

NATIONAL UNIVERSITY OF MEDICAL SCIENCES

MSc in Athletic Therapy

Research Paper: Sports Strength and Conditioning
in conjunction with Therapy

Arun Kumar

6/22/2015

Student Number: S140212

Topic: Sports Strength and Conditioning in conjunction with Therapy

Introduction

Sports Professionals in this era have a daunting task; to always be stronger, faster and better. They are placed under high amount of stress and pressure to always perform and be the best. If one ever wants to slow down and take a short break, his competitors will always overtake him and very soon, he will be out of the race. These are the demands an athlete goes through to be the best, to produce results and bring glory home.

In order to achieve results, athletes place their bodies under tremendous amount of physical stress. One slip and that's it, end of their sporting career. Old school training methodology may no longer be applicable to athletes nowadays. Sports professionals have to adopt a more structured regimen backed by sports science. They have to follow a comprehensive, systematic and integrated system in order to achieve success. In this paper, I will put together why Sports Strength and Conditioning is extremely essential for every individual sportsmen and how therapy will complement it.

Sports Strength and Conditioning

Sports Strength and Conditioning (SSC) is a term used to describe the training protocols that athletes undergo to improve their physical and mental fitness. A Basketball player will always remain an amateur if he only focuses on improving his dribbling, court sense and shooting ability. In order to get to the next level, he would have to work on his anaerobic ability, power, strength, reaction time and most importantly, aerobic endurance. All this parameters can only be achieved if one undergoes SSC.

SSC coaches or Performance coaches are highly skilled in this area and have the ability to coach and transform each individual athlete. SSC coaches will be able to bridge the ever widening gap between science and practical application and they have a full understanding of the structure and function of the human movement system.

Every athlete and even non-athletes have to be functional. Function is an integrated, multiplanar movement that involved acceleration, deceleration and stabilization. Integrated training is a comprehensive approach that attempts to improve all components necessary for an athlete to perform and for an average individual to perform his activities of daily living.

Traditionally, strength and conditioning would mean enhancing one's maximum strength and mass. But that will no longer be applicable. One must be functional; accelerate, decelerate, dynamically stabilise and be powerful. We have to look and understand how science has helped us improve in our performance. Here is a simple concept:

$$\text{Force} = \text{Mass} \times \text{Acceleration}$$

Force is Power, the very power a boxer needs to deliver a knock-out punch.

$$\text{So, Power} = \text{Strength} \times \text{Speed}$$

Above is an equation that shows the importance of integrated training. In order to get power, we need to have strength (mass) and speed (acceleration). The athlete now knows that apart from developing his sports skills, he needs to develop other parameters in order to deliver that knock-out punch.

This is Sports Strength and Conditioning; where science is used to develop an integrated training model which will mould an athlete to be functional.

Therapy for Athletes

Therapy for athletes is another important aspect of SSC. Therapy is the prevention, immediate care and rehabilitation of musculoskeletal injuries. A therapist will be able to assess an individual for any injury and also educate in injury prevention. In terms of SSC, therapists play an integral role by applying various massage techniques to stretch the muscles, manipulate joints and loosen the tight ligaments. This allows an athlete to recover faster and stay injury-free in most cases. Massage helps to relieve both physical stress and mental stress and allows the athlete to catch a better night of sleep. Moreover, it is very evident that massage therapy works as all the top athletes in the world are engaging professional Osteopaths to help overcome their injuries and for injury prevention.

Components of an Integrated Sports Strength and Conditioning Program

As mentioned above, an integrated program means covering all aspects of conditioning in order to be functional. The various components of an Integrated SSC program are listed and will be covered below:

1. Flexibility Training
2. Cardiorespiratory Training
3. Core Training
4. Balance Training
5. Plyometric Training
6. Speed, Agility and Quickness Training
7. Multiplanar Resistance Training
8. Sports Specific Conditioning

Flexibility Training

Flexibility is the normal extensibility of all soft tissues that allows full range of motion of a joint and optimum neuromuscular efficiency throughout all functional movements (1). The general purpose of flexibility training is to:

- Correct muscle imbalances
- Increase range of motion
- Decrease muscle hypertonicity
- Relieve joint stress
- Improve the extensibility of the musculotendinous junction
- Maintain the normal functional length of all muscles

A SSC coach and therapist would have to understand the different types of flexibility training in order to plan a proper and suitable program based on the needs and goals. The different types of flexibility are corrective flexibility, active flexibility and functional flexibility.

Corrective Flexibility	Designed to correct common postural dysfunctions, muscle imbalances and joint dysfunctions. Self-Myofascial release, static stretching and neuromuscular stretching are applied. (2)
Active Flexibility	Designed to improve soft tissue extensibility in all planes of motion by employing the neurophysiological principle of reciprocal inhibition. (3)
Functional Flexibility	Designed to improve multiplanar soft tissue extensibility and provide optimum neuromuscular control throughout that full range of motion. (4)

Cardiorespiratory Training

Of the various components that comprise an athlete’s total physical fitness program, cardiorespiratory endurance is the most misunderstood. One would think that cardiorespiratory training means to run or sprint. That’s a misconception. One would have to understand the different energy system present and have to select which system is the most appropriate for their goal. Many athletes incorrectly assume that cardiorespiratory training is synonymous with aerobic training. This concept can delay their performance. The most common goals associated with cardio training are:

- 1) Improve performance
- 2) Reduce mental anxiety
- 3) Weight management

Cardio training is more than just training run long distance (Aerobic training). This is especially true for athletes who must constantly tap into top-end anaerobic energy system, while minimising fatigue from long court games.

Core Training

Training the Core is extremely important not only for athletes but even for ordinary individuals looking to live an injury free life. A comprehensive core training program enables an athlete to achieve optimum neuromuscular control of the lumbar pelvic hip complex, achieve optimum performance and in most cases, stay injury free.

Balance Training

Understanding the concepts of balance training would allow an athlete to achieve his goals faster. Balance training involves an individual to train his weak muscle group that always has been dominated. For example, when doing squats, we would most often subconsciously rely on our stronger leg to do most of the work. The dominating leg would never allow the weaker leg to have the same output. This is the nature of the human brain. Neurologically, the brain would send a signal via the neurons to the muscles in the legs to activate and perform the task. What the brain would want is to get the job done in the most effective and fastest way, and that is to rely on the stronger leg to perform the task. In order to tackle this muscular imbalance, the trainer would have to program unilateral training protocols into the program. Single leg squats would allow the weaker leg to carry the same load as the dominant leg.

Skipping the step above would simply result in an imbalanced body and could lead to further implications in the future.

Plyometric Training

Plyometric training is defined as a quick, powerful movement involving an eccentric contraction, followed immediately by an explosive contraction. This is accomplished by the Stretch Shortening Cycle. Training for explosiveness is extremely important for high performance athletes. For a goalkeeper, being able to jump and save the top corner goal requires power from the lower extremity. In order to achieve the power required, one has to adopt the right training method which focuses on the goal. There are three phases in plyometric training:

- 1) Eccentric Phase (also known as loading or cocking): This phase increases muscle spindle activity by pre-stretching the muscle prior to activation. Potential energy is stored in the elastic components of the muscle during this phase and would soon be converted to kinetic energy.
- 2) Amortization Phase: This is the time between the end of the eccentric contraction and the initiation of the concentric contraction. This phase should be kept as short as possible. A prolonged amortization phase results in less than optimum neuromuscular efficiency from a loss of potential energy. A quick rapid changeover will result in a powerful output.
- 3) Concentric Phase: This Phase occurs immediately after the amortization phase and involves a concentric contraction which results in a high output.

Speed, Agility and Quickness Training

Speed, agility and quickness are some of the most significant and visible components of athletic success. An improvement in the ability to react quickly, apply significant force rapidly in the appropriate direction and to redirect that force if needed is the ultimate goal of a program to improve speed, agility and quickness.

Multiplanar Resistance Training

Resistance training is undeniably the most important component in this integrated training system. Resistance training trains our muscles and strengthens them. It helps to strengthen our bones by increasing bone density. In order to reach the full potential in sports, one would have to include resistance training into their program. Individuals training with the same basic exercises and movements such as bench press will adapt by getting stronger, while using lesser motor units. While adaptation is good, this would only mean hitting a plateau. In order to always improve, one must continually recruit more motor units. Activating more motor units increases the number of muscle fibers, creating a greater potential. (5)

Common Musculoskeletal Injuries

Location	Epidemiology	Prevention Strategies
Foot	There are various foot injuries that can happen due to traumatic injury or due to over use. The top three most common foot injuries are Achilles tendonitis, Plantar facilities and metatarsal fractures	<ul style="list-style-type: none">• Wearing the right type of shoes can be extremely important in preventing foot injuries• Proper stretching is paramount to improve range of motion• Strengthening the musculotendinous structures of the foot and improve proprioception
Ankle	Ankle injuries are reported to be the most common sports-related injury. The three kinds of ankle injuries are Lateral Ankle Sprains, High Ankle Sprains and Medial Ankle Sprains.	<ul style="list-style-type: none">• Incorporating proprioceptive and balance training frequently• Conducting specific training like wobble board single leg stand decreases the chance of injuring the ankle• Strengthening of the muscles surrounding

		the ankle using resistance bands is useful
Knee	Knee injuries are the second most common injuries in the sporting world. The two most common diagnoses are Patellofemoral pain and Anterior Cruciate Ligament tears. Both PFP and ACL injuries are public health concerns because of the high frequency.	<ul style="list-style-type: none"> • Specific prevention exercises are to be done • Strengthening of the hip muscles decreases internal hip rotation, adduction and knee valgus. • Strengthening of the quadriceps is also essential • Proprioception – Balance training and Plyometric – Agility training helps in the prevention of ACL tears.
Lower Back	Back injuries can be very costly to both the individual and the health care system. The complexity of the surgery and medications make it as such. 6-15% of athletes experience back pain at least once in their career. Athletes who suffer lower back pain are most likely to experience it again in the future. Repeated injury to the back may predispose the athlete to future osteoarthritis and long term disability.	<ul style="list-style-type: none"> • Exercise is clearly very important in prevention • Strengthening the core muscle group is extremely important as the core creates intrinsic muscular force to stabilize the lumbar spine during movement such as lifting

Training Progression

There are various training methodologies and no method is wrong, provided it is done sensibly. When I get the opportunity to train athletes, I like to use my own method called Re-Con. Re-Con stands for Rehabilitation and Conditioning. It is of utmost importance that an athlete approaches a SSC Coach for a productive program.

Re-Con

The ideal phase for Re-Con will be 9 to 12 months. 3 to 6 months will be spent for rehabilitation if there is any existing injury and 6 months will be spent for conditioning. The table below will show an illustration on this.

Period (9 month program)	Phase	Health Care Specialist
Month 1 - 3	Rehabilitation Phase	Osteopath, Physiotherapist, Physician
Month 4	<p>Aerobic Base Training Phase</p> <ul style="list-style-type: none"> • Training below the first ventilatory threshold <p>Stability and Mobility Training Phase</p> <ul style="list-style-type: none"> • Focuses on strengthening postural muscles and correcting muscular imbalances 	Personal Trainer, Strength Specialist
Month 5 – 7	<p>Aerobic Endurance Conditioning Phase</p> <ul style="list-style-type: none"> • Focus will be on increasing the distance covered via walking • Running at this stage may be high impact for some cases, thus brisk walking can be introduced • Progression to uphill walking from flat gradient • Progression to cardiorespiratory exercises such as boxing or dance aerobics will be introduced <p>Strength Training Phase</p> <ul style="list-style-type: none"> • Introduction to body weight exercises such as squats, lunges, push ups, bird-dog etc. • Proper activation of stabilisation muscles and postural muscles must be present before progressing onto external loading • Toward mid of month 6, external loading should be introduced, lifting fundamentals to be covered 	Personal Trainer, Strength Specialist, Yoga Trainer

	<p>Yoga Training Phase (Flexibility)</p> <ul style="list-style-type: none"> • Clients are to be introduced to the importance of proper flexibility • Tight muscle groups to be stretched everyday • Balance and postural muscles to be trained via Yoga 	
Month 8	<p>Anaerobic Training System</p> <ul style="list-style-type: none"> • Short bursts of anaerobic sets such as sprints or fast biking <p>High Intensity Interval Training (H.I.I.T)</p> <ul style="list-style-type: none"> • H.I.I.T method to be applied to weights training. This method allows clients to tap on their anaerobic system, increase heart's capacity to pump oxygen rich blood throughout the body faster under high demands • Gives the clients more confidence in working through discomfort • Performance training to be done; sports specific training. 	Personal Trainer, Strength Specialist
Month 9	<p>Testing Phase</p> <ul style="list-style-type: none"> • Fitness Testing and Postural Assessment to be conducted to mark the progress and improvement made by the client • Client to attend a review session with the main coach 	Personal Trainer, Strength Specialist, Head Coach

Conclusion

As mentioned in this paper, Sports Strength and Conditioning is an integral aspect of performance enhancement. If an athlete wants to excel in his field, he will need to adopt the principles of the integrated training system. Massage therapy forms an important aspect of SSC. In order to recover faster and overcome muscular imbalances, one has to undergo massage

therapy sessions with a professional. As mentioned, massage therapy aids in muscle recovery and SSC aids in muscle conditioning. Together, this would be the perfect 'equation' to Athletic Conditioning.

References:

- 1) NASM Essentials of Sports Performance Training Manual
- 2) NASM Essentials of Sports Performance Training Manual
- 3) NASM Essentials of Sports Performance Training Manual
- 4) NASM Essentials of Sports Performance Training Manual
- 5) NASM Essentials of Sports Performance Training Manual