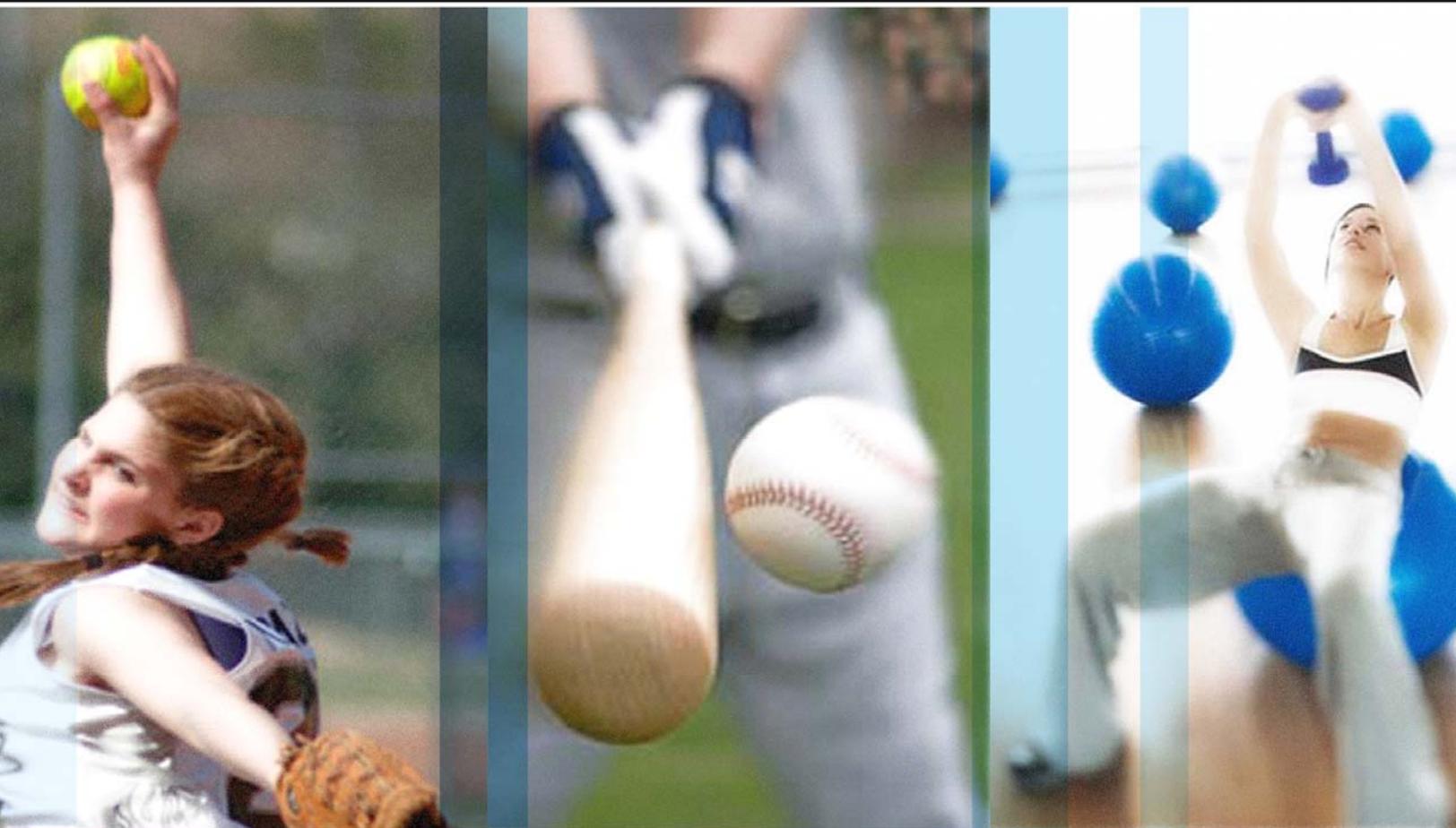


Fastpitch Softball: Physiological Demands and Performance Factors



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Powerful Resources to Quickly
and Easily Boost Your Game!

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Published by:

M.O. Dagenais & Associates, Inc.

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About the Author

Marc O. Dagenais, MHK, CSCS, ChPC Softball Peak Performance Coach



Marc O. Dagenais is a sought-after peak performance coach and an expert at improving performance, developing talent and helping athletes and teams reach their full potential. He works with softball players to help them turn their athletic talent into extraordinary performances and he consults with coaches on how they can get more out of their players, turn their struggling team around or get an edge over their opponents.

Marc has an exceptional combination of softball coaching expertise and sports sciences knowledge – which is a very rare combo in the world of softball. He has intimate knowledge of what it takes to develop and maintain a high level of performance in athletes.

Marc has worked with numerous elite amateur, college and professional athletes including hundreds of softball players. He has also been coaching women's competitive fastpitch softball for almost 20 years and has coached at every level of the game from grassroots to the college and the international level. He has served three years as an Assistant Softball Coach at Simon Fraser University in Burnaby, B.C and he presently works and coaches with the Canadian Women's Softball National Team Program.

In addition to having an extensive background as a softball coach, trainer, and consultant, Marc has advanced studies in sport sciences (high performance coaching, sports psychology, and strength and conditioning) and numerous high level certifications.

Also, in addition to being an expert strength and conditioning specialist and a high-level softball coach, he is also extremely well-versed in the areas of sports psychology, sports nutrition, and injury management.

FASTPITCH SOFTBALL: PHYSIOLOGICAL DEMANDS AND PERFORMANCE FACTORS

In order to be able to successfully scout, recruit, identify athletes, detect talent, design a long-term development plan or sport-specific training program, one must understand the specific demands of the game of softball.

Movement Training

The body functions mechanically with all parts working together to produce efficient movement. Pitching does not involve just the shoulder; hitting doesn't involve the hands alone – both skills require whole-body coordination. Functional training that emphasizes all of the sport's elements raises player performance to the highest level. Sports training is all about training the movements, not the muscles.

Biomechanical Factors

The primary softball skills are throwing, fielding, hitting and running. All skills take place in at least one of the three planes (sagittal, frontal and transverse). This means that players need to train in all three planes, use three dimensional movements and work on multi-directional speed and quickness.

Performance Factors and Physiological Analysis

Energy systems: The action in a single play averages less than 7 seconds in length and most plays last 5 seconds or less. A single pitch takes about 1.5 to 2.5 seconds from the initiation of the motion to the ball being caught by the catcher. Therefore, it is the powerful ATP-CP energy system, also known as “anaerobic alactic system” that mostly fuels every action in softball. While any athlete might benefit from a good “cardio”, the aerobic system does not play a big role in softball. A good base in aerobic endurance will serve as a foundation to develop the anaerobic system. Some sport scientists suggest that it could help recover quickly from fatigue.

In terms of metabolic training, softball players should spend some time developing a base of aerobic endurance in the off-season but the most

important thing to train is the ability to move explosively for a short period of time. Training should focus on many brief all-out actions, full-out short duration speed activities and other drills exercising the ATP-CP system.

Strength: Every single action in softball is an explosive action. Pitching, hitting, throwing, quick lateral movements, jumps off the bases and others are all explosive. The need is for muscular power. Power is a function of speed and strength. More specifically, softball players need throwing power and acceleration power. A base in overall body strength and maximal strength is also important as it serves as a foundation to build muscular power. Some muscular endurance is also beneficial, especially for pitchers.

Because of the variety of skills and movements in the sport of softball, most body parts need to be trained. They all contribute in one way or another to enhance performance in softball. Shoulder and back strength as well as the rotator cuff muscle group are important in throwing but the legs and the core (hips and abdominals) also contribute to the throwing motion. The legs and the core are even more important for hitting as the power comes from the middle and lower body.

Softball players do need strong stabilizers to keep them injury free and this is a fact that a lot of them have weak stabilizers (mostly shoulder, trunk and knee stabilizers). There is an important need to work on shoulder, core and knee stability. The most neglected area in sport performance training is core training and it is one of the most important. Core training will enable the athlete to achieve better performance, increase torso power and joint stability, improve posture and neuromuscular coordination, reduce injuries and enhance movement efficiency. Floor based crunches and sit-ups do very little for core stability and trunk power. Stability ball training will develop the deep abdominal muscles needed to stabilize the trunk while medicine ball exercises will develop the power of the trunk.

In short, softball players need to develop a base of strength and then concentrate on developing muscular power with explosive training (plyometrics, explosive tempo weight training and olympic lifting). They also require strong stabilizers and lots of time should be spent on core training.

Flexibility: Flexibility is defined as the range of motion around a joint. Softball players require dynamic flexibility, which is the ability to move through a full range of motion. A greater range of motion contributes to improved athletic performance and is associated with a reduced risk of injury.

Overall flexibility is important in softball but it is especially important to increase flexibility in the tight areas. Some of the common tight muscles or muscle groups among softball players are hamstrings, hip flexors, calves and chest area (pectoralis minor more specifically). This tightness greatly increases the risk of injury.

Flexibility needs to be developed prior to the beginning of the season with a good stretching program that focuses on the major muscle groups and thigh muscles. Stretching should be done after any workout as part of the cool-down when your muscles are warm and most receptive to stretching. Static stretching prior to exercise has been shown to decrease performance and to have no impact on the incidence of injury, which is contrary to the popular belief. A proper “active” warm-up is still essential to minimize injury and to prepare the body to perform prior to any physical activity.

Speed, Quickness and Agility: Softball is a quick game as everything needs to be done as fast as possible. To be successful, softball players need multi-directional quickness, first step quickness, lateral movement, acceleration and linear speed. These performance factors must be trained and developed as much as possible. Just a slight improvement can make a huge difference. Training sessions should include footwork, running form drills, agility drills, lateral movements, sprints and lots of quick explosive actions.

Coordination: All athletes require a base of general coordination, which is the ability to perform movements of various degree of difficulty quickly, with great precision and efficiency. In the case of softball, the specific movements that require coordination are hitting and fielding a moving ball, throwing to a specific target and executing plays while in motion. Hand-eye coordination is especially important (Kindall 1992).

There are not too many specific methods of training coordination compared to other biomotor abilities. Coordination is a natural, inherited ability (Kindall 1992). To successfully develop coordination, it is important

to develop and acquire a high variety of skills. The practice of a variety of sports helps the development of coordination. Coordination can be achieved in sport specific training by employing exercises with progressively increased complexity.

Balance: Gifted athletes have very good balance. Balance is closely associated with coordination and is important in softball as a lot of plays are executed off-balance. Good balance will enhance performance and reduce the risk of injury. Balance training also known, as proprioception training will also build a strong back and abdominals, and improve coordination (Kindall, 1992).

Balance should be trained using stability balls and balance boards. To improve balance, the body needs to be put in unstable environments so the muscles will react and produce the appropriate action to maintain stability. Not only is balance training important, but also it is also fun and challenging (Twist 2000).

INJURY FACTOR ANALYSIS

As in any other sport, there is always a risk of injury. In softball, there are different levels of injury risk and they can also vary by specialized position or role (Loosli, 1992). Most injuries incurred by athletes are related to the joints.

Commonly injured joints: Softball players, because of their particular role, must spend more time protecting the joints and maintaining a high degree of integrity within the joint. Some of the most commonly injured joints in softball are (Janda, 1990):

- Shoulder
- Knee
- Ankle
- Hip
- Elbow

Major cause of injuries: One reason why softball players suffer a high degree of joint injury is the "ballistic" nature of the game. With the exception of the pitcher and catcher, the ball player is idle on the field until the ball is hit towards them. Then a sudden movement is required as they respond to the ball. The sudden reaction involves a fast contraction of the muscle around the joint and great shearing forces on the joint itself (Janda, 1990).

Ballistic moves are dangerous as the forces applied to a joint and the associated muscles, tendons and ligaments require muscular contractions that are by themselves dangerous. Outfielders often suffer hamstring pulls as they go after a ball. The sudden start to a full speed dash places enormous stress on the muscle insertions.

In an ordinary game, pre-game warm-ups are rarely performed adequately. Then, the athlete, for the most part, remains fairly idle and cools down. The "warmed" state is not maintained. The reaction to a ball or a hit, then requires "cold" muscles to forcibly contract.

Infielders: They must be aware of the knee. Their reaction to a ball often requires lateral movement. There are very few knee injuries that occur in a forward motion, but lateral movements place unnatural and high levels of stress on the joint. Add to this a "cold" state of condition within the muscle, then the athlete is subject to a high risk for injury. Proper leg

training, especially focusing around the knee can at least strengthen the area and reduce risk.

Outfielders: They need the proper balance in the legs, as they must react like a sprinter to chase down a ball. Consider that sprinters are "very warmed-up" before a race. Now imagine an outfielder, standing around, cooling off and they are required to "sprint" to a ball. The risk is high for injury.

Throwing: This is also putting softball players at risk of injury. Softball players perform many throws during the course of a season and this can lead to tendonitis and rotator cuff problems. They can also get injured during a game where they have to throw in a rush. Proper conditioning of the shoulder and the rotator cuff is essential.

During these brief, explosive periods of action, there is a constant interplay of force production and force reduction. Most injuries occur during the force reduction, or deceleration phase of throwing, hitting, fielding and running. Consequently, to remain healthy during the softball season and to increase skills and performance levels, training should emphasize speed, power and the ability to decelerate safely.

To train deceleration, eccentric training, also known as "negative training", should be emphasized. Examples of eccentric movements are: deceleration phase of a sprint, landing phase of jump, follow-through phases of hitting and throwing, etc. Eccentric training can be done by emphasizing the lowering phase of any resistance training exercises.

HANSON'S MODEL OF HUMAN PERFORMANCE

As described by Bompa (1985), the integration of various factors into planning is essential to achieve a peak in athletic performance. In order to better understand the implication of various aspects of human performance in athletic success, I would like to present and discuss Hanson's Model of Human Performance. According to Hanson (2001), there are four absolutes for human performance:

1. **Biomechanical:** Human movement is dynamic balance – the ability to move center of gravity with postural stability and joint integrity through ranges of motion. Three-dimensional motion analysis identifies the most efficient and effective methods and techniques for performing any human movements.
2. **Physical:** To prehabilitate the body to perform efficiently, effectively, and free of pain through musculo-structural stabilization and integrative strength and flexibility training. Once nerves, muscles, tendons, ligaments, and bones are properly positioned, developed, and synchronized, an individual will optimize injury-free performance in any work/play activity.
3. **Nutritional:** To create an optimal metabolism. Finding a blood chemistry that will help prepare and repair the body before and after physical performance. Identifying the foundation for optimal nutrition by learning how to properly combine, rotate, supplement, and enhance foods.
4. **Mental/Emotional:** To connect mind and body by linking kinesthetic awareness with mental/emotional management for optimal performance. It is thinking, feeling, and doing with function at work or play.

Performance Imperative #1 – Biomechanics

Biomechanics are laws of physics applied to the human body. Softball players are subject to these laws because their body's are structure (bones), levers and hinges (joints and connective tissues), power (muscle), fuel (blood chemistry), and programming (mental/emotional). They absorb energy, direct energy and deliver energy in three extremity positions (linear, circular, and angular). According to Hanson, a baseball or softball athlete, to do all of these effectively and efficiently requires:

1. Dynamic balance - a weight transfer with head over belly button (center of gravity) between balls of the feet.
2. Postural stabilization – minimizing head movement by finding a posture and keeping during weight transfer.
3. Movement efficiency – Proper sequential order for the various actions of a movement to optimize the transfer of force.

Athletes are only as efficient as their worst mechanic (Hanson, 2001).

Performance Imperative #2 – Functional Strength

Absolute strength alone is not enough for baseball or softball. To support a large numbers of throws, pitches, or swings, a player must have functional strength and stamina. To do this requires:

1. Integrated Flexibility Work – training for optimal range of motion in all torso/extremity positions or movements.
2. Body Work – closed chain training the body itself for resistance.
3. Joint Integrity Work – training joints for endurance in movement patterns specific to baseball or softball.
4. Machine Work – heavier resistance training on movement specific machines.
5. Free Weight Work – heavier resistance training with dumbbells and barbells in positions and movements specific to baseball or softball.

Athletes are as strong as their weakest link (Hanson, 2001).

Performance Imperative #3 – Nutrition

Eating to find an optimal blood chemistry and metabolism that will help prepare and repair the body before, during and after competition. This requires learning how to:

1. Food Combination – finding the right ratio of protein, complex/simple carbohydrates and smart fat.
2. Timing – time the food intake to get the most out of training and maximize performance in competition.
3. Food Supplementing – ensuring a daily intake of the right vitamins, minerals, digestive enzymes, and anti-oxidants.
4. Food Enhancing – adding specific enhancements to daily intake for optimal recovery from stresses of preparation and competition.

The wrong foods most often fuel the wrong results (Hanson, 2001).

Performance Imperative #4 – Mental/Emotional Management

Trying to connect mind and body by linking proprioception and kinesthetic awareness with thinking, feeling and doing in preparation and competition. This requires understanding of:

1. The conscious mind – the thinking part of the brain
2. The sub-conscious mind – the feeling processor of the brain
3. Psycho-neuro immunological responses – the body's result of thinking and feeling under stress.
4. Auditory, visual, tactile performance enhancement – training the mind to direct the body to perform under stress.



Are You Struggling to Achieve Your Full Potential?

Is Your Team Underperforming?

Does Your Game Need a Boost?

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