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FROM HUMAN EVOLUTION TO MODERN ATHLETICS

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Abstract
Human skeletal muscle exhibits remarkable plasticity, adapting to many external stimuli, including normal contractile loading. Accordingly, muscle function and exercise capacity span a wide spectrum, from individuals with low levels of endurance and strength and who are inactive to elite athletes who produce remarkable performances based on pleiotropic training-based muscle adaptations.

Keywords: evolution, achievement of upright, muscle function, exercise capacity, resistance-based training

Introduction

Our current understanding of the signal integration, interpretation, and output coordination of the cellular and molecular mechanisms that govern muscle plasticity across this continuum is incomplete. Thus, training methods and their application to elite athletes rely largely on a "trial and error" approach, with the experience and practice of successful coaches and athletes often providing the basis for "post hoc" scientific inquiry and research. This review provides an overview of the morphological and functional changes as well as the molecular mechanisms underlying exercise adaptations to endurance and resistance-based training. These characteristics are placed in the context of innate genetic and individual differences in exercise capacity and performance, with special emphasis on aging athletes. Human evolution was integral to the achievement of upright, bipedal walking, which provided advantages for locomotion, prey and predator hunting. In fact, high endurance capacity and excellent thermoregulatory ability were necessary for human survival. Evolutionary theory describes the mechanism of natural selection as "survival of the fittest", the main assumption being "foot," as opposed to "unfit," there was a greater chance of survival. In this regard, human skeletal muscles, limbs, cardiovascular and metabolic systems are highly adapted for upright movement, and the energy efficiency for bipedal walking and running is much higher than that of other primates. Along with changes in bone structure, larger limbs and joints, a stronger perceptual system, fine motor control and balance, a larger brain size and cognitive sophistication evolved. The evolution of large brains in humans was probably facilitated by the running behavior of our ancestors, which allowed access to the high-protein food sources necessary for brain development. Bipedal, long-distance running requires complex computations not only for gait, balance, and step control, but also for remembering locations associated with abundant food sources, recognizing prey and predators, and long-distance running. it also requires extensive cognitive processes to provide direction. Such adaptations are supported by adequate energy availability and oxygenation, high levels of metabolic regulation, and flexibility. The coevolution of skeletal muscles and their associated organ systems was characterized by progressive and recurrent interactions. Behavioral lifestyles and energy availability are determined by periodic cycles of feasts and famines, and certain genes have evolved to efficiently conserve and regulate the use of endogenous fuel stores, called "thrifty genes."

Evolution process

Evolutionary selection of 5 major traits facilitated long standing, restricted, bipedal locomotion in humans. Skeletal strength, for example, is provided by large joint spaces in the lower but not upper limbs to distribute impact forces. Stabilization is a big tool for bipedal locomotion, with the spinae and gluteus muscles contributing to reduced forearm mass to relieve chest and arm tension, while shortening of the face length helps stabilize the head or bio-tensegrity system to limit discomfort. Sweat glands with a certain high density for cooling the brain, reduced body hair, dense blood vessels of the skin, breathing through the mouth and a large epithelial area of the nose help in thermoregulation. Finally, the coevolution of locomotion and the brain (for anticipation, advance preparation, sensory integration, preplanned multi-level compensation to deal with disturbances and destabilizations), cognitive ability (remembering landmarks, long-distance directions, prey and predator recognition, tracking, and speculative observation/anticipation), cognition, fine motor control, and balance resulted in the expansion of cerebello-cerebralcortical circuits.

Peak performance in modern sports

It is likely exceeds these shared evolutionary traits due to effective training strategies and paradigms, nutrition and supplementation, technological innovations such as equipment and facilities, and genetic and epigenetic predispositions.

In contrast to the strong evolutionary pressure to optimize endurance capacity, the control of skeletal muscle mass and strength has evolved in a more limited manner. Although adequate muscle strength is closely related to the environmental demands of the day and is indispensable for survival, genes encoding proteins that act on

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muscle cells to stop muscle cell growth, such as myostatin, have escaped negative evolutionary selection. escaped. This seems like a bit of a paradox, since naturally occurring mutations in the myostatin gene have been shown to have several benefits, including significant increases in muscle mass in mice, dogs, cattle, and even humans. From an evolutionary perspective, low muscle mass would be associated with the conservation of carbohydrate-based fuel, which is essential for maintaining brain function while reducing resting and locomotor energy expenditure during periods of food deprivation. Excessive muscle mass (ie, high birth weight) can also lead to birth problems that predispose to evolutionary disadvantages. Non-muscle-related functions of myostatin, such as tendon maintenance and repair and injury risk, could have contributed to positive selection of this factor. Finally, potential trade-offs between fatigue resistance and the promotion of endurance versus muscle mass, strength, and power could have influenced the evolutionary process. Accordingly, although there is some degree of synergy, humans have evolved distinct controls and adaptations for endurance and strength-based activities.

Conclusion

The world of professional and Olympic-level sports today has produced athletes who look bigger, stronger, and faster than 100 years ago. However, it has been argued that the athletes' bodies have not changed much during this time and that the improved performance is mainly the result of technological progress. Future olympics, extraordinary feats of strength, speed and agility of man will be demonstrated. As an archaeologist who focuses on the development of the human species throughout evolutionary history, it's interesting to consider how and why we became so good at certain things, from the javelin throw to the 500-meter dash. Much of what makes our bodies capable of athletic prowess dates back to long before we became Homo sapiens. Human athletic paleobiology is a branch of research that uses trained athletes to study the adaptations of the human body. These studies focus on metabolism and peak physical performance, limb biomechanics, and other aspects of human anatomy and physiology to get a feel for the types of activities humans were capable of in the past.
Here's a quick rundown of some of the things humans can do for this amazing sport, along with a brief look at where these skills came from and how long they've been around.

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