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This article explores a timely and pressing question: if artificial intelligence (AI) can generate strength and conditioning programs, what then is the evolving role of the strength and conditioning coach? Organizations, such as the National Strength and Conditioning Association (NSCA), have long championed the advancement of this profession, fostering a robust community through certification, education, and professional development. Yet, the recent surge in AI-driven platforms capable of producing customized workouts with minimal input has sparked both curiosity and concern within the field (2,7,17).

This article aims to answer two important questions: 1) Could AI pose a legitimate threat to the strength and conditioning profession? and, more importantly, 2) Which elements of coaching are uniquely human and irreplaceable? While AI may assist in program design by leveraging data and established training principles, the responsibilities of the strength and conditioning coach extend far beyond algorithmic outputs (1,5,12,19). This article outlines the multifaceted role of the strength and conditioning coach, highlighting the experience, judgment, and interpersonal skills that remain essential in optimizing athlete performance and ensuring long-term development.

INDIVIDUALIZATION AND CONTEXTUALIZATION

A core responsibility of the strength and conditioning coach is the ability to conduct a performance-oriented needs analysis (15). The needs analysis goes beyond general programming to identify the specific physiological, biomechanical, and psychological demands of both the sport and the individual athlete (15).

While AI can assist in aggregating performance data and suggesting evidence-based programming, it lacks the nuanced judgment needed to interpret that data within the broader context of an individual athlete profile (17). Strength and conditioning coaches must consider variables such as injury history, sex/gender, training age, positional demands, and psychological readiness (2,12,15). Exercise testing and performance evaluation are essential components of this process; however, the data collected, especially in team and non-laboratory environments, often come with empirical research limitations (15). It is the experience of the strength and conditioning coach, and reflection on that experience, that determines what is meaningful and actionable.

In an ideal setting, strength and conditioning coaches tailor programs to the evolving needs of each athlete, adjusting in real-time based on feedback, performance trends, and unforeseen circumstances. This level of individualization and responsiveness remains a distinctly human strength—one that AI cannot fully replicate (17). In the age of AI, this also highlights the importance for strength and conditioning coaches to effectively recognize and respond to contextual factors (e.g., social, situational, professional) that influence performance and coaching outcomes.

TECHNIQUE INSTRUCTION AND SAFETY

Among the most critical responsibilities of a strength and conditioning coach is providing supervision, hands-on instruction, and the assurance of safety during training sessions (12). Strength and conditioning coaches play a pivotal role in teaching proper technique, identifying movement inefficiencies, and making real-time corrections that reduce injury risk and enhance performance outcomes. Their presence is vital for maintaining high standards of safety and effectiveness in training (12).

Imagine a scenario where an athlete is performing a complex lift, such as a clean and jerk. A strength and conditioning coach will observe the form of the athlete, provide immediate feedback, and make necessary adjustments to ensure the lift is performed safely and effectively. While AI and digital feedback tools can support technique correction by impersonating human estimation and interactive virtual coaching, their value depends on how accurate and meaningful the feedback is applied by the athlete (7,9,18). From an educational perspective, it is important to consider how AI-based instruction cannot accommodate diverse learning styles, ensuring that everyone receives guidance in a format that resonates with how they learn best. Another concern with AI technology is that it may only view one angle of the exercise rather than multiple planes of movement while also potentially disregarding individual anatomical differences (9). Also, the dependence of AI on expensive technological devices may limit its accessibility in under-resourced training environments. The ability of strength and conditioning coaches to provide situational and tangible real-time intervention is something AI cannot fully replicate, highlighting the importance of human oversight in training.

MOTIVATION AND RELATIONSHIP BUILDING

Beyond technical instruction and program design, strength and conditioning coaches play a vital role in fostering motivation, accountability, and a positive training environment (8,10,13,14). The relationships they build with athletes are grounded in trust, empathy, and consistent support, elements that are essential for long-term development and adherence to training. These interpersonal connections often serve as a foundation for athlete success. Consider the impact of a strength and conditioning coach who consistently encourages and supports an athlete through physically and mentally demanding training sessions. This motivational presence can be the deciding factor between an athlete persevering through a challenging workout or disengaging entirely. The ability of the strength and conditioning coach to inspire, mentor, and connect on a personal level contributes not only to physical performance, but also mental and emotional well-being. While AI may offer reminders or motivational prompts, it cannot replicate the depth of human connection or the nuanced understanding that comes from shared experience and real-time interaction. The role of the strength and conditioning coach as a motivator and mentor remains irreplaceable in cultivating resilient, committed athletes.

ADAPTATION AND PROBLEM-SOLVING

Athletic development is rarely linear. Setbacks such as injuries, illness, or performance plateaus are inevitable, and it is in these moments that the adaptability of a strength and conditioning coach becomes most evident. Strength and conditioning coaches draw on their experience, intuition, and contextual understanding to adjust training plans in ways that go far beyond algorithmic recommendations (16). Till et al. claim strength and conditioning coaches make decisions and shape their strategies for intervention based on six broad domains of theoretical and applied knowledge; these six domains include (16):

- Their athlete
- The principles of strength and conditioning coupled with the demands of the sport within which the athlete competes
- The principles of skill acquisition and learning
- The social, cultural, and political context within which they operate
- The strength and conditioning coach's existing knowledge, beliefs, values, and behaviors
- The coaching process, referred to as their "planning, delivering, and reflecting" practices (i.e., problem-solving ability)

For example, if an athlete falls ill or sustains a minor injury, a strength and conditioning coach can immediately modify the training program to accommodate their current condition within the session by reducing the intensity, altering the exercise selection, or shifting the focus to recovery and mobility while also seeking specific feedback from the athlete. This real-time problem-solving ability ensures that athletes remain engaged and continue progressing, even when circumstances are less than ideal. Although AI can produce generalized recommendations based on data inputs, it lacks the sensitivity and emotional intelligence required for nuanced decision making in complex, evolving environments. In comparison, the ability of a strength and conditioning coach to adapt dynamically to unforeseen challenges is essential for sustaining progress and avoiding long-term disruptions in athlete development.

COMMUNICATION AND COLLABORATION

Effective communication and interdisciplinary collaboration are essential components within the role of the strength and conditioning coach (4,12). Strength and conditioning coaches regularly engage with sport coaches, athletic trainers, sport scientists, and nutritionists to ensure a comprehensive and athlete-centered approach to performance and well-being. Their ability to interpret data, articulate training rationale, and advocate for the needs of athletes are critical in aligning all stakeholders toward a common goal.

For instance, a strength and conditioning coach may work closely with a nutritionist to develop a dietary plan that complements training load and recovery needs. Similarly, collaboration with medical staff ensures that return-to-play protocols are safely

and effectively integrated into training. This holistic, team-based approach enhances the quality and sustainability of athlete development—something that cannot be achieved through generic AI-generated programming (4).

Furthermore, effective communication and collaboration by strength and conditioning coaches are integral to their daily interactions with athletes. Beyond instruction, strength and conditioning coaches are encouraged to foster environments that promote problem solving and critical thinking as essential components of the learning process (6). By serving as both a communicator and coordinator, the strength and conditioning coach ensures that training strategies are not only scientifically sound, but also appropriate and aligned with the overall performance environment.

ETHICAL AND PROFESSIONAL ACCOUNTABILITY

Strength and conditioning coaches are held to high standards of ethical and professional conduct (3,11,12). Through certification bodies such as the NSCA, coaches commit to codes of ethics that prioritize athlete safety, informed consent, and evidence-based practice (3,11). This accountability ensures that training decisions are made with integrity, transparency, and the best interests of the athlete in mind.

Unlike AI systems, which operate based on programmed logic and data inputs, strength and conditioning coaches are responsible for the ethical implications of their decisions. They must navigate complex scenarios such as balancing performance goals with injury risk or managing training loads across diverse populations, while upholding professional standards (3,11,12). This human-centered decision-making process is critical in maintaining trust and safeguarding athlete welfare.

As AI continues to evolve, it may serve as a valuable tool in supporting data analysis and program design. However, AI lacks the moral reasoning and professional accountability that define the coaching profession. The presence of a certified, ethically-grounded strength and conditioning coach remains essential in ensuring that training practices are not only effective, but also responsible and athlete-centered.

RISK MANAGEMENT AND LEGAL CONCERNS

An often overlooked, yet critical, aspect of the strength and conditioning profession is risk management. Certified Strength and Conditioning Specialists® (CSCS®) are trained not only in exercise science, but also in injury prevention, emergency response, and legal responsibilities associated with athlete care (12). They are typically insured (either individually or by an employer) and operate under professional standards that ensure accountability in elevated-risk environments.

In contrast, relying solely on AI for tasks, such as technique instruction introduces significant legal and ethical concerns (2). AI systems are not certified or licensed professionals, nor are they capable of assuming liability for injuries or accidents that may

occur during training. This becomes particularly problematic in settings involving minors, high-performance athletes, or individuals with medical conditions where legal oversight and professional judgment are essential (12).

For example, if an athlete sustains an injury while following an AI-generated program without professional supervision, questions of liability and negligence may arise (12). In many jurisdictions, organizations may be required to employ certified professionals to oversee physical training. Thus, the presence of a qualified strength and conditioning coach is not only a best practice, it may be a legal necessity.

CONCLUSION

As AI continues to evolve and integrate into the world of sports performance, it brings with it exciting possibilities for data analysis, program generation, and logistical efficiency. However, this article has highlighted many dimensions of coaching that remain uniquely human and critically important. From individualized program design and real-time technique correction to motivation, collaboration, ethical accountability, and legal risk management, the strength and conditioning coach fulfills a role that extends far beyond what AI can replicate. Strength and conditioning coaches bring a heuristic understanding, emotional intelligence, and professional judgment to every interaction—qualities that are essential for athlete safety, development, and long-term success. Rather than viewing AI as a threat, the future of strength and conditioning lies in leveraging technology as a tool that enhances, rather than diminishes, the role of the strength and conditioning coach. By combining the precision of AI with the irreplaceable human elements of coaching, the profession can continue to evolve while preserving the core values that define it.

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