Function Key	
DF	Dorsi Flexion
PF	Plantar Flexion
Irot	Internal Rotation
ExRot	External Rotation
Flx	Flexion
Ext	Extension
RRot	Right Rotation
LRot	Left Rotation
Ab	Abduction
Ad	Adduction
Ev	Eversion
In	Inversion
Atilt	Anterior Tilt
Ptilt	Posterior Tilt
LHike	Left Hip Hike
RHike	Right Hip Hike
LatRFlx	Lateral Flexion Right
LatLFlx	Lateral flexion Left

Movement Key	
RF	Right Foot
LF	Left Foot
RK	Right Knee
LK	Left Knee
RHip	Right Hip
LHip	Left Hip
RCage	Rib Cage
Shlders	Shoulders

MOVEMENT ANALYSIS

MARIA KIRILENKO DEFENSIVE BACKHAND

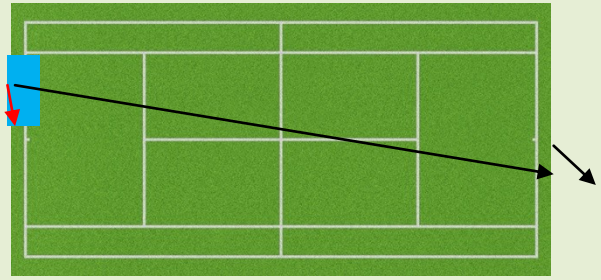
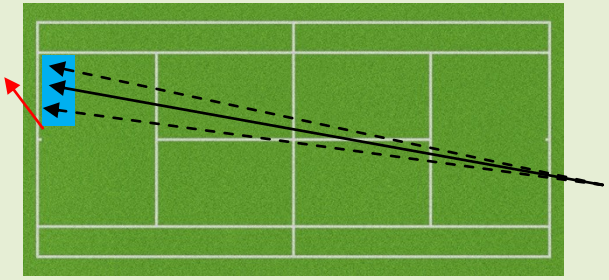
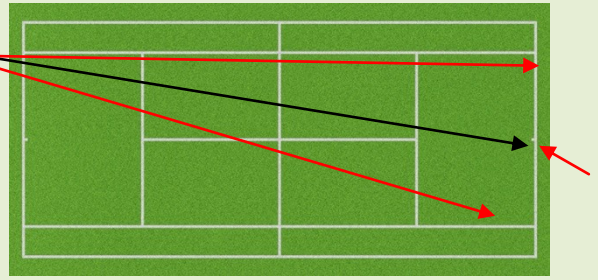
Mike Crooks

Latest Revision: 05/06/2013

A complete movement analysis of Maria Kirilenko executing a defensive backhand. The analysis considers the tactical intention of the stroke, discussing possible reasoning and effects. Following this the analysis provides a biomechanical breakdown and a movement summary with key features. Finally the system provides suggested exercises and drills aid in the development of the movement cycle

TACTICAL INTENTION: In considering the tactical possibilities it is important to consider the complete movement cycle and the effect on the opponent.

1. Initiation impulse	2. Weight shift	3. 2nd impulse	4. Cross over	5. Suspension
				

Opponent Position	Intended Shot	Recovery Position
		
From the initiation position it can be hypothesised that Maria is in a neutral position with the opponent looking to hit aggressive defence to regain control of the point. It seems the ball is being received from widher a central or cross court position.	Maria's intention is to absorb the oncoming balls energy by moving back from the baseline and into the line of the ball. She will aim to drive as much energy back into the ball as possible from this position to regain control in the point by forcing her opponent into a defensive position.	From her final recovery position (see video) the shot was effective and Maria moves into a similar position to that which she started further looking to take control of the point. She has regained the initiative.

6. Full Back Swing	7. Racket Head drop	8. Impact	9. Follow Through	10. Recover
				

Movement Analysis

1. Initiation impulse		2. Weight shift		3. Post 2nd impulse		4. Cross over		5. Suspension	
									
RF	DF + IR	**RF**	PF + ExRot		Left foot impulse shifts weight to rear (L) leg		Small cross over step, heel strike (loading of hamstrings/glutes)	**RF**	DF+IRot+Ev (Pro)
LF		**LF**	DF + IRot					**RK**	Flx
RK	Flx	**RHip**	ExRot + Ext + Ab	**RF**	DF+IRot			**RHip**	IRot + Flx + Add
LK	Flx	**LHip**	IRot + Flx + Ad	**RK**	Flx		Slight spinal extension.	**Pelvis**	Rotated R further than shoulders
Pelvis	ATilt	**Pelvis**	RRot	**Lside**	Abducted (coupling)				
RCage	ATilt				Shoulders and pelvis square (c-spine rotL)				This pos will set the back leg
Spine	Flx		Weight shift to left side from right foot impulse						
Shlders	Flx								

6. Full Back Swing		7. Racket Head drop		8. Impact		9. Follow Through		10. Recover	
									
RSide	IRot + Ad	**Pelvis**	Rot L before shoulders		Minimal weight transfer due to minimal rear loading in previous image.	**Pelvis**	Decel (glutes, Hams)		Load returns to Left leg for recovery. It seems Maria is unable to load fully on the left side (possible reason for knee bandage).
LF	ExTRot					**RCage**	Rotating R fast		
LK	Ex		Even distribution of weight R-L.			**Spine**	RRot		Shoulders pass the pelvis and the abs load again to decelerate the motion.
LHip	ExRot + Ab + Ext						Feet off the floor suggesting lower body cannot deal with upper rotation force		
	load of the abdominal muscle via separation of pelvis and ribcage								

MOVEMENT ANLSYSIS SUMMARY

1. Initiation impulse	2. Weight shift	3. 2nd impulse	4. Cross over	5. Suspension
				

Key Features

- Maria struggles to load into the rear leg, this will put excess stress on hip, knee, ankle joints and will require heavy rotational force to produce shot
- This may account for knee bandage
- The lower body is more linear in its force transfer with less pelvis rotation (back swing to impact)
- The upper body rotates fast with arms extended towards target (possibly under excess stress due to inability to load in the lower structures (in this case).
- Pelvis / Ribcage separation in backswing load and follow through load - decelerates the movement
- Possibility of mismanaging the space and time as suggested by the two feet coming off the ground.

Allowing Maria to absorb force and load into the left side (left ankle pronation, knee flexion, hip flexion, internal rotation and adduction) will increase the output of her strokes and improve her ability to repeatedly defend well in an efficient manner.

6. Full Back Swing	7. Racket Head drop	8. Impact	9. Follow Through	10. Recover
				

Functional Exercise	***These exercises promote joint/muscle actions that are prevalent in the output of the tactical intention and challenge the body in 3 dimensions in order to stimulate full potential.***	
SITUATION	**EXERCISE**	**DESCRIPTION**
Movement to the ball	Clock Lunge (6-8 o'clock)	Right foot fixed, Left foot step
	Cross step lunge	Step across body into lunge (Both sides for symmetry and balance)
Movement through stroke	Propulsion (left leg)	Step forward with R foot and maintain extension in L leg. Feel stretch in LHip. Use R knee as driver to push pelvis forward. Progress to stepping in and out and further progress to rotating the pelvis and using the arms to simulate racket.
	LFoot Load	Load weight into L foot by flexing at the knee and hip. Reach R foot out to various positions to challenge the L foot experience, Progress to adding tiptoe and hopping.
Movement in recovery	LHop & Step	Hop on the Left foot with right knee up and flexed. On landing step R foot out and extend L leg.
	LHop & Shuffle	As above with shuffle step instead of single step.

Movement Drills	***These drills integrate the functional exercises and should consider the complete movement cycle.***
Defensive Diagonal	Start in a ready position, move diagonally backwards using desired movement pattern, loading rear leg with 80% of body weight. Play full stroke and recover. Can use a hand fed ball to further integrate.
Variations on above base drill	1. Add light medicine ball and incorporate throw 2. use racket to gain specificity 3. Change angles/distances of movement for full experience 4. Add in "speed" element (time pressures and/or actual hitting drill)