Physiotherapy for Athletes with Limb Deficiencies

Introduction:

An amputation is the surgical removal of part of the body, such as an arm or leg, as a result of trauma, medical illness or surgery. Congenital dysmelia is birth without a limb or limbs, or without a part of a limb or limbs. When grouped together, these are referred to as "athletes with limb deficiencies".

Athletes with limb deficiencies often use prostheses which replace the missing body part. Movement is always challenged as the prosthesis lacks active control from muscles, placing additional load on muscles further up the body segment (e.g. hip or shoulder).

Useful terms:

Prosthetic: A device that replaces a body part (e.g. a running leg).

Orthosis: A device that supports a body part (e.g. a brace).

Orthotist/Prosthetist: A specialist who fits these devices.

Stump: The body part that fits into the socket.

Socket: The hard part of the prosthetic (often carbon fibre) that moulds around the stump.

Liner: The fabric/textile that fits between stump and socket to provide padding and enhance fit.

BKA = below knee amputee

AKA = above knee amputee

TKA = through knee amputee

BEA = below elbow amputee

AEA = above elbow amputee

TEA = through elbow amputee

Osseointegration = a surgical procedure which fits a metallic pin directly into the bony stump to enable more direct fitting for a prosthetic

This document was prepared in collaboration with
Paralympics Australia and the Queensland Academy of Sport.

Physiotherapy considerations

- Consider the level of amputation, as mobility, range of movement, coordination, balance and comfort vary greatly depending on the level of amputation. Stump length will influence lever arms, power and muscular attachments.
- Assess the athlete's range of movement and strength.
- Aim for symmetry as much as possible for ideal joint and body loading, recognising that this isn't possible in all cases.
- Be aware of any movement restriction, balance and coordination challenges, and take these into consideration with any relevant drills or exercises. It's good to help athletes practice balance through their prosthesis in a safe way, as well as lay down the foundation for optimal basic movement patterns.
- Consider what other areas and structures are getting loaded as a result of how the athlete moves, or the asymmetries that exist. If the athlete has a unilateral amputation, consider what is happening on the contralateral side, as there are increased demands on the unaffected limb.
- Athletes cannot generate force with their muscles to cause the prosthetic joint to rotate, other joints (most frequently the hips) will have to work harder to enable the movement. For instance, a lower limb amputee will not be able to push the leg from the ankle; rather, they will pull the leg from the hip.
- Athletes using a prosthetic device will often have increased energy expenditure for physical tasks, and the energy expenditure increases with higher level amputations.
- Find out what the athlete can do, or what may be presenting challenges (eg self- confidence, socket fit, pain, technology), and if an athlete is limited by their prosthesis, work with them on alternative exercises.

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- Athletes will use prosthetic liners to help with the fit of the residual limb into the socket (like wearing socks in shoes). Athletes will sweat in the socket, and their stump can become swollen and uncomfortable. Their stump can also fluctuate in size/volume depending on how long post-amputation they are, and also during long haul travel. Monitor the fit of their prosthesis during high risk times when their stump size and shape may be altered to ensure an optimal fit. Can consider the use of compression garments/devices to control swelling if necessary.
- Constant and continual repetition can cause skin breakdown. Talk to the athlete about finding a good balance between repetitions and changing the nature of the loading.

Medical Risk Factors

Skin Breakdown: Moisture within the prosthetic socket can lead to swelling, making prosthetic fit more difficult. Build up of perspiration can lead to bacterial development and infection. Hygiene strategies can minimise issues. Need to monitor training load and adjust load/repetition as required. If an athlete is using a new prosthetic close monitoring of the fit and skin integrity is required. Ensure there is appropriate time out of socket to unload stump as well.

Thermoregulation: Can be an issue due to reduced surface area in which to lose heat, scarring and graft tissue. Athletes may have problems in hot, humid conditions. Individualised cooling strategies are required.

Post Amputation Pain (Phantom Limb Pain): The experience of pain in the area of the leg which has been amputated. Depending on severity, this may need to be managed by a pain specialist. There are conservative strategies available (e.g. through www.noigroup.com).

Working with a multidisciplinary team e.g. prosthetist, athlete and coach can maximise the functional potential, training capacity and performance outcomes of an athlete with a limb deficiency.

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Resources, Links and References

https://www.ukcoaching.org/resources/tips/coaching-amputee-participants

www.noigroup.com

https://www.physio-pedia.com/High_level_rehabilitation_of_amputees

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