Using Pilates to improve the basketball jump shot

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ABSTRACT

This Case Study uses a Pilates program to optimise the jump shot and decrease the risk of injury for a 49 year old female basketball player. The muscles and sequence of movements involved in a basketball jump shot are described. The development of the jump shot in the game of basketball as well as the conditions under which it is employed are described. The increasing popularity of Pilates in the general and professional sporting community is noted. The benefits of Pilates and the ten principles underlying the BASI approach are outlined. The Pilates program follows the BASI Block System format. Foot work on the reformer and leg work using the jump board are included to improve the alignment, control and explosive power of the player’s jump shot.
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ANATOMICAL DESCRIPTION OF A JUMP SHOT

One of the ways players score points in a basketball game is through the use of a two-legged jump shot. A jump shot is where the player jumps up and shoots the ball at the top of the jump. The jump shot requires a high level of athleticism because it is executed while the whole body is in full motion. A large number of muscles are involved, as illustrated by this diagram:

(Diagram originally appeared in Basketball Anatomy).

**Primary muscles:** gluteus maximus, gluteus medius, quadriceps (rectus femoris, vastus lateralis, vastus intermedius, vastus medialis), hamstrings (biceps femoris, semitendinosus, semimembranosus), external and internal obliques, transversus abdominis.

**Secondary muscles:** erector spinae (spinalis, longissimus, iliocostalis), deltoids, rectus abdominis, iliopsoas, soleus.
Three phases of the jump shot

To prepare for the jump shot the player holds the ball and ‘squares off’ by placing feet and shoulders in alignment towards the basket. Starting position is with the feet slightly less than shoulder width apart and the stance is slightly staggered, to minimise forward or backward motion during the vertical jump. The knees are bent in readiness for take-off (Knudson, 1993). This phase is illustrated by the first two pictures in the sequence directly above.

The execution or flight phase - involves a vertical jump and release of the ball at the top of the jump trajectory (pictures 3-5 above). The execution phase involves both power and muscle work. The player must maintain balance whilst extending the legs, back, shoulders and elbow. Power must be generated from the legs, hips, knees and ankles to drive the player off the ground and above the opponent. Airborne, the player’s hips, knees and ankles should be in alignment. The muscles of the shoulder, elbows, and wrist are recruited to shoot the ball (Sport NZ, 2010).

The follow-through phase concludes the movement. After the player releases the ball there is a continuation of the flick of the wrist, and the fingers follow the movement of the ball. Maintaining balance when landing is crucial both to prevent injury and prepare for the next movement. The idea is to explode up and land soft, returning to the take off position.
Blazevich (2010) describes the kinetic chain - a domino effect whereby the force behind the jump shot comes directly from the extension of the legs, moving through the trunk, shoulders, arms and wrists. The diagram below depicts the initial movement in the foot and ankle, generating all the way through the knee joints, the hip joints, the SI joints, thoracic lumbar joints and cervical spine.

(Blazevich 2010)
INTRODUCTION

The game of basketball was invented back in 1891 but the jump shot did not appear until the 1930s. It is now considered to be a vitally important element of technique in basketball and one requiring a high level of athleticism. Struzik et al (2014) suggest that up to 70% of all the shots made (at the semi-professional and pro level) are jump shots. Under game conditions it is usually performed on the move and executed under time as well as defensive pressure. To make the basket and avoid injury or offensive foul, the shooter needs good proprioceptive awareness of the body in space and the ability to allocate attention to the basket as well as fellow players and opponents.

In the United States, basketball teams including the Orlando Magic, New Jersey Nets, Tampa Bay Buccaneers and Detroit Lions now incorporate Pilates into their conditioning Program. Big names like Kobe Bryant, LeBron James, Dwayne Wade, Jason Kidd and Steve Nash are doing Pilates. Read more: http://lifestyle.inquirer.net/224896/why-real-men-even-pro-ballers-are-doing-pilates/ #ixzz5Ie89BnW2. Closer to my home, I was delighted recently to see the Sydney Kings Captain and two times NBL MVP Kevin Lisch take to the Cadillac and Wunda Chair as part of his off season training.

Pilates studio owner Jennifer McCamish trains professional sportmen. McCamish sums up the benefits of Pilates to the professional sporting community as follows:

“The Pilates technique trains the deep stabilizers to strengthen the core. This helps improve proprioception, body awareness, and breathing to support a large body in motion. The more you’re in control of your bodyweight in space, the more efficiently you move”.

Read more: https://www.mensjournal.com/health-fitness/a-big-guys-guide-to-pilates-w491558/
The increasing popularity of Pilates amongst professional sportsmen - including basketballers, reflects what Isacowitz and Clippinger (2011, p.x) describe as the profound evolution of Pilates in the general community. Today Pilates is found in private studios as well as general fitness and medical centres. Clients cover the age spectrum and range from people experiencing injury and disease right up to elite athletes.

What lies behind the burgeoning popularity of Pilates and why is it so beneficial for such a diverse demographic? It is well recognised that Pilates can help to build healthy movement patterns, improve muscle balance and mitigate negative postural changes that come with age. But according to Isacowitz and Clippinger (2011, p.1):

“Pilates is not just exercise. Pilates is not just a random choice of particular movements. Pilates is a system of physical and mental conditioning that can enhance your physical strength, flexibility and coordination as well as reduce stress, improve mental focus, and foster an improved sense of well-being. Pilates can be for anyone and anyone”.

This emphasis on addressing both mind and body is fundamental to the ten principles of Pilates underlying the BASI approach. The ten BASI principles are derived from, and build upon the original work of Joseph Pilates. The ten principles, outlined in the BASI Study Guide are:

<table>
<thead>
<tr>
<th>Awareness</th>
<th>Balance</th>
<th>Breath</th>
<th>Concentration</th>
<th>Center</th>
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<tbody>
<tr>
<td>Control</td>
<td>Efficiency</td>
<td>Flow</td>
<td>Precision</td>
<td>Harmony</td>
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Whilst the ten principles underlie the entire Pilates repertoire their emphasis in individual exercises will vary. In the upcoming description of a Pilates program to improve a basketball jump shot and reduce the risk of injury, the notes indicate if an exercise specifically incorporates a principle/s and I regard the principle as relevant to the objectives of the Case Study.
WHO IS THE CLIENT?

My client Steph is a 49 year old caucasian female, 163cm tall and weighing 56kg. She is a left-handed shooter and also kicks a ball with her left foot. Steph has played basketball competitively since junior days when she represented her State and achieved selection to National talent squads. She plays either shooting or point guard. Steph was also a successful junior Irish Dancer, winning a place consecutive years at the Australian championships. She ceased competitive basketball in her late twenties and resumed playing socially two years ago in A grade. After ceasing competitive basketball, Steph remained fit and active, exercising daily - either weights training, running or cycling. She has practiced mat Pilates on and off for a number of years and in the last five years has attended group Pilates reformer classes. Despite a high level of physical activity over her life Steph has remained relatively injury free. Her main injuries are a broken right clavicle 15 years ago and more recently, bulging L5 and L6 discs, which she has rehabilitated well through physical therapy, Pilates and the cessation of Barre classes.

WHAT ARE WE SEEKING TO ACHIEVE?

On her return to playing basketball Steph noticed a general decrease in speed and agility. Of more concern was her relatively slight build in comparison to other players. Whilst a shooting or point guard isn’t expected to drive to the basket, Steph was finding that her ability to shoot from outside over her defensive opponent was restricted. To score points she needed to shoot more jumpers. Being older, Steph is also more worried about injury. Injuries common to basketball are sprained ankles, sprained ACLs or MCLs and back issues (from playing on hard surfaces).

DESCRIPTION OF THE BASI PROGRAM

The program I developed for Steph follows the BASI Block System format. The Block System allows me to program using the entire repertoire in a sequential structure. Whilst the structure is standardised there is significant flexibility in the choice of series as well as individual exercises comprising the blocks. This enables me tailor the program according to a client’s individual needs and goals (Study Guide BASI Comprehensive Course).
<table>
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<tr>
<th>BLOCK</th>
<th>REPERTOIRE</th>
<th>REASONS and NOTES</th>
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| Warm Up                | **Intermediate** - Roll up, spine twist supine, double leg stretch, single leg stretch, criss cross | • prepare mind and body  
• teach pelvic lumbar stability  
• teach stable unilateral movement  
• spinal rotation and oblique emphasis |
| Foot Work              | **Reformer** - Parallel heels & toes, v position toes, open v heels & toes, calf raises, prances, single leg heels & toes | • concentrate on utilising the feet  
• bring awareness to foot movement  
• improve lower extremity alignment  
• support explosive jumping power |
| Abdominal Work         | **Cadillac** - Breathing with PT bar           | • use breath to promote core stability  
• heighten body awareness  
• promote flow in movement  
• improve coordination and balance |
| Hip Work               | **Cadillac** - Lying side single leg series: changes, scissors, circles front and circles back | • increase range of hip joint motion  
• strengthen hip adductors  
• challenge pelvic lumbar stability |
| Spinal Articulation    | **Reformer** - Semi-circle                      | • teach spinal articulation  
• challenge hamstrings  
• added benefit of shoulder extension |
| Stretches              | **Pole Series:** shoulder stretch, overhead stretch, side stretch, spine twist | • enhance shoulder mobility  
• stable trunk in lateral flexion/rotation  
• good stretch for the chest |
| Full Body Integration - fundamental/intermediate | **Reformer** - Knee stretch round back, knee stretch flat back | • learn hip hinge  
• hip hinge creates a higher jump than a jump from the knees  
• decrease hip stiffness |
| Arm Work               | **Cadillac** - Arms Standing Series: chest expansion, hug a tree, circles up and down, punches, biceps | • teach precise upper body movement  
• promote stable spine with long reach  
• enhance external shoulder rotation  
• punches supports lat/back extension |
| Full Body Integration - advanced/master | **Reformer** - Long back stretch | • assist elbow extension (triceps and anconeus)  
• increase wrist strength  
• encourage scapular stabilisation |
| Leg Work               | **Reformer** - Jumping series: parallel, v position, single leg parallel, leg changes  
variation: chi ball held at chin height to practice coordinated extension of arms at top of jump | • condition without wear and tear  
• teach hips, knee and ankle alignment  
• practice controlled landing  
• heavy springs: power in lower body  
• light springs: challenge abdominals |
| Lateral Flexion/Rotation | **Reformer** - Mermaid                  | • good for turning & throwing sport  
• builds relationship between hip joints  
- one hip is in internal rotation, the other in external rotation  
• abdominal obliques/spinal mobility |
| Back Extension         | **Cadillac** - Hanging back                  | • build all around back strength  
• supports proprioceptive awareness  
• mimics a jump shot - extension through lats, back, shoulders & wrists  
• gives a good chest stretch |
CONCLUSION

The jump shot is an important element of basketball technique and especially relevant to my client Steph who is a shooting guard of small stature. An optimal jump shot requires explosive power, which derives from the coordinated extension of the ankle, knee and hip. In addition to explosive power, Steph needs to jump and land with control. Core stability and knowing how to align the hips, knees and ankles during these movements could be the difference between landing smoothly or landing and spraining an ankle.

Foot work on the Pilates reformer and leg work using the jump board are great ways to do plyometric training without creating additional wear and tear on the body. Steph is demonstrating better muscle activation, alignment and stability in her foot work and leg work during our sessions and she reports feeling more agile and better coordinated on the court in pre-season training.

Whilst foot work and leg work mimic the movement that we are trying to improve, at the end of the day they are just two components of Steph’s Pilates program. In the same way that a muscle does not work in isolation, a BASI Block System conditioning program is focussed on the whole body and the body as a whole. The Pilates emphasis on mind-body connection, proprioception and the ability to keep the pelvis and spine stable while moving the body promote efficient movement. The work we are doing to strengthen Steph’s abdominals and back, increase rotation with a stable trunk and improve her shoulder extension whilst maintaining scapular stability will combine to improve all facets of Steph’s game.
BIBLIOGRAPHY


