

SPORTS EQUIPMENT

Revision

In which sports do we use the following equipment?

Paddle – bat – stick – pole – bow – club – rod – fin – oar – ribbon – saddle – belt – binding – harness – shin guard – goggles – sabre – mouth guard – cochonnet – handlebars – compass – anchor - snorkel

Reading

Is the Use of Advanced Materials in Sports Equipment Unethical?

INTRODUCTION

This article addresses the role of advanced materials in sports. At the highest professional level, sports are a highly competitive occupation with millions of dollars depending upon fractions of a second or tenths of a centimetre. However, even the dedicated amateur is willing to invest a great deal of money to improve his or her performance. Thus, just as in other fields, the use of advanced materials in athletics can be justified if it leads to enhanced performance.

SPORTS EQUIPMENT DESIGN

The optimum design of sports equipment requires the application of a number of disciplines, not only for enhanced performance but also to make the equipment as user-friendly as possible from the standpoint of injury avoidance. Clearly, this design includes materials science, mechanical engineering, and physics; however, knowledge of anatomy, physiology, and biomechanics is also necessary. Biomechanics can be simply defined as the science of how the body reacts to internal and external forces. Thus, it is an attempt to apply the basic laws of physics and mechanics to the joints, ligaments, and tissues of the body as they are subjected to loading.

THE IMPACT OF ADVANCED MATERIALS

Running

Shoes, in particular, have shown substantial improvements in the running events. However, this improvement has been much more in the comfort/avoidance-of-injury arena rather than in absolute performance enhancement. Thus, during the first Olympics in 1896 when Spiridon Loues won the marathon, all of Greece celebrated with him as he just broke three hours with a time of two hours, 59 minutes. Almost 100 years later, the Olympic record is two hours, 12 minutes, and 36 seconds, about a 30% improvement. The majority of this improvement can be attributed to an improvement in human performance.

Cycling

Cycling is a highly efficient form of transportation, with energy consumption lower than that of a walker and much lower than that of powered vehicles. The bicycle has been around for almost 200 years, maturing from the 1817 [Draisienne](#) (walking device). Today, advanced materials, in combination with aerodynamic consideration, have led to vastly improved bicycles.

A number of advances have contributed to the high efficiency of the modern-day bicycle, including the development of spoked wheels, the chain concept, pneumatic tires, and accessories (e.g., seats, brake levers, and pedals). However, the two major advances are in the frame and wheels.

Tennis

Until about 25 years ago, tennis rackets were made from wood. In the late 1960s, metal frames, generally fabricated from steel or aluminium, were introduced. Presently, composite rackets are very popular both from the viewpoint of efficiency (accelerating the ball across the net) and in terms of reducing the dangerous vibration that can lead to tennis elbow. The impact force experienced by a player on returning a tennis ball travelling at 160 km per hour is approximately equivalent to lifting a weight of about 75 kg. These forces can transmit a high load leading to damage to the small blood capillaries in the muscles and tendons around the elbow joint. Better technique can help, but an improved racket can also make a major contribution.

ETHICAL CONSIDERATIONS

Although some examples of the use of advanced materials in sporting goods have been discussed, there are certainly more possible. Where the sporting achievement can be measured in absolute terms, great improvements have been made in those sports where equipment is critical. However, the use of advanced materials in sports equipment presents some ethical questions. We can clearly enhance behaviour by allowing the use of advanced materials, but where should the line be drawn, or should there be no restrictions?

This brings us to a second question: should we allow competition at the highest level to be only affordable to the elite because of the high cost of equipment?

Where should this end? Can we ensure that people are competing and not the advanced materials? Certainly, we do not want to go back to a wooden pylon. But how about electronically guided darts, solar-energy-enhanced bicycles, and terrain-following golf balls that automatically find the lowest local elevation on a surface (the bottom of the hole)?

Lots of questions, few answers. What do you think?

(adapted from <http://www.tms.org/pubs/journals/JOM/9702/Froes-9702.html>)

Vocabulary

Match the expressions on the left with their collocations on the right.

Mechanical	Efficiency
Advanced	Amateur
High	Materials
Injury	Engineering
Dedicated	Performance
Enhanced	Avoidance

Questions

1. What is the role of sports equipment in sports?
2. What disciplines are applied in sports equipment design?
3. Summarise the impact of advanced materials in running, cycling and tennis.
4. Give more examples of technology impact from your sport.
5. What are the burning issues in this field according to the author?