EVALUATION & TREATMENT OF UPPER EXTREMITY INJURIES IN TENNIS PLAYERS

Combined Sections Meeting 2019
Washington , D.C.
January 23-26, 2019

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DISCLOSURES

No Disclosures.
The intent is to share the latest evidence and experience with the topic

LEARNING OBJECTIVES

- Describe the role of the kinetic chain in tennis and how weak links in the kinetic chain relate to upper extremity injuries in the tennis athlete.
- Examine the biomechanics of the tennis serve and ground strokes.
- Describe the incidence and prevalence of shoulder, elbow, and wrist injuries in the tennis athlete.
- Describe the treatment interventions in common tennis-related upper extremity injuries.
- Develop a tennis-specific rehabilitation program including the integration of equipment modifications such as string tension, racket characteristics, vibration dampeners, orthotics, braces.
- Describe return to play criteria for tennis athletes following an upper extremity injury.

Course Outline

- Background pertaining to the kinetic chain and weak links
- Biomechanics of Tennis Serve and Ground Strokes
- Common tennis injuries
- The role of the scapulae in UE injuries
- Implementing a Treatment Plan
- Return to play criteria
- Question and answer session

The Kinetic Chain

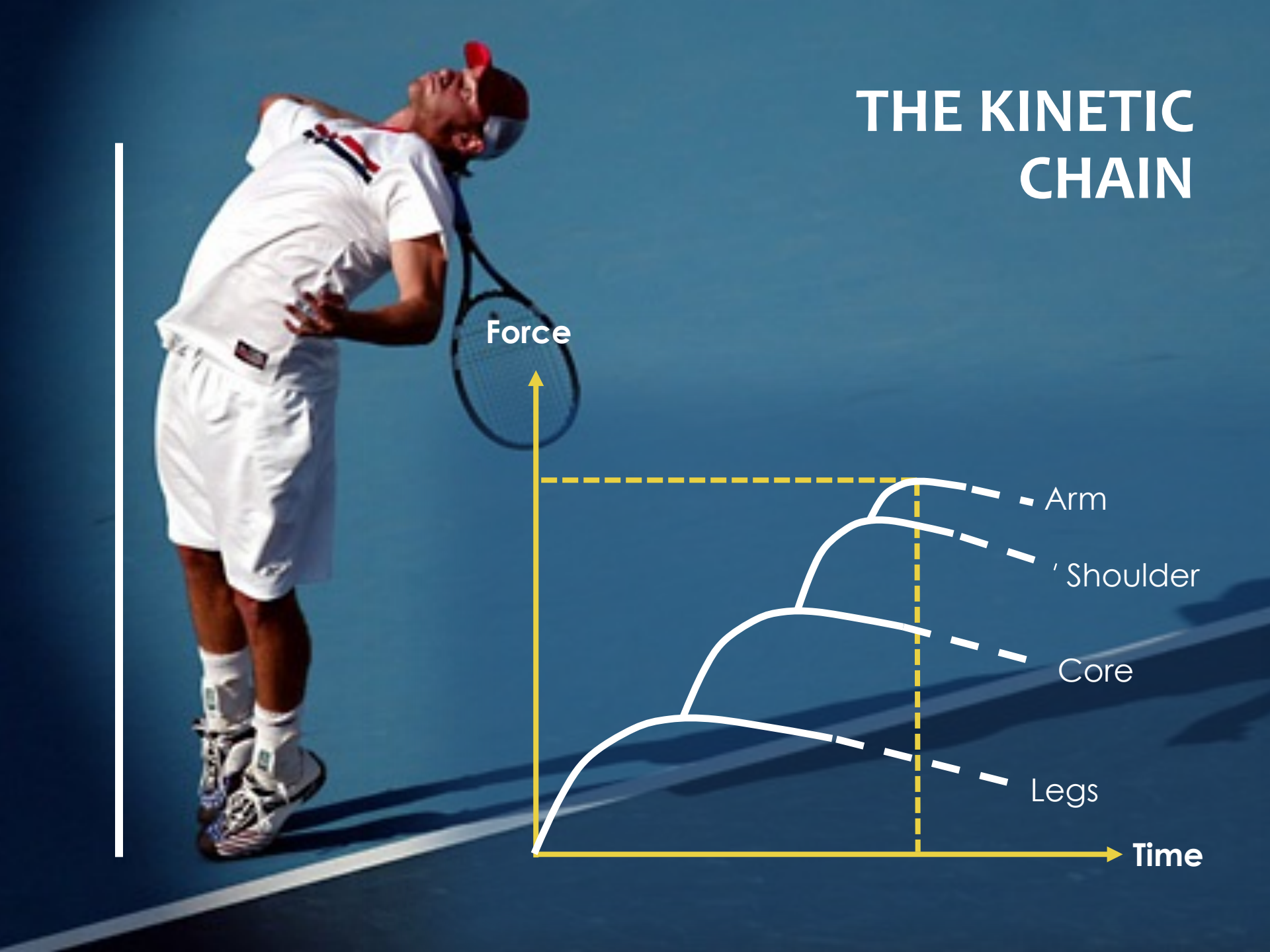

A combination of
successively
arranged joints

The Kinetic Chain

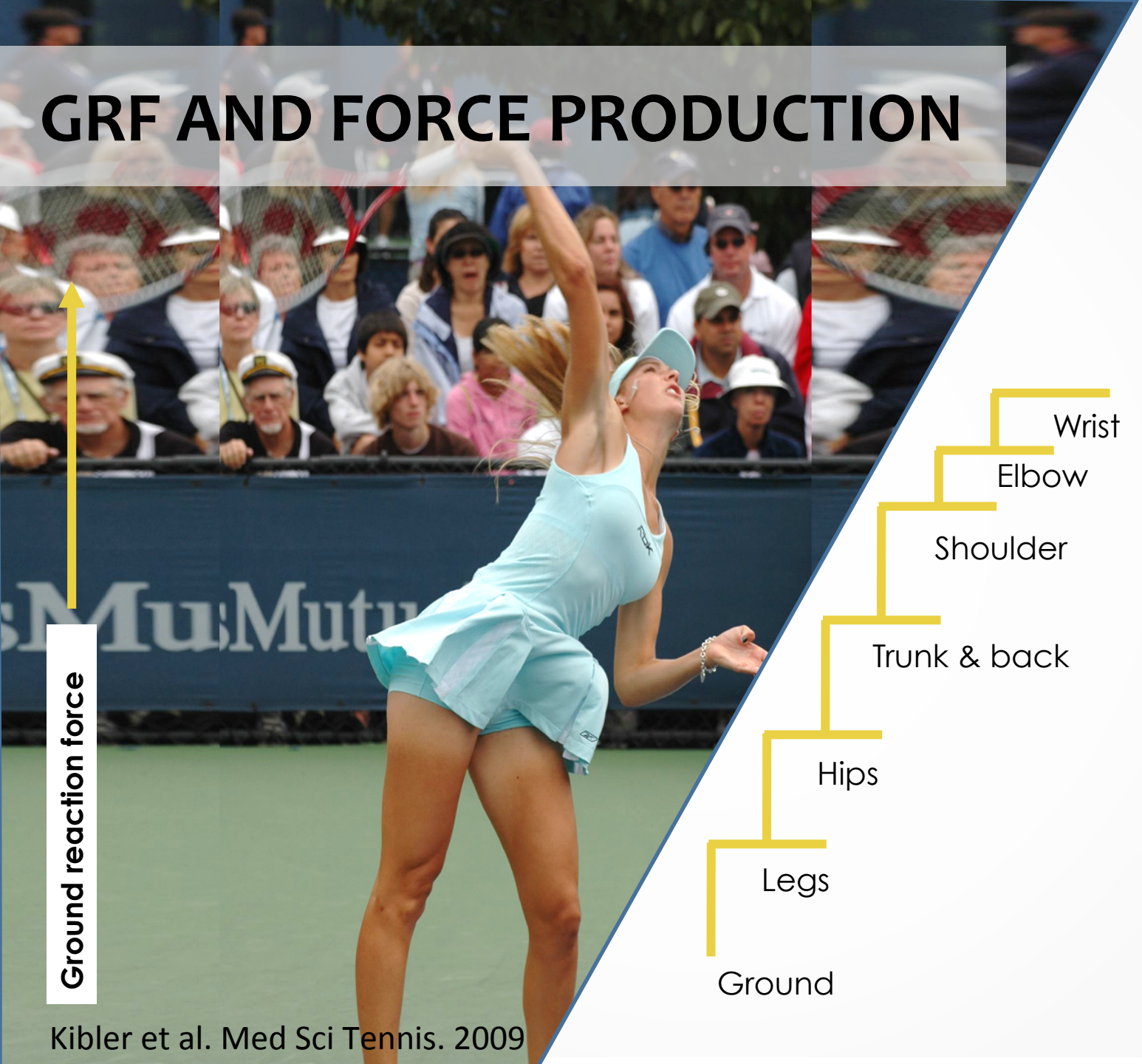
"The best way to maximize power and minimize loads is through efficient use of the kinetic chain"

- Local Segmental Control
- Transfer of Forces
- Timing

THE KINETIC CHAIN



GRF AND FORCE PRODUCTION



Wrist 10%

Elbow 15%

Shoulder 21%

Trunk & back

Hips

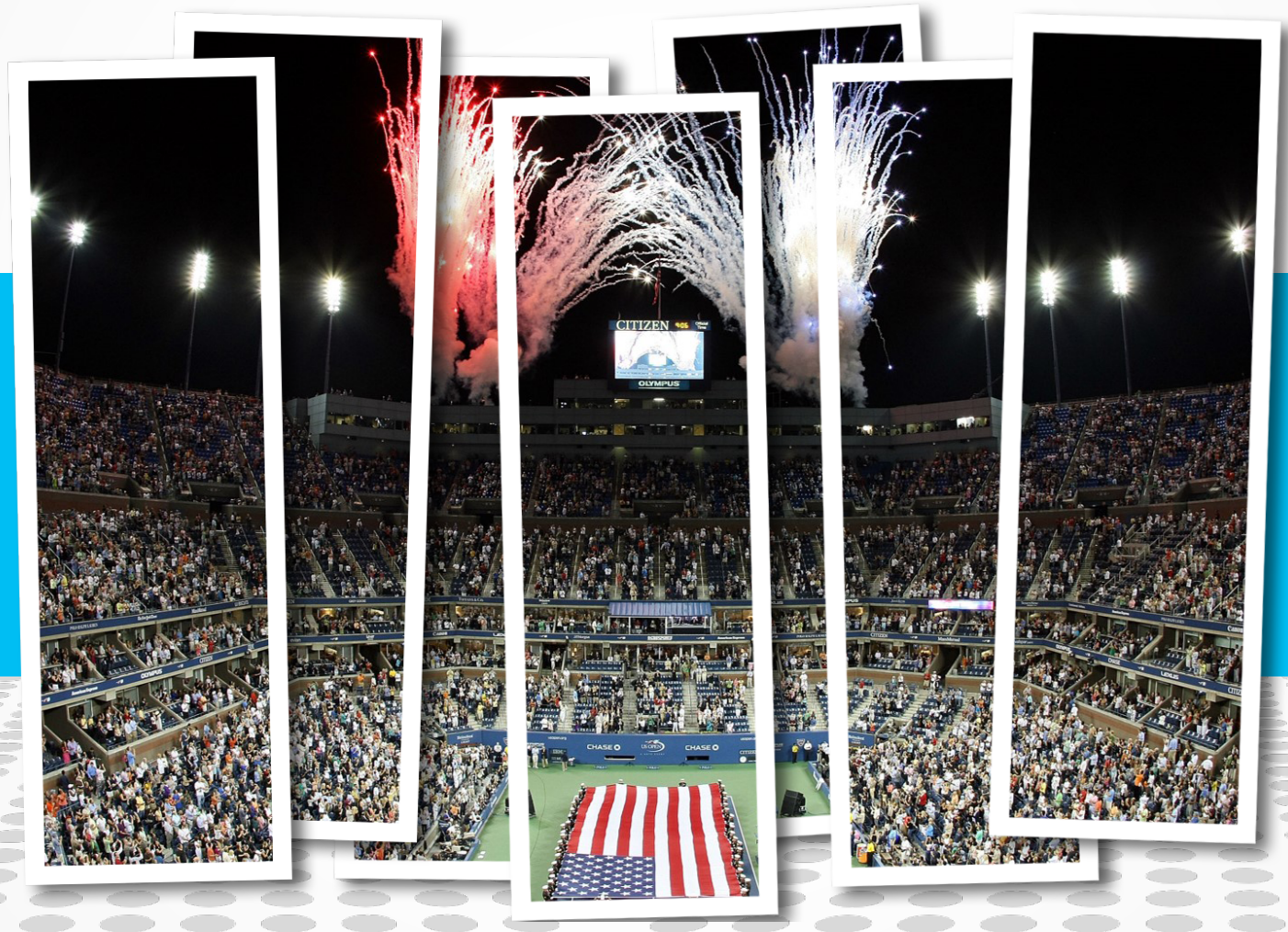
Legs

Ground

54%

Kibler et al. Med Sci Tennis. 2009

THE BIOMECHANICS OF TENNIS



THE SERVE

UNDERSTANDING THE MUSCLES

Gastrocnemius/Soleus
Knee Extensors
Gluteals
Hip Rotators
External & Internal Obliques
Erector Spinae
Abdominals
Deltoid
Latissimus Dorsi
Rotator Cuff
Pectoralis Major
Serratus Anterior
Wrist/Forearm/Hand

PHASES	STAGES
Preparation First Movement to MER	Start Release Loading Cocking
Acceleration MER to ball contact	Accelerate Contact
Follow Through Phase Post contact to end of serve	Decelerate Finish

START

Style versus Substance
Be Relaxed
Mentally prepare for the serve

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

RELEASE

- Release the ball between eye level and top of the head
- Arm at 45 degree angle or posting toward the net post
- Allows hips to rotate and builds consistent framework for the release.

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

LOADING

- USE OF THE GROUND
- 50 - 54% of force through hand and racket comes from ground, legs and trunk
- **LOADING:** Where we store the energy in the lower bosy
- **MUST LOAD THE BACK LEG!!**

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

LOADING

- Store energy back and down to release the energy to go up and out
- 45° angle at the shoulder and hips
- KNEE FLEXION > 10 degrees
- Occurs with ball toss
- Back leg pushes upward/forward
- Front leg is stable post for rotation

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

LOADING

- HIP & TRUNK COUNTER ROTATION
- Engine for force development
- Occurs with knee flexion
- Back hip counter rotates
- Allows for optimal scapular position

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

LOADING

- Arm in scapular plane
- Maximum Shoulder ER
- Shoulder Horizontal ABD
- Driven by trunk/hip rotation
- Allows optimal force generation and acceleration into the ball

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

COCKING

- Releasing the energy from lower body to upper body
- Tip of racket pointing to the ground
- Elbow to the sky
- Chest to the sky – need good T spine extension
- Body straight

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

ACCELERATION & CONTACT

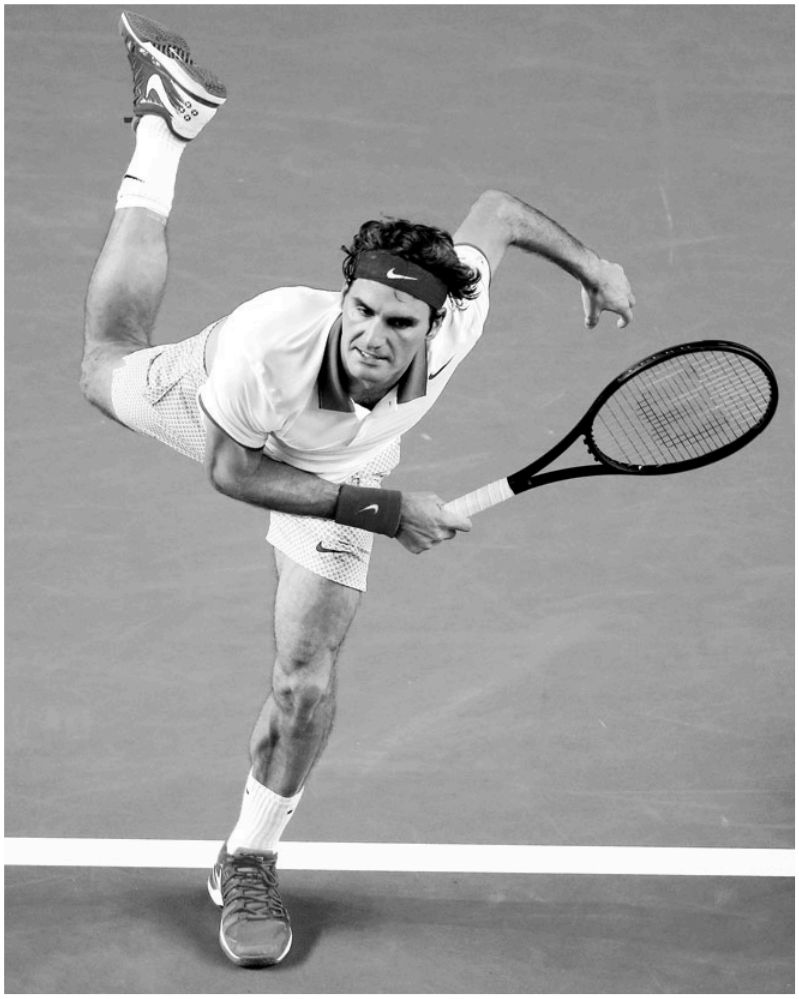
- Using the energy created to efficiently transfer energy into the ball
- **LONG AXIS ROTATION:** Shoulder IR & Forearm pronation
- Lats, Pecs, Subscapularis
- Teres mm, Infraspinatus

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

DECELERATION

- Following contact
- The athlete must declerate the arm
- Contact side of the strings are now pointing to the right side fence.
- **LONG AXIS ROTATION:** shoulder IR and forearm pronation

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

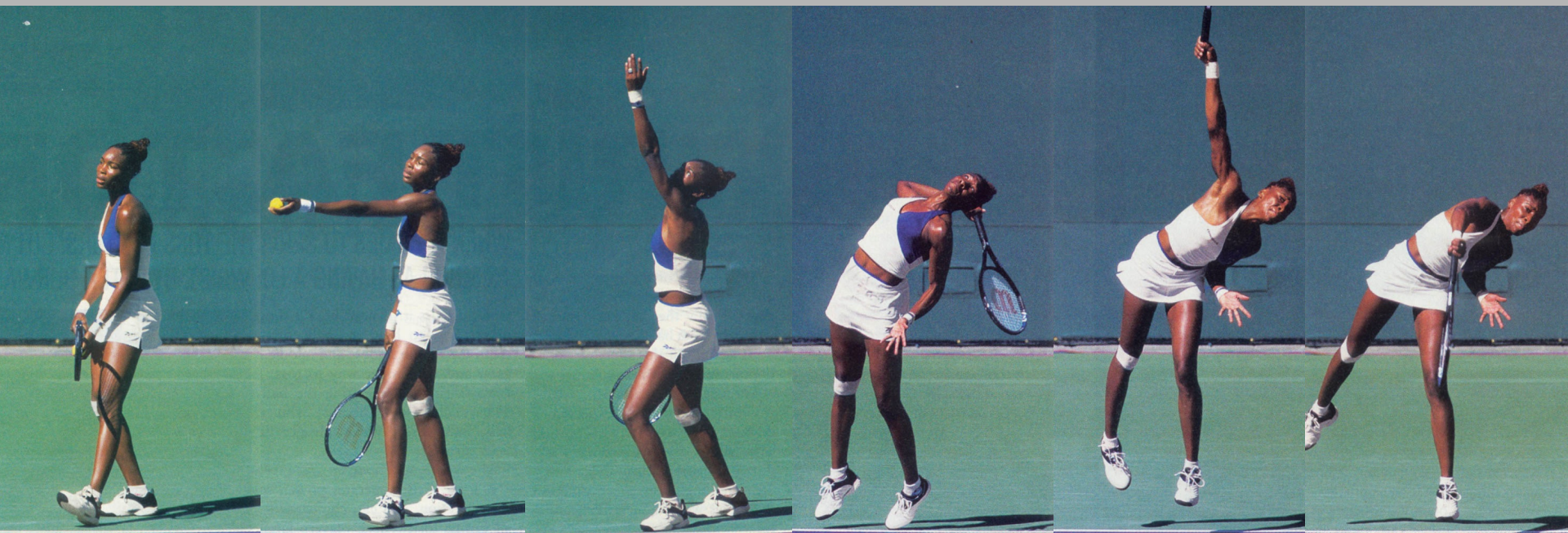


FINISH

- The short period at the end of deceleration and before the initial movement to prepare for the next stroke
- A balancing act
- Allows athlete to prepare for the next shot

Kibler et al. Med Sci Tennis. 2009
Roetert & Ellenbecker. NSCA 2009

TENNIS SERVE ANALYSIS



PUSH THROUGH vs PULL THROUGH SERVE

PUSH-THROUGH MOTION:

- Push-though serve is optimal as using the kinetic chain optimally to generate kinetic energy to push the ball over the net

PULL-THROUGH MOTION:

- Kinetic breakage in the legs, back or shoulder
- In trying to maintain serve velocity, the athlete changes from an efficient push-through movement from the legs, to a "pull through" movement using the trunk and arm muscles
- Tight trunk muscles will limit ability to achieve max cocking
- Without full cocking, you can't achieve maximum acceleration
- Watch the back hip! Lack of hip rotation will use a pull-through motion

THE FOREHAND

- On toes preparing to receive ball
- Shoulder, Hip & Trunk Rotation
- Load weight onto the back leg
- Cocking phase
- Racket head begins to drop and gains speed

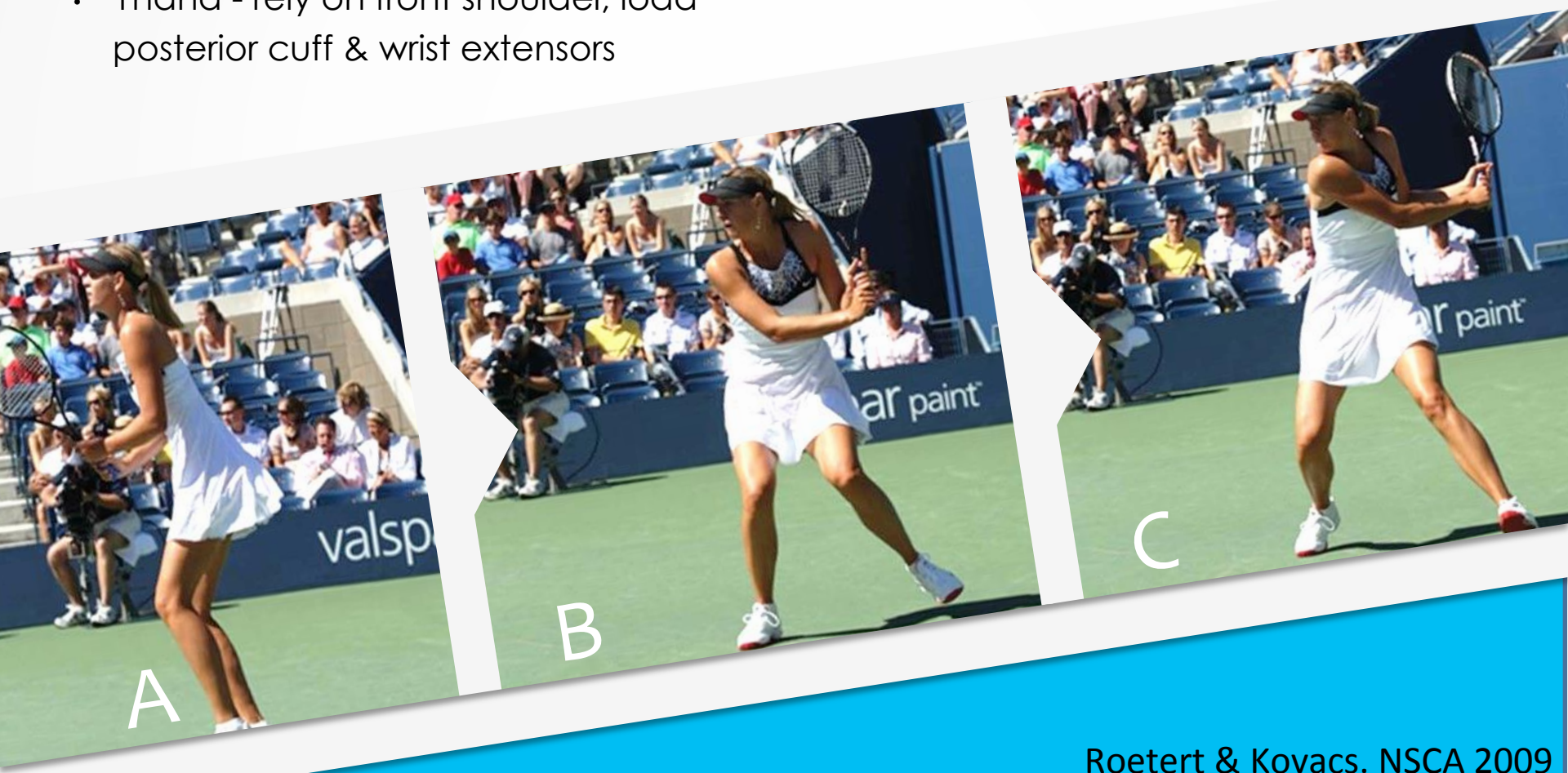
Roetert & Kovacs. NSCA 2009

- Racket head drops to hit from low to high
- The torso rotates to face the net
- The contact point is in front of the body
- The racket hits the ball lifting it up for topspin
- Front leg pulls the body forward rotating the hips
- Strong push-off from back leg
- Follow-through across the body
- Shoulder IR, forearm pronation, wrist flexion

Roetert & Kovacs. NSCA 2009

THE BACKHAND

- Prepare grip
- Step in with front leg and begin Trunk & Shoulder Rotation
- Prepare to load back leg
- 2 hand - back arm pushes racket
- 1hand - rely on front shoulder, load posterior cuff & wrist extensors



Roetert & Kovacs. NSCA 2009

- Drop racket head to hit from low to high to create top spin
- The contact point in front of the body
- Trunk rotation as the front leg pulls the body forward
- Strong push-off from back leg
- Follow-through across the body

Roetert & Kovacs. NSCA 2009

Dynamic Warmup

- https://youtu.be/mo4Wq_NK-jQ
- https://onetherapy.com/specialties/tennis-medicine/

Recovery

Foam Roller

- https://onetherapy.com/rolling-for-recovery/


RETURN TO PLAY

RETURN TO TENNIS

- Functional Pain-free ROM
- Functional Testing
- Stroke Analysis
- Equipment Assessment

- Rest : Play
- Dynamic Warm-up
- Cool-down
- Gradually increase on-court time, intensity, duration, frequency
- Recovery days
- Multidisciplinary approach

RETURN TO TENNIS GUIDELINES

- **Stage 1**
- Partner feed 20 forehands and 20 backhands from net
- Rest 5 minutes
- Repeat

- **Stage 2**
- Partner fee 10 forehands and 10 backhands from net
- Rally from baseline for about 50 strokes alternating forehand and backhand
- Rest 5 minutes
- Repeat

- **Stage 3**
- Rally from baseline for about 15 minutes
- Rest 5 minutes
- Hit 10 forehand and 10 backhand volleys, point of contact in front of the body
- Rally groundstrokes for 15 min from baseline
- Repeat10 volleys again.

RETURN TO TENNIS GUIDELINES

- **Stage 4**
- 20 minutes of groundstrokes mixing in volleys (70% graoundstrokes, 30% volleys)
- Perform 5 simulated serves without ball
- Perform 10 serves with foam ball
- Perform 10-15 serves with standard ball
- Finish with 5-10 minutes of ground strokes

- **Stage 5**
- 30 minutes of groundstrokes mixing in volleys (70% graoundstrokes, 30% volleys)
- Perform 5 serves with foam ball
- Perform 10-15 serves with standard ball
- Rest 5 minutes
- 10-15 additional serves
- Finish 5-10 minutes of ground strokes

- **Stage 6**
- Repeat Stage 5 increasing serves to 20-25.
- Before resting, have partner feed easy short lobs to attempt a controlled overhead smash.

- **Stage 7**
- Attempt practice sets before match play without pain or excessive fatigue in arm

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Thanks