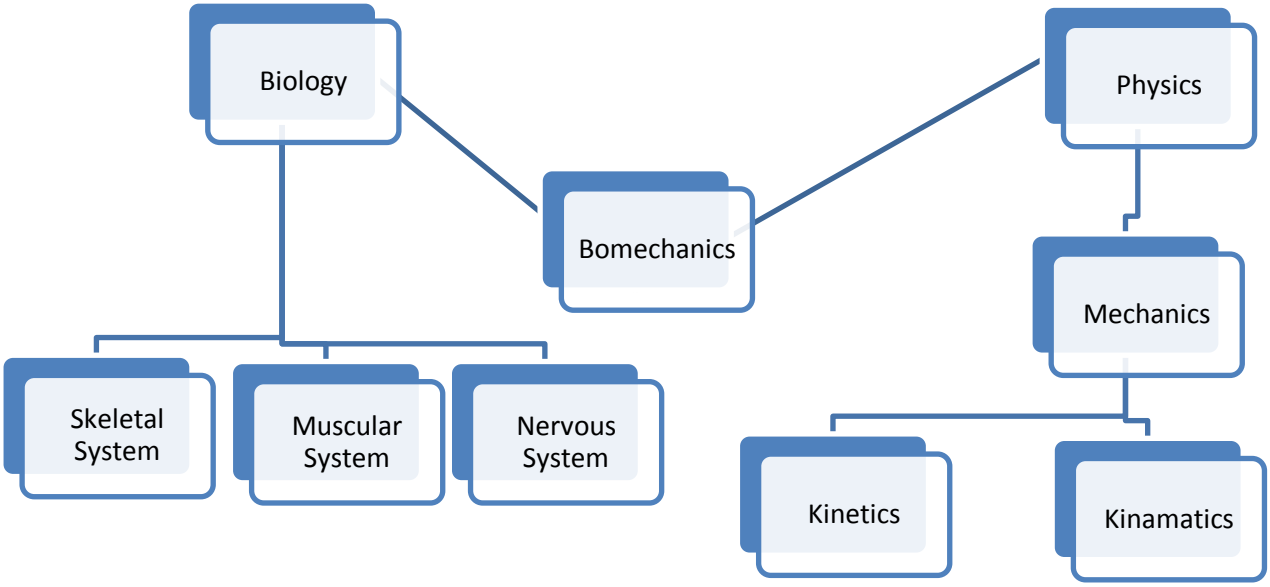
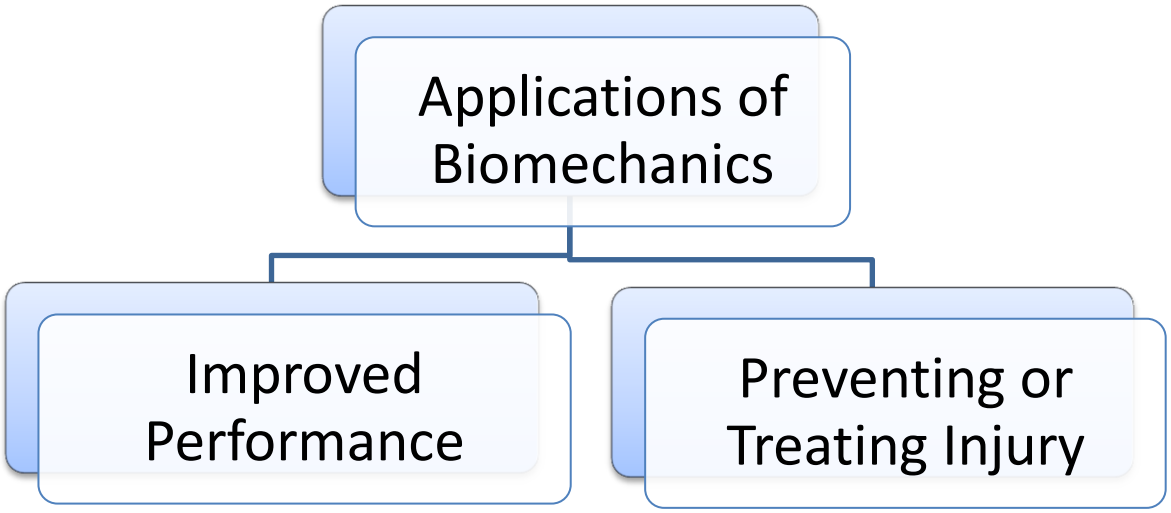
WHAT IS BIOMECHANICS ?

Biomechanics has been defined as *the study of the movement of living things using the science of mechanics* (Hatze, 1974).
Mechanics is a branch of physics that is concerned with the description of motion and how forces create motion. Forces acting on living things can create motion, be a healthy stimulus for growth and development, or overload tissues, causing injury. Biomechanics provides conceptual and mathematical tools that are necessary for understanding how living things move and how kinesiology professionals might improve movement or make movement safer.



WHY STUDY BIOMECHANICS?

Scientists from many different areas (e.g., kinesiology, engineering, physics, biology, zoology) are interested in biomechanics. Why are scholars from so many different academic backgrounds interested in animal movement? Biomechanics is interesting because many people marvel at the ability and beauty in animal movement. Some scholars have purely theoretical or academic interests in discovering the laws and principles that govern animal movement. Within kinesiology, many biomechanists have been interested in the application of biomechanics to sport and exercise. The applications of biomechanics to human movement can be classified into two main areas: the improvement of performance and the reduction or treatment of injury



Improving Performance: Human movement performance can be enhanced many ways. Effective movement involves anatomical factors, neuromuscular skills, physiological capacities, and psychological/cognitive abilities. Most kinesiology professionals prescribe technique changes and give instructions that allow a person to improve performance. Biomechanics is most useful in improving performance in sports or activities where technique is the dominant factor rather than physical structure or physiological capacity.Since biomechanics is essentially the science of movement technique, biomechanics is the main contributor to one of the most important skills of kinesiology professionals: the qualitative analysis of human movement (Knudson & Morrison, 2002).

Preventing and Treating Injury: Movement safety, or injury prevention/ treatment, is another primary area where biomechanics can be applied. Sports medicine professionals have traditionally studied injury data to try to determine the potential causes of disease or injury (epidemiology). Biomechanical research is a powerful ally in the sports medicine quest to prevent and treat injury. Biomechanical studies help prevent injuries by providing information on the mechanical properties of tissues, mechanical loadings during movement, and preventative or rehabilitative therapies. Biomechanical studies provide important data to confirm potential injury mechanisms hypothesized by sports medicine physicians and epidemiological studies. The increased participation of girls and women in sports has made it clear that females are at a higher risk for anterior cruciate ligament (ACL) injuries than males due to several biomechanical factors (Boden,Griffin, & Garrett, 2000). Continued biomechanical and sports medicine studies may help unravel the mystery of this high risk and develop prevention strategies (see Chapter 12). Engineers and

occupational therapists use biomechanics to design work tasks and assistive equipment to prevent overuse injuries related to specific jobs. Combining biomechanics with other sport sciences has aided in the design of shoes for specific sports (Segesser & Pforringer, 1989), especially running shoes (Frederick, 1986; Nigg,1986). Since the 1980s the design and engineering of most sports shoes has included research in company biomechanics labs. The biomechanical study of auto accidents has resulted in measures of the severity of head injuries, which has been applied in biomechanical testing, and in design of many kinds of helmets to prevent head injury (Calvano & Berger, 1979; Norman, 1983; Torg, 1992) etc.