The Impact of Future Technology on Athletic Therapy

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This article explores my vision of some technologies that will shape the manner in which we practice and care for physically active individuals. Although the discussion focuses on the evaluation, treatment, and rehabilitation of orthopedic injuries, the preventative aspects of athletic health care show great promise. An example would be a single piece helmet/shoulder pad to further protect the cervical spine and head.

According to the dictionary, the primary definition of invent is to devise or create by original effort, especially to conceive or make originally through some mechanical, electrical, or other device. The primary definition of innovate is to introduce or bring in something new.

Using these definitions, I could identify only three inventions in sports injury treatment over the past 20 years. Most of the “new” products introduced to our professions were actually innovations of existing techniques, devices, or theories. Other techniques have evolved based on a reversal of traditional thought. What were once contraindications became indications for use, and vice versa. The development and implementation of therapeutic tools and techniques is as much of a linear process as it is cyclical.

Consider for example the development of electrical modalities. As far back as 420 B.C., Hippocrates recommended shocks from torpedo fish to help cure a wide range of illnesses. Benjamin Franklin recommended electrical shocks to relieve convulsions during the 1750s. Duchenne, circa 1850, realized the benefits of an alternating (Faradic) current on healing tissues (DeVahl, 1992). And during the early part of the 19th century no traveling medicine show was worth the price of admission unless it featured devices based on the “Miracle of Electricity.”

Ironically, many of the quack devices of that period used some of the currents and techniques we employ today.

Concurrent with the development of physical therapy as a health care profession, the scientific use of electricity as a therapeutic tool began to evolve. We were soon able to manipulate the two fundamental forms of electricity, alternating and direct currents, to deliver various forms of electrical pulses to the body in order to elicit specific physiological effects. An invention unrelated to medicine, the microchip, was incorporated to deliver more precise pulses and to reduce the size of the generator.

What were the three inventions in athletic therapy I alluded to earlier? The first was the Cybex™ (Long Island, NY) Corporation’s introduction of isokinetic technology. Isokinetic devices introduced a whole new realm of practice, research, and body of knowledge to our profession which, following the expiration of their patent, led to the formation of new industries and corporations.

The other two important inventions, magnetic resonance imaging (MRI) and lasers, are primarily used by physicians but have a direct impact on athletic health care. MRIs provide a quick, safe, noninvasive, and relatively accurate method for identifying pathology. Although they are expensive, MRIs often eliminate the higher costs and risks associated with exploratory surgery and the discomfort of arthrograms.

We know that sunlight has been used since the dawn of time as a healing modality. But the development of surgical lasers has reduced the amount of healing time associated with surgery and, in the case of brain trauma, has made the surgical procedure more precise.

A surprising nondevelopment is the inability to substantiate the
Does technology really enhance our clinical practice and improve the health care of athletes? Certainly this question is as relevant today as it will be tomorrow. How can you decide about purchasing a new piece of equipment? The following criteria can help you determine whether the product is potentially viable to your facility.

Criteria/Rationale

- **Theory**: Does the device operate on sound physical and physiological principles? Do not hesitate to contact colleagues or experts to get their comments on the manufacturer’s claim.
- **Efficacy**: Have the benefits of the device been substantiated through controlled research? Anecdotal claims should be viewed with caution.
- **Cost-Benefit Ratio**: How often, and for what conditions, will the use of this device be indicated in your facility?
- **Time-Benefit Ratio**: What are the indirect costs associated with this device? Will its use require an inordinate amount of your staff’s time? Is any special training needed to operate it? If so, what are the financial and time costs associated with training?
- **Uniqueness**: Can other equipment or techniques produce the same results?

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efficacy of low-power laser as a therapeutic device, especially as it relates to superficial wound healing (Gam et al., 1993). In the early 1990s this device held promise for superficial wound healing and also demonstrated the ability to affect the deeper tissues by increasing the availability of ATP and increasing enzyme activity (Greathouse et al., 1985). However, contemporary controlled studies have failed to support these early findings (Beckerman et al., 1992; Mulcahy et al., 1995).

Today’s advanced electrical modalities are the result of evolution and innovation that was assisted by an invention designed for the military and the space program. The microchip (or microprocessor), either in therapeutic devices or computers, has simplified and improved many aspects of athletic therapy. Tedium tasks have become automated, the accuracy of devices has improved, and technology has replaced some of the decision-making.

This “dumbing down” of our technology has resulted in a preprogrammed, push-button approach to many therapies.

Less skilled and knowledgeable individuals may now use devices simply by selecting the desired results from a menu. Rehabilitation professions run the risk of losing sight of the underlying principles and clinical science of the device or technique being used. Another drawback to this is the inability to adjust the output parameters from those preset at the factory.

What does the future of athletic therapy hold? Improved technology and computing power will lead to the development of “smart” modalities that will continue to decrease in size while increasing the functionality of existing equipment. Lastly, we will see developments in biochemistry and biotechnology leading to the evolution of nanotechnology.

**Smart Modalities**

Present-day therapeutic devices tend to be one-way devices. Ultrasound delivers energy to the body but receives no physiological feedback from the patient. Biofeedback units measure the body’s physiological activity but, other than through the patient’s voluntary systems, provide no direct feedback to the body.

Even the most advanced, accurate treatment protocols are based on the average response of a relatively limited sample size. To achieve their full therapeutic benefits, modalities must begin to interact with the patient’s physiological response to the applied energy and make constant adjustments to obtain the desired treatment effects.

Consider the use of ultrasound to increase subcutaneous tissue temperature. Ground-breaking research has recently been conducted on the intensity and duration of the treatment dose required to raise subcutaneous tissue temperature during ultrasound application (Draper & Ricard, 1995; Draper et al., 1995). However, the recommended pro-