

Return to sport & high level function post insertion of mega prosthesis in adolescents and young adults – Research requirements and methodological challenges

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## Background

Long term survival rates for children, adolescents and young adults with malignant bone tumours are slowly improving with advances in medical imaging, chemotherapy and surgical techniques [1-4].

It is well-established that physical inactivity is associated with increased risk of a range of diseases including coronary heart disease, type II diabetes mellitus and depression [5, 6]. People who meet physical activity guidelines recommended by international health authorities – 2 sessions of strength training and the accumulation of 150 minutes of moderate intensity aerobic activity – can reduce relative disease risk by approximately 40% [7].

It is recommended that cancer survivors follow the general physical activity guidelines [8]. Physical activity is an important means of improving fitness and mental and physical functioning in cancer survivors [8, 9] however, the health, fitness and functional benefits accrued by bone cancer survivors who regularly meet current physical activity guidelines is not known, and further research is required.

Among adolescent and young adult cancer survivors, sport is likely to be an attractive type of physical activity because it is age appropriate and culturally significant in our society. Competition is one of the most potent social motivators for sports participation [10], and competitive success is most commonly achieved by an increase in both training load and training quality [11-13]. To date, research evaluating the effects of performance-focused sports training on the health, fitness and functioning of individuals post limb salvage with megaprosthesis has not been conducted but is required.

## Purpose

The purpose of this paper is to review methodological challenges associated with developing and evaluating 2 different types of interventions for patients post lower limb reconstruction with megaprosthesis secondary to bone sarcoma: an intervention aimed at assisting patients to meet national physical activity guidelines; and an intervention aimed at assisting patients to improve sports performance. Outcomes will inform discussion as to whether these people should be eligible for Paralympic sport within current classification guidelines and provide some of the information required to develop an appropriate classification system.

## Methods

A literature search was conducted using PubMed, Embase and Web of Science databases. Studies describing physical activity guidelines, as well as those describing function, sport and physical activity levels in individuals post limb salvage surgery with megaprosthesis for management of bone sarcoma were reviewed. Research requirements and methodological challenges were then identified by an expert panel, consisting of an orthopaedic oncologist, physiotherapist and 4 published exercise scientists – including a biomechanist, two internationally recognised classifiers in Paralympic sport and an exercise and cancer specialist.

## Results

There are a number of methodological challenges which complicate the development and evaluation of training intervention studies in this population. These may be broken down into three principle areas: outcome measures, research design and intervention development.

### *Outcome Measures*

A number of subjective and objective outcome measures have been used to evaluate function, physical activity and quality of life. It has yet to be established what physical parameters need to be measured in an intervention study, and which outcome measures should be used to quantify them.

#### *Research Design*

Research design issues that are evident in current literature include: 1) Small sample sizes, 2) selection bias and 3) multiple sources of patient group heterogeneity.

#### *Intervention Development*

As there have been no training intervention studies in this population, there are no population specific benchmarks with regards to exercise programming.

#### Conclusion

To date, research evaluating the effects of performance-focused sports training on the health, fitness and functioning of individuals post limb salvage with megaprosthesis has not been conducted. Further research in this area is required. Methodological challenges to consider when developing and evaluating such interventions can be broadly classified into outcome measures, study design and intervention development.

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