

**PILATES FOR VOLLEYBALL PLAYER:
FOCUS ON THE SHOULDER
IN YOUNG ATHLETE**



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ABSTRACT

The heavy load of training that young high potential athletes place on their body while growing exposes them to imbalanced development and injuries. In volleyball, the different technical movements strain the shoulder intensely. It is reported that up-to one player out of two reports is suffering from his dominant shoulder ¹, potentially leading to serious trauma. In young volleyball athletes, the range of motion, the intensity of strikes and repetition of gestures in the course of their training can quickly lead to unilateral and unbalanced development of the muscular pattern². Strength and stretch of shoulder muscles as well as stabilization, flexibility and mobility of articulations will be essential to prevent injuries³. The Pilates method used as a regular cross training will certainly help to support a bilateral harmonious development and to prevent shoulder injuries. Ultimately, the 10 pillars of the method can benefit young athletes in every range of competencies required at the highest level including concentration, precision, center and awareness.

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ANATOMICAL DESCRIPTION

The shoulder involves four bones making up three joints and two sliding planes (**Figure 1**):

- The scapulo-humeral, connects the humeral head to the scapula, moves in the three planes.
- The acromioclavicular, connects the clavicle to the scapula.
- The sternoclavicular, connects the sternum to the clavicle.
- The scapulo-serrato-thoracic, two sliding planes between the scapula and the costal grid.
- The subacromiodeltoid bursa considered as a "false joint".

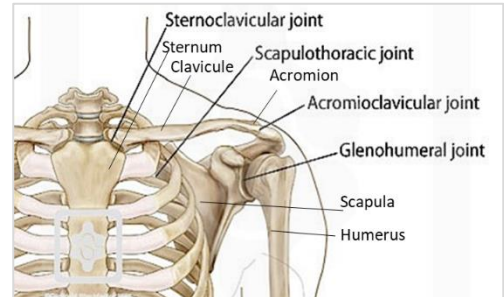


Figure 1: Shoulder Articulations bones and joints representation⁴.

Joint capsules, ligaments, a fibrocartilaginous bead and rotator cuff muscles maintain the joints. They are passive and active stabilizers that provide cohesion and mobility to the entire complex. Twelve main muscles are organized in three large groups and participate to shoulder articulations (**Figure 2**):

- Shoulder muscles: Deltoid, Pectorals, Latissimus Dorsi and Terres Major.
- Rotator Cuff: Supraspinatus, Infraspinatus, Terres Minor and Subscapularis.
- Scapula muscles: Trapezius, Rhomboids, Levator Scapulae and Serratus Anterior.



Figure 2: Shoulder articulations.

Three groups of muscles are involved in shoulder articulations.

A. Shoulder muscles

- a. Deltoid
- b. Pectorals
- c. Latissimus Dorsi
- d. Terres Major

B. Rotator Cuff

- a. Supraspinatus
- b. Infraspinatus
- c. Terres Minor
- d. Subscapularis

C. Scapula muscles

- a. Trapezius,
- b. Rhomboids
- c. Levator Scapulae
- d. Serratus Anterior

(Image bank source ⁵)

The scapulo-humeral joint, a spheroid type, allows movements in the three planes: Flexion (50 °) / Extension (25 °), Abduction (90 °) / Adduction (10 °), External Rotation (35 °) / Internal (95 °). Circumduction also known as revolution cone is the combination of these three movements (**Figure 3**). **Table 1** summarizes the muscles involved in each of these movements.

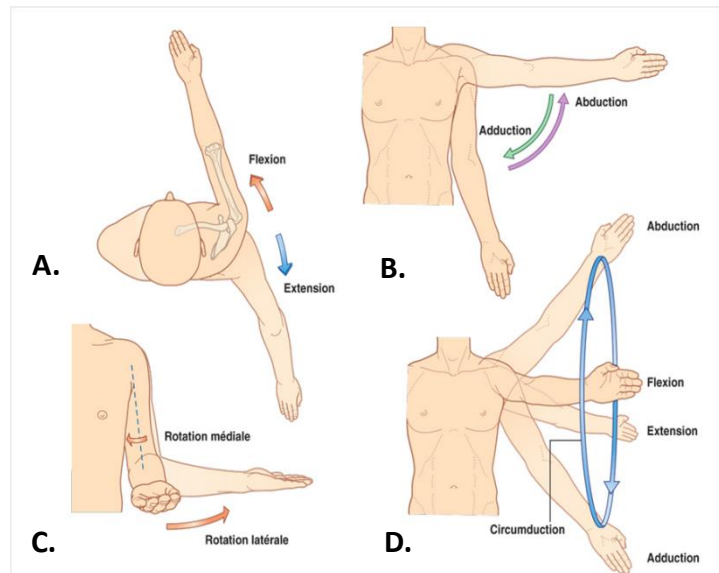


Figure 3: Schematic Representation of shoulder movements from *Delmas V. et al^A*

- (A) Flexion/Extension
- (B) Abduction/adduction
- (C) External/Internal Rotation
- (D) Circumduction

SHOULDER MUSCLES	SHOULDER MUSCLES & ROTATOR CUFF		
FLEXION Pectorals Major (Claviculaire) Deltoïde (antérieur)	ABDUCTION Deltoïde Supraspinatus	EXTERNAL ROTATION Infraspinus Terres Minor	CIRCUMDUCTION Flexion Abduction Extension Adduction Rotation externe Rotation interne
EXTENSION Pectorals Major (Sternal) Latissimus Dorsi Terres Major Deltoïde (postérieur)	ADDUCTION Pectorals Major Latissimus Dorsi	INTERNAL ROTATION Subscapularis Terres Major	

TABLE 1: Summary of the main muscles involved in the shoulder movements

INTRODUCTION

With nearly 260 million participants, volleyball is one of the 3 most popular sports in the world. France has 1.8 million practitioners, including a little over 140,000 licensees, the distribution of men / women is almost equal (52% of men vs. 48% of women). 60% of Licensees are under 20 years old, making volleyball the 1st university team sport and 2nd school sport in France ⁶.

There are four different player positions in volleyball: attackers (outside hitter and opposite), main blocking and attacking middle blocker, overhand passing for toss setter, and defending libero⁷. Serving, passing, setting, hitting, blocking are technical volleyball skills that strain the shoulder so intensely that more than one player out of two reports suffering from his dominant shoulder ^{1,8}.

Several phases can be responsible for the onset of pain or pathologies in the shoulder: serving, spiking, passing and blocking. The player uses these articulations extensively in the four movements described in **(Figure 2)**. Due to the repetition of gestures in dynamic (service, attack), static (reception) or by reflex reaction (defense / block) **(Figure 4)**, the shoulder is subjected to high mechanical stresses that can lead to trauma.

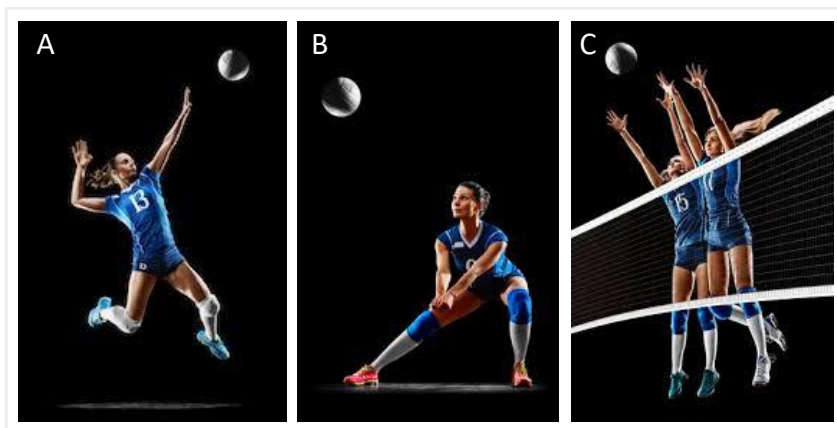


Fig 4: Shoulder movements in volleyball practice

- (A) Dynamic (attack, service)
- (B) Static (reception)
- (C) Reflex (defense, block)

(Image bank source ⁹)

STUDY CASE

1. CONTEXT

Baptiste is a 15 years old, 176 cm, 67 kg elite volleyball player in the U15M age category (Under 15 Male). Like his entire team, he started playing volleyball around 4 years old and quickly increased his training regimen to an average of 10 hours per week (excluding competitive tournaments every weekend from September to May). School holidays are devoted to training courses either at the Regional Training Center, with the Departmental Selection or to Beach Volleyball camps. In 2019, his team obtained a promising Regional and National Record (Regional elite champion title, 3rd at the U13M National French Cup, 5th at the French U13M Championship).

Postural analysis

Baptiste's postural analysis is characteristic of a young man in good physical conditions, presenting athletic muscle development, balanced over the whole body. His height of 176 cm places him at +1 standard deviation from the median (From World Health Organization weight and height curve of boys aged 1 to 18) which is common for a teenager playing volleyball. The posture is anatomical; no alignment abnormality is observed in lateral or ventral views. Dorsal view highlights muscles hypertrophy on his right side corresponding to his dominant shoulder. Superficial upper back muscles in both resting and engaged positions are overdeveloped compared to the left side (**Figure 5**). Consequences on morphology and strength of a daily asymmetrically activity of the scapular muscles, shoulder muscles and rotator cuff have been largely documented in this sport ^{10,11}.

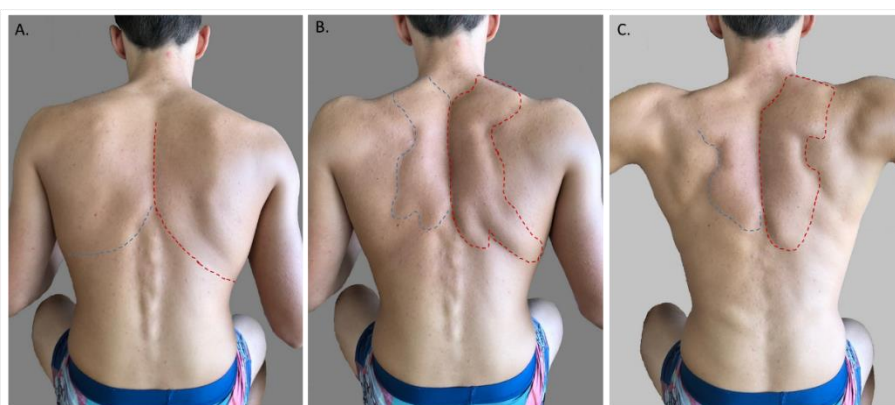


Fig 5: Posterior view of a 15-year-old athlete with intensive volleyball practice, right muscles hypertrophy on the dominant shoulder is observed (red dot line).

- (A) Latissimus dorsi
- (B) Rhomboid, Trapezius, Posterior serratus
- (C) Trapezius

This asymmetric use from an early age can lead to shoulder pathologies. The spectrum extends from instabilities/pain, to conflicts/tendinopathies and can induce ultimately, in the most serious cases, to micro-traumatic neurological lesions¹².

The traumatic pathologies find their origins in insufficiently congruent joint surfaces, movements of large amplitude, movements carried out with very high speed, insufficient development of musculature, poor proprioception and degraded gestural technique. Their appearance and development will be prevented by the coach through appropriate training, including the correction of the technical gesture, muscle strengthening and proprioception work¹³. Injury situations will be cautiously handled by physician professional, however a cross training involving the Pilates method could make of this case a good candidate.

2. BASI PILATES COMPREHENSIVE PROGRAM

2.1. GOALS: strength, stretch and control of the muscles for a better mobility, flexibility and stability of the shoulder.

The cross training that can complete the preventive measures taken during volleyball training should first help to strengthen mobility, stability and control of shoulder joints. The second objective is to homogenize the bilateral development in order to protect young athletes from serious injuries¹⁴. In the case of Baptiste, the approach should allow to compensate the postural adaptations associated with the muscles overdevelopment of his dominant shoulder. In 2006, Reeser et al reported strategies for the prevention of volleyball related injuries³. According to the authors, athletes should engage in a year round program of predominantly eccentric resistance training designed to maintain coordinated scapular/rotator cuff function, strength, and endurance. In addition, the study emphasizes the importance of maintaining elite volleyball athletes on a program of core strengthening/stability training^{3, 14}. The Pilates method is particularly suited to this dual objective of injury prevention and balanced muscular development. The challenge will be to make the method sufficiently enjoyable on the long-term for this young athlete accustomed at best to the excitement of matches and the adrenaline of competition, at worst to a manly physical preparation in weight training sessions. I am convinced that using the Pilates method, as a routine on the long-term should help to extend the skills of this young athlete and increase his technical performance through a balanced body protected from injuries.

The proposed program herein is built to balance the body by selecting a set of exercises from the repertoire with muscles focus or/and an objective involving: stretching, strengthening and proprioception of the three large group muscles of the shoulder complex. The goal is:

- To improve mobility through stretching.
- To strength the shoulder muscles, the scapula muscles and the rotator cuff. The forms of contraction used during the reinforcement must respect the real constraints of the shoulder during the spike: isometric reinforcement for the scapula fixators, concentric reinforcement

for the internal rotators, and eccentric reinforcement for the external rotators. By strengthening the weaker side of the body (here, the left side shoulder muscles), the performance of the dominant side will be also enhanced¹⁵.

- To control the stability of the joint through a proprioception work, the objective is to stimulate the activity of deep muscles (here rotator cuff), which ensure the adjustment of the movement. The principle is to vary situations to stimulate joint stabilization capacities provided by the neuromuscular system, both statically and dynamically.

2.2. REPERTOIRE TO AVOID WHEN SHOULDER PAIN OR INJURY

The repertoire of the BASI Pilates Method¹⁶ allows a complete work of the different muscle groups involved in the shoulder articular complex. Avoiding or at least taking certain precautions when performing the exercises listed in **Table 2** will be necessary in case of shoulder pain.

SHOULDER IMPINGEMENT AND PAIN PRECAUTION					
CADILLAC	REFORMER	WUNDA	STEP BARREL F2 CHAIR	MAT	AUXILLARY
Arms Standing Series Circles (Up, Down) Butterfly Arms Roll Up Bottom Loaded Sitting Back	Side Arm Kneeling Series Deltoid Reach Cross Arm Pull Triceps Arms Overhead Arm Kneeling Series Down Circles Circles Up Rowing Series Rowing Back 2 Rowing Front 1 Rowing Front 2 Arms Sitting Series Salute Semi-Circle	Side Kneeling Arm Side Kneeling Stretch	STEP BARREL / SPINE CORRECTOR Overhead Stretch The Reach F2 CHAIR Circles Up Salute	Control Balance Boomerang Back Support Leg Pull Back Side Kick Kneeling Hip Circles Prep Side Bend Twist Rocking Swan Dive	POLE Overhead Stretch MAGIC CIRCLE Swan Prep

TABLE 2: Summary of the repertoire organized by apparatus to be avoided or executed with caution in case of shoulder pain

2.3. BASI REPERTOIRE WITH SHOULDER MUSCLES FOCUS & OBJECTIVES

Table 3 is the result of an extensive analysis of the BASI repertoire¹⁵ (all apparatus) organized in muscle focus and objectives emphasizing on shoulder muscles, rotator cuff and scapula muscles. This table is instrumental in the preparation of a diversified and enjoyable work program on shoulder cross training. In order to be compliant with the 10 pillars of Pilates method the program will follow the BASI Block System introducing exercises separate from the shoulder.

TABLE 3: Analysis of the BASI repertoire focusing on shoulder, organized by apparatus and block system. Muscles focus (black typo) and objectives (grey typo) on shoulder muscles, rotator cuff and scapula muscles. For a comprehensive overview of the repertoire, results are presented in a single Table. Apply Digital Zoom on Table to ease the reading.

	SHOULDER MUSCLE (TRUNK-HUMERUS)							ROTATORS CUFF (SCAPULA-HUMERUS)				SCAPULA MUSCLES (TRUNK-SCAPULA)		
	SHOULDER STABILIZER	SHOULDER ADDUCTORS ABDUCTORS	SHOULDER HORIZONTAL ADDUCTORS ABDUCTORS	SHOULDER FLEXORS	DELTOID	LATISSIMUS DORSI	PECTORALS	SCAPULA STABILIZER	SCAPULA ADDUCTORS	SCAPULA ABDUCTORS	ROTATOR CUFF	TRAPEZIUS	RHOMBOID	SERRATUS ANTERIOR
CADILLAC	ARM Push Through Group Sitting Forward	ARM Push Through Group Sh Add Sit Forw Sh Add Sit Side Sitting Side Prep Sitting Side FBI Push Through Group Side Reach	ARM Arm Standing Series Up Circles Down Circles Hug a Tree Punches Biceps	ABDO Warm Up series Mini Roll Ups Mini Roll up Oblique Roll Up Top Loaded Roll Up Bottom Loaded	ABDO Bot Lift with RUB	ABDO Bot Lift with RUB	ABDO Bot Lift with RUB	ABDO Warm Up series Mini Roll Ups Mini Roll up Oblique ARM Arm Standing series Chest Expansion Up Circles Down Circles Biceps Push Through Group Sitting Forward Sitting Back Sh Add Sit Forw Sh Add Sit Side	ARM Push Through Group Sitting Side Prep Sitting Side	ARM Push Through Group Sitting Side Prep Sitting Side	ARM Push Through Group Sh Add Sit Side STRETCHES Shoulder Stretch			
REFORMER	ARM Rowing Series Rowing Front 2 FBI Balance Control Back Prep Knee Stretch Series Scooter Round Back Flat Back	ARM Arm Supine Series Adduction Up Circles Down Circles Arm Sitting Series Rhomboids 1 Side Arm Kneeling Series Deltoid Reach Cross Pull Arm Arm Overhead Rowing Series Rowing back 1	ARM Arm Sitting Series Rhomboids 1 Hug a Tree Arm Kneeling Series Down Circles FBI Up Stretch Series Long Stretch	ABDO Hundred	ABDO Hundred Prep Hundred Coordination	ABDO Hundred Prep Hundred Coordination	ABDO Hundred Prep Hundred Coordination	ARM Arm Supine Series Adduction Up Circles Down Circles Arm Sitting Series Chest Expansion Rhomboids 1 Hug a Tree Arm Kneeling Series Chest Expansion Up Circles	ARM Arm Supine Series Adduction Up Circles Down Circles	ARM Arm Supine Series Adduction Up Circles Down Circles	ARM Side Arm Kneeling Series Cross Arm Pull		ARM Arm Sitting Series Rhomboids 1	
WUNDA				ABDO Full Pike	ABDO Pike Sitting Stan Pike Reverse Full Pike Torso Press Sit	ABDO Pike Sitting Stan Pike Reverse Torso Press Sit	ABDO Pike Sitting Stan Pike Reverse Torso Press Sit	ABDO Pike Sitting Cat Stretch Knee Stan Pike Reverse Full Pike				ARM Shrugs		ABDO Pike Forward Full Pike
LADER BARREL STEP BARREL				ARM Frog Back	FBI Tendon Stretch	FBI Tendon Stretch	FBI Tendon Stretch	ARM Triceps Press Sit Triceps Prone Frog Back Side Kneeling arm						FBI Tendon Stretch
F2 CHAIR AVALON	ARM F2 Chair/AVALON Arms Sitting Series Salute Biceps	ARM AVALON Arms Supine Series Adduction Up Circles Down Circles	ARM F2 Chair/AVALON Arms Sitting Series Biceps Up Circles Down Circles Arms Sitting Side Series Abduction	ARM F2 Chair/AVALON Arms Sitting Series Chest Expansion Up Circles Rhomboids	ARM F2 Chair/AVALON Arms Sitting Series Chest Expansion Up Circles Rhomboids	ARM F2 Chair/AVALON Arms Sitting Series Chest Expansion Up Circles Rhomboids	ARM F2 Chair/AVALON Arms Sitting Series Chest Expansion Up Circles Rhomboids	ARM F2 Chair/AVALON Arms Sitting Series Hug a Tree Biceps Up Circles Down Circles Salute	ARM F2 Chair/AVALON Arms Sitting Series Rhomboids		ARM AVALON Arms Sitting Side Series External Rotation Internal Rotation		ARM F2 Chair/AVALON Arms Sitting Series Rhomboids	
MAT	SPINAL ARTICULATION Rolling		BRIDGING Push up	ABDO Hundred	BRIDGING Back Support Leg Pull Back	BRIDGING Back Support Leg Pull Back	BRIDGING Back Support Leg Pull Back	BRIDGING Back Support Leg Pull Back	BRIDGING Front Support Leg Pull Front Push up	LAT FLEX & ROT Twist				
AUXILIARY	ARM MAJOR CIRCLES Arms Overhead	ARM MAJOR CIRCLES Sg Arm Side Press	ARM MAJOR CIRCLES Arm Bent Arm Straight	ARM MAJOR CIRCLES Arms Overhead	ARM PUL A PUL Arms Standing Series Extension Up Circles Down Circles	ARM PUL A PUL Arms Standing Series Extension Up Circles Down Circles	ARM PUL A PUL Arms Standing Series Extension Up Circles Down Circles	ARM MAJOR CIRCLES Standing Series Arm Bent Arms Straight Sg Arm Side Press Single Arm Bicep	BACK EXTENSION MAJOR CIRCLES Swan Prep	ARM PUL A PUL Arms Standing Series	STRETCHES PUL CIRCLES Overhead Stretch			

3. PROGRAM OUTLINE - CLASS PLAN FOR SESSION 1-20 AND SESSION 20+

As mentioned in the introduction, the challenge is to create enjoyable Pilates program that will keep Baptiste motivated on the long term in order to take all the benefit from the practice. The proposition herein takes into consideration the information collected in Table 3 and Table 4. The split into two group sessions, 1-20 and 20+, is arbitrary and will be adapted according to Baptiste physical conditions and level of motivation and concentration at the beginning of every session.

From session 1-12 to session 12-20 the increase of stretch, strength, flexibility and endurance of the muscles will be obtained by increasing the number of exercises per session and the number of repetition of each exercises chosen in the repertoire (Fundamental & Intermediate). Group session 20+ proposes exercises from intermediate and some from advanced repertoire that will be introduced according to Baptiste's progression curve. To note that despite the good physical condition of this young athlete, we will exclude Master exercises from the regimen. A premature introduction of advanced/master repertoire to Pilates beginner at this age will decrease the benefit of the cross-training. Indeed, core strength, body alignment consciousness and mind-body integration will be essential to fully benefit from the method prior to consider any athletic demonstration. The two program outlines offer multiple possibilities of training organized into four categories corresponding to the four main apparatus (including Mat). The Step barrel, Ladder barrel, Avalon and Auxiliary such as Magic Circles, Pole and Ped-A-Pul will be particularly of interest for beginners while practicing the Mat repertoire. Since much of the Intermediate and Advanced exercises place extreme stress on the shoulder, the transition from session 1-20 and session 20+ will be smooth. Introduction of elements from some advanced repertoires will be implemented according to Baptiste ability to execute in control the fundamental and the intermediate repertoires. Appropriate shoulder mechanics, the strength balance and the adequate flexibility of the shoulder of volleyball player will allow Baptiste to benefit fully from the Pilates method. Adequate stabilization and coordinated movement of the scapula will decrease the risk of injury while performing the repertoire. Due to his athletic physical condition, some blocks may seem easier than others to Baptiste, nevertheless balance and harmony during the flow of the class will be maintained every time.

Table 4 outline BASI repertoire propositions that could be modified using different options. Only one Arm work series will be implemented per session. In the 20+ group session, for each block, warm up with fundamental/intermediate exercises will be executed prior to the Advanced one (example: Monkey/Tower Prep and then Tower). To note, Mat Repertoire Block system is slightly different from Apparatus. For that reason, FBI is changed into Bridging and Hip and Leg Work will be executed using either Auxillary, Step/Ladder barrel or Avalon. To maintain harmony and flow during the class, the same accessories will be used during the entire session (for example Mat & Magic circles or Mat & Step Barrel).

PROGAM OUTLINE - CLASS PLAN FOR SESSION 1-20				
BASI BLOCK	SESSION 1-12 & 13-20 (Increase number of exercises per session and number of repetition)			
WARM-UP	Roll Down Variations of: beginner warm up: Pelvic Curl, Spine Twist Supine, Chest Lift, Chest Lift with Rotation, Leg changes			
FOOT WORK	Any Foot work on Cadillac, Reformer or Wunda Chair depending on the following program. Wunda will be done ahead of a Mat+Auxillary+Barrel class			
	WUNDA + BARREL+AUXILLARY	CADILLAC	REFORMER	MAT+AUXILLARY +BARREL+AVALON
ABDO WORK	Pike Standing Stan Pike Reverse Cat Stretch Knee	Warm Up series Mini Roll-Ups Mini Roll up Oblique Roll Up Top Loaded	Hundred Prep Hundred Coordination Short Box Series Round/ flat Back Tilt Twist Roundabout Climb a tree	MAT Hundred STEP BARREL Chest Lift Reach* Overhead Stretch*
HIP WORK	STEP BARREL Supine Leg Series Openings Helicopter Scissors Bicycle Bicycle Reverse	Supine Leg Series Frog Down/Up Circles Walking Bicycle	Supine Leg Series Frog Circle Down Circle Up Openings	STEP BARREL Supine Leg Series Openings Helicopter Scissors Bicycle Bicycle Reverse
SPINAL ARTICULATION	Pelvic Curl	Monkey Original Tower Prep	Bottom Lift Bottom Lift with Extension	MAT Rolling Spine Stretch
STRETCHES	POLE SERIES Shoulder Stretch Overhead Stretch*	Shoulder Stretches	Hamstring Stretch Group Standing Lunge	STEP BARREL Should Stretch Lying Side Reach Overhead Stretch
FBI	MAT variation on Wunda Leg Pull Front Leg Pull Back*	Push Through Group Sitting Forward Side Reach Kneeling Cat Stretch	Up stretch Group Down Stretch Elephant Long Stretch Knee Stretch Group Scooter Round Back Flat Back Reverse Knee Stretch	MAT (Bridging) Leg Pull Front Back Support * Leg Pull Back* Back Support
ARM WORK	Shrugs Side Kneeling Arm* Triceps Press Sit Triceps Prone Frog Back Side Kneeling arm	Arm Standing Series Chest Expansion Hug a Tree Circle Up* Circle Down* Punches Biceps Sitting Side Prep	Arm Supine Series Extension Adduction Circles Up Down Circles Triceps Arm Sitting Series Chest Expansion Biceps Rhomboids 1 Hug a Tree Salute* Shoulder Push Single arm Double arm	MAGIC CIRCLE Arm Bent Arms Straight Arms Overhead Single Arm Side Press Single Arm Bicep PED A PUL Extension Adduction Up Circles Down Circles Triceps F2 CHAIR/AVALON Arms Supine Series Extension Adduction Up Circles Down Circles Triceps
LEG WORK	Hip Opener Hamstring Curl	Squats	Long Box Series Hamstring Curl Skating single leg	LEG WEIGHT Gluteals Side Lying Series Side Leg Lift Forward & Lift Forward with drops
LATERAL FLEXION & ROTATION	Side Stretch Side Kneeling Stretch*	Push through Group Side Lift with PTB	Mermaid	MAT Spine Twist Side Kicks AVALON Rhomboids with Rotation Spine Twist Sit
BACK EXTENSION	Swan Basic	Prone 1	Long Box Series Breaststroke Prep Pulling Straps 1	MAT Back Extension Swimming MAGIC CIRCLE Swan Prep* STEP BARREL Swan Prep Swan

PROGAM OUTLINE - CLASS PLAN FOR SESSION 20+				
BASI BLOCK	SESSION 20+ (Advanced and Master exercises)			
WARM-UP	Roll Down Variations of: intermediate/advanced Warm-up: Pelvic Curl, Spine Twist Supine, Double leg Stretch, single leg stretch, Criss cross, Roll Over, Roll Up			
FOOT WORK	Any Foot work on Cadillac, Reformer or Wunda Chair depending on the following program. Wunda will be done ahead of a Mat class			
	WUNDA	CADILLAC	REFORMER	MAT +AVALON
ABDO WORK	Pike Sitting Full Pike Torso Press Sit	Roll Up Bottom Loaded* Bottom Lift with RUB	Abdo Leg in Strap Series Double Leg Double leg with rotation Long Box Series Backstroke Teaser Prep Teaser	MAT Hamstring Pull 1,2,3 Teaser 1,2
HIP WORK		Lying Side Singe Leg Series Changes Scissors Circle forward Circle back	Extended Frog Extended Frog Reverse	AVALON Supine Leg Series Hip Extension Frog Openings Scissors Helicopter
SPINAL ARTICULATION	Jack Knife	Tower	Short Spine Long Spine Semi-Circle*	MAT Open Leg Rocker Control Balance*
STRETCHES		Shoulder Stretches	Hamstring Stretch Group Kneeling Lunge Full Lunge	LADDER BARREL Shoulder Stretch 1 & 2 Gluteal Hamstrings Adductors Hip Flexors
FBI	Tendon Stretch	Sitting Back* Saw	Up stretch Group Up Stretch 1 Up Stretch 2 Up Stretch 3 Long Back Stretch Balance Control Front Balance Control Back Prep Balance Control Back Tendon Stretch	MAT (Bridging) Push up Jack knife Scissors Bicycle
ARM WORK	Side Kneeling Arm* Triceps Press Sit Frog Back	Push Through Group Shoulder Add Sit side Shoulder Add sit forward Sitting Side Prep Sitting Side	Arm Kneeling Series Chest Expansion Circles up* Down Circles* Triceps Salute* Side Arm Kneeling Series Deltoid Reach* Cross Arm Pull* Triceps* Arm Overhead * Rowing Series Rowing Back 1* Rowing Front 1 * & 2*	F2 Chair/AVALON Arms Sitting Series Chest Expansion Biceps Rhomboids Hug a Tree Up Circles Down Circles Salute F2 Chair/AVALON Arms Sitting Side Series Abduction External Rotation Internal Rotation
LEG WORK	Lunge Group Forward Lunge Step down Group Backward Step down	Squats	Jumping Series Parallel Position V Position Single Leg Parallel Leg Changes	LEG WEIGHT Gluteals Kneeling Box Series Hip Ext bent Knee Hip Abduction bent knee Hip Ext Straight Leg
LATERAL FLEXION & ROTATION	Side Pike	Arm Standing Series Butterfly Arms *	Short Box Series Side over on box	MAT Side Bend* Twist* Side Kick Kneeling* Hip Circles Prep *
BACK EXTENSION	Swan on Floor Back Extension single arm	Push Trough Series Prone 1 Prone 2	Long Box Series Breaststroke Pulling Straps 2	MAT Double Leg Kick* Rocking Prep Swan Dive Prep AVALON Swimming High Swan

TABLE 4: Program outline for group session 1-20 (A) and 20+ (B).

Exercises with from BASI repertoire

No focus on shoulder complex

Muscles Focus on Shoulder complex

Muscles Objectives on Shoulder complex

*** To avoid when shoulder pain

CONCLUSION

In this case study we described a strategic usage of Pilates method as a cross training for a young volleyball athlete. This aims at supporting harmonious bilateral development, preventing shoulder injuries and improving performances. Beyond the benefit of the method on the core strength, I am convinced that Pilates adapted to the challenges of volleyball can contribute, in a sustainable way, to the mental preparation of athletes such as Baptiste. Indeed, during the stress and challenges of the competition, each of the pillars will find a favorable echo in optimizing the game. Awareness of the challenge at each point; Balance in all action game; Breath for fast recovery; Concentration for anticipating the ball trajectory; Center for blocking; Control for passing; Efficiency when spiking (higher and stronger); Flow while covering the ground; Precision for hitting and obviously Harmony between team members. As a future Pilates teacher I sincerely wish, my son will appreciate the benefit of this mind-body method as much as I enjoy cheering for his team.

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