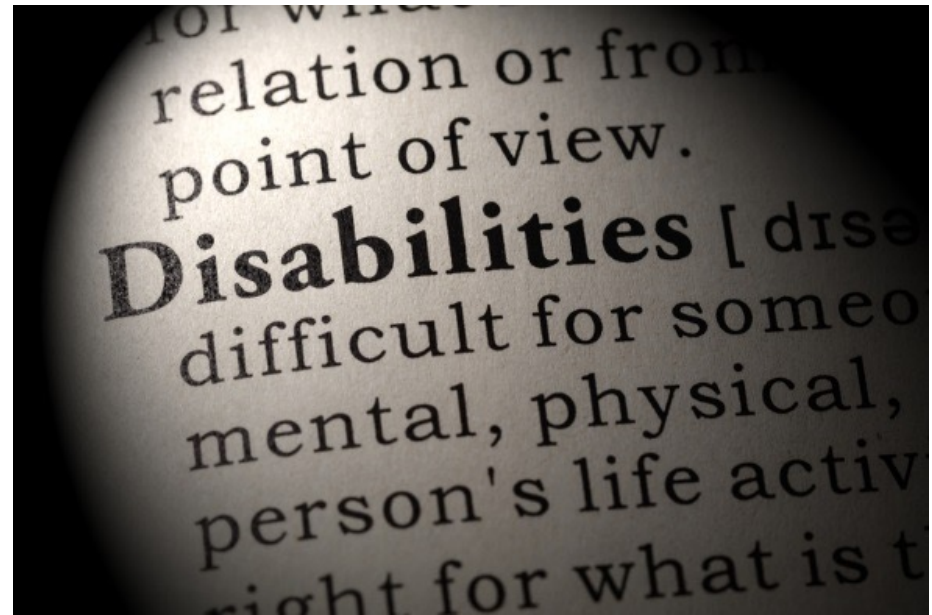
- Consideration given to entry and access to all facilities.
- Safe evacuation procedures in emergencies.
- Respect for other legislation, for example, safeguarding vulnerable adults.



Guidelines for disabled people

Because of the various kinds of disability, describing specific components of an exercise prescription for each condition can be difficult.

- Physical disabilities.
- Spasticity.
- Neurological conditions.
- Damage to sensory nerves.
- Depression.



Guidelines for disabled people

Physical disabilities

- **Progressive disorders** (e.g. multiple sclerosis) – monitor carefully to ensure that the exercise programme is not causing exacerbation.
- **Asymmetrical weakness** (e.g. stroke, cerebral palsy) – aim to improve functioning of the affected side as much possible.
- **Spasticity** – flexibility training can be beneficial for tight and rigid muscles, but seek authorisation from a suitably trained medical authority on how to stretch a spastic muscle without causing injury.

Guidelines for disabled people

- **Neurological conditions** (e.g. muscular dystrophy) – a decline in CNS functioning results in muscles becoming progressively weaker. Concentrate on maintaining general fitness.
- **Damage to sensory nerves** – this can result in pressure sores when not attended to regularly. Vigilance is important.
- **Depression** – a disabling condition in its own right. It can sometimes be a secondary condition resulting from the challenges of living with a disability. Reduced motivation and energy levels can contribute to drop-out. Medications have many negative side effects, including weight gain and suicide risk.

Guidelines for disabled people

If there are any doubts regarding the ability to work safely and effectively with a disabled client, seek the advice of a medical authority.

