

# Consensus Opinion on the Best Practice Features of Lower Limb Injury Prevention Programs

## Executive Summary

### Background

Osteoarthritis (OA) is a joint disease in which protective cartilage breaks down and wears away, allowing bones to rub together. The disease can cause mild to severe pain, stiffness, swelling, and reduced motion in the joint. Over time, arthritis of the knee can make physical activities and even walking difficult and can significantly limit one's quality of life. OA is considered a major contributor to disability and is the most common form of arthritis, affecting over 27 million Americans. Medications and behavioral intervention may help reduce OA symptoms but there is no treatment to reverse disease progression. In severe cases, the only option may be knee replacement surgery.

Injury to the knee joint, such as an anterior cruciate ligament (ACL) rupture, whether treated surgically or non-operatively, can lead to OA of the knee later in life (referred to as post-traumatic osteoarthritis, or PTOA). Individuals with a history of knee injury are 3-6 times more likely than those without knee injury to develop knee OA. In fact up to 50% of individuals with ACL will develop knee OA within 10-15 years following an ACL injury.

Joint injury is common in the general population, but it occurs at a higher rate in athletes. In particular, youth who participate in running and jumping sports such as soccer, football, and basketball have an increased risk of major lower limb injuries. Participation in sports is on the rise with youth athletes and injuries of the ACL are now seen with greater frequency in children and teens. Joint injuries, such as those to the ACL or meniscus, at a young age, have a long-lasting impact on health and well-being, including decreased quality of life, more years of life with disability, greater risk of developing comorbidities, and psychosocial and economic consequences.

Research studies suggest neuromuscular training exercises can reduce the risk for ACL and other traumatic knee injuries, which can benefit athletes practicing in a variety of sports and athletic levels. In addition to reducing the risk of ACL injury, these neuromuscular training programs can also improve strength, balance, and measures of athletic performance such as vertical jump height, aerobic fitness, and sprint speed. Furthermore, these programs are practical, easily implemented (no equipment required), time-efficient, and more cost-effective than surgical treatment of ACL injury.

### Purpose of the Guideline

The Osteoarthritis Action Alliance Lower Limb Injury Prevention Task force developed this draft Guideline to provide evidence-based recommendations on key components that should be included as part of neuromuscular training program for prevention of major joint injury to the knee in youth athletes and subsequent onset of PTOA later in life. The task force identified 7 core components: (1) *Lower extremity and core muscle strength training exercises*; (2) *Plyometric-jump training exercises*; (3) *Consistent feedback to participants on proper technique*; (4) *Require minimal-to-no equipment*; (5) *An appropriate dose (i.e., 15 sessions over six weeks with 15-min exposures as a minimum, started prior to season)*; (6) *Attention to participant compliance*; (7) *Balance exercises as a component but not sole aspect of the program*. The Guideline is intended to be used by athletic trainers, coaches, and health care professionals who supervise or lead youth sports and other physical activities. Additional research is needed to further describe the effectiveness and safety profile of each of the core components on

reducing lower limb and ACL injury risk, and also to better define the minimum dose/exposure for effectiveness.

### **Description of the Methods Used to Analyze the Evidence and Formulate the Recommendations**

Task force authors include athletic trainers, sports medicine physicians, content experts and Osteoarthritis Action Alliance staff. The Guideline search strategy focused on the identification of primary studies, systematic reviews and meta-analyses published on neuromuscular warm-up strategies for preventing lower limb injuries. The strength of the evidence was based on the consistency with which the component was associated with the prevention of an ACL or lower limb injury. The method used to formulate the recommendations was expert consensus whereby two task force members discussed and reviewed the best available evidence, developed a draft of the literature review, and discussed gaps with the task force at-large. The task force reviewed the evidence and came to consensus on a final set of recommendations using the National Institute for Health and Clinical Excellence (NICE) framework.

### **Implementation of the Guideline**

To the best of our knowledge, this is the first edition of Guidelines developed for use by policymakers and health professionals. Schools, community groups, media, and state and local government can use the Guideline information to develop programs, policies, and communication for the general public. Adherence to the guideline is voluntary. The task force will review the literature annually and update the Guideline as necessary.

These best practice guidelines are optimally implemented with competent practitioners (including but not limited to athletic trainers and coaches), appropriate planning and resources, operational leadership, and organizational and administrative support. At this time we are seeking collaboration with individuals and groups who are interested in helping to develop implementation strategies for this guideline. Please contact the Guideline Developers if you would like to participate in the process of guideline implementation.

### **The Osteoarthritis Action Alliance**

The Osteoarthritis Action Alliance is a broad coalition of public health leaders and stakeholders committed to elevating osteoarthritis a national health priority and promoting effective policy, systems and environmental solutions that aim to address the individual and national toll of OA. More information on the OA Action Alliance can be found by visiting the website: <http://oaaction.unc.edu/>.

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\*Substantial contribution in searching the literature

All members provided substantial contributions to conception of the Guideline, review of extracted results from the literature search, and revision and final approval of the Guideline and Executive Summary. We also acknowledge the contributions of Jennifer M. Hootman, PhD, Epidemiologist at the Centers for Disease Control and Prevention for her technical expertise and Stephanie Defazio, an undergraduate student in the Department of Exercise and Sport Science at the University of North Carolina at Chapel Hill for her contribution to developing stakeholder engagement strategies.

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Declarations of interest and confidentiality were made by all members of the Guideline development task force. There are no conflicts that would bias this work. Further details are available from the Osteoarthritis Action Alliance.

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