



# **Sports injury Prevention Project:**

## **The Netball Performance Test**

**Professor Alexandra McManus**

Curtin Health Innovation Research Institute, Curtin University, Australia


**Professor Mark Stevenson**

The George Institute for International Health, University of Sydney






# Overview

- Sports Injury Prevention Project
    - Phase 1 – Popn-based epi study
    - Phase 2 – Time motion Analysis
    - Phase 3 – Performance tests
  - Four sports
  - Netball results only
- 



## Phase I – Analyse existing data

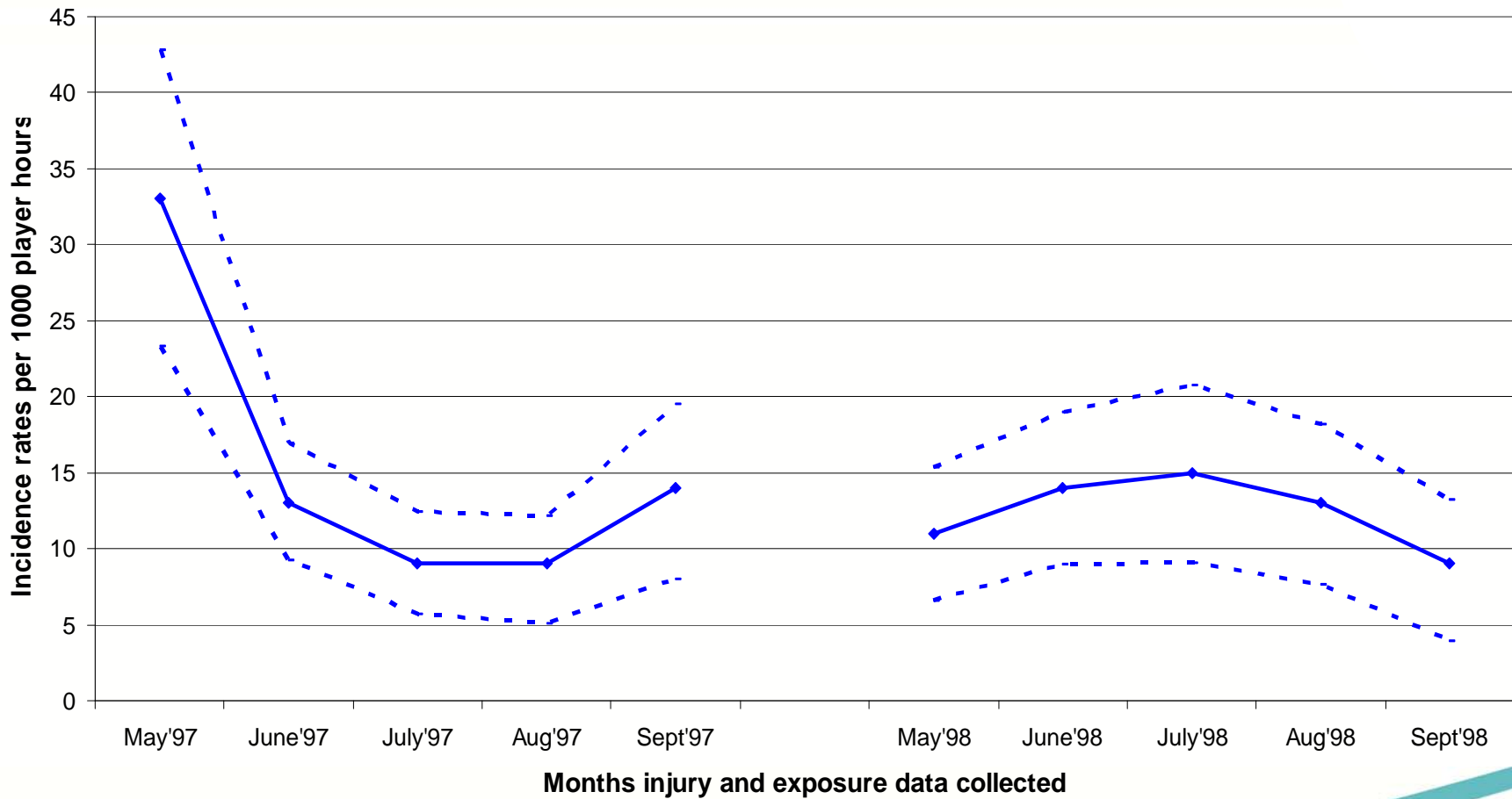
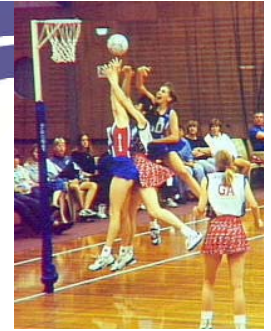
- WA Sports Injury Study 1997/98
  - Cohort May 97 to September 98
  - Baseline preseason questionnaires
  - Monthly telephone interviews (n=10)
- 

## Phase I – Epi study



- Most common injuries
  - ankle (32%), knee (17%), hand or wrist (15%), back (9%)
- Most common mechanism
  - ligamentous sprains (34%), muscle strains (22%), bruising (15%)

# Phase I – Incidence of injury



# Phase I – RF & PF



<b>Factor</b>	<b>R/P*</b>	<b>p &gt;  z  value**</b>	<b>Incidence rate ratio (95% Confidence interval)+</b>
<b>Trained 4 or more hours per week</b>	<b>P</b>	<b>0.039</b>	<b>0.66 (0.45 to 0.98)</b>
<b>Was not injured playing sport in the last 12 months</b>	<b>P</b>	<b>0.001</b>	<b>0.58 (0.43 to 0.79)</b>
<b>Not warming up before a game</b>	<b>R</b>	<b>0.048</b>	<b>1.11 (1.00 to 1.23)</b>
<b>Not open to new ideas etc</b>	<b>R</b>	<b>0.010</b>	<b>1.04 (1.00 to 1.07)</b>

Key: \* Risk (R) or protective (P) against injury

\*\* An alpha level of  $p < 0.05$  was set as the criterion for statistical significance for all analyses

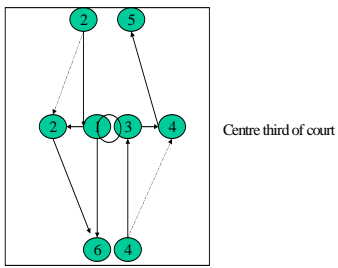
+ IRR after adjusting for age

# Phase 2 - Time-motion analysis

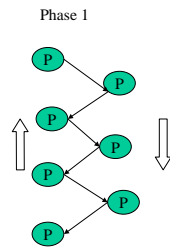
- Quantify position demands
- Differences between positions
- Tailored training guidelines
- Performance tests



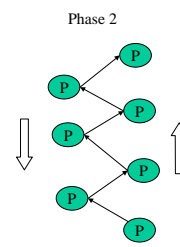
# One camera at training



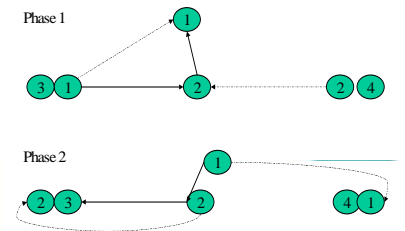
Mvt of player ----  
Mvt of ball ----



Mvt of player ----  
Mvt of ball ----



Phase 1 and 2 are  
performed together



Mvt of player ----  
Mvt of ball ----




# 4 cameras at games



Positional groups	Positions within each group
defenders	goal keeper, goal defence
wings	wing attack, wing defence
centre	centre
shooters	goal shooter, goal attack




# Speeds of locomotion - mvts

- High intensity
    - sprinting (running with maximal effort)
    - cruising (running with purpose and effort)
  - Low intensity
    - jogging (running no effort to stride/accelerate)
    - utility (purposeful backwards/sideways shuffling mvts)
    - standing
    - walking
- 

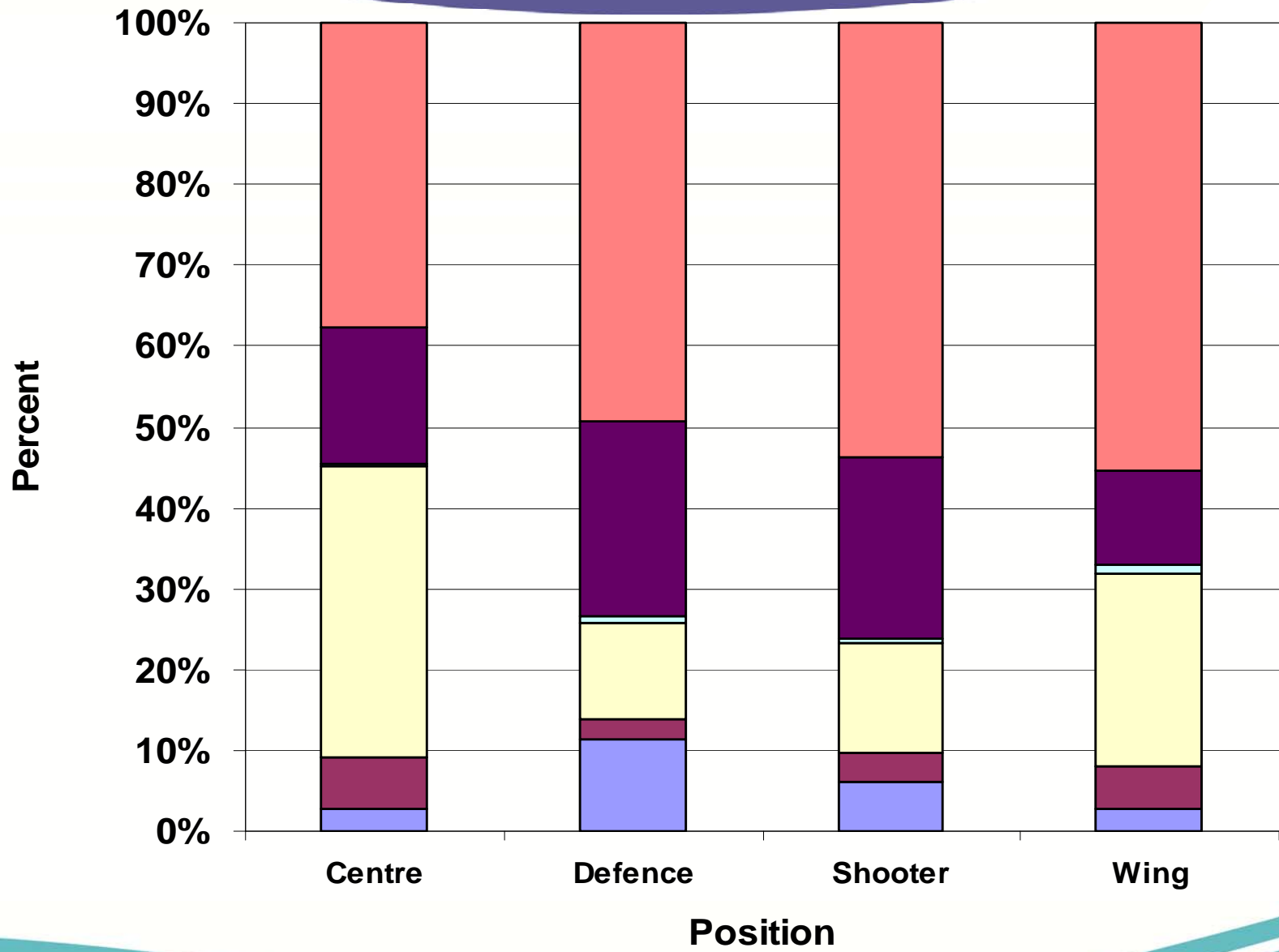


# Discrete activities

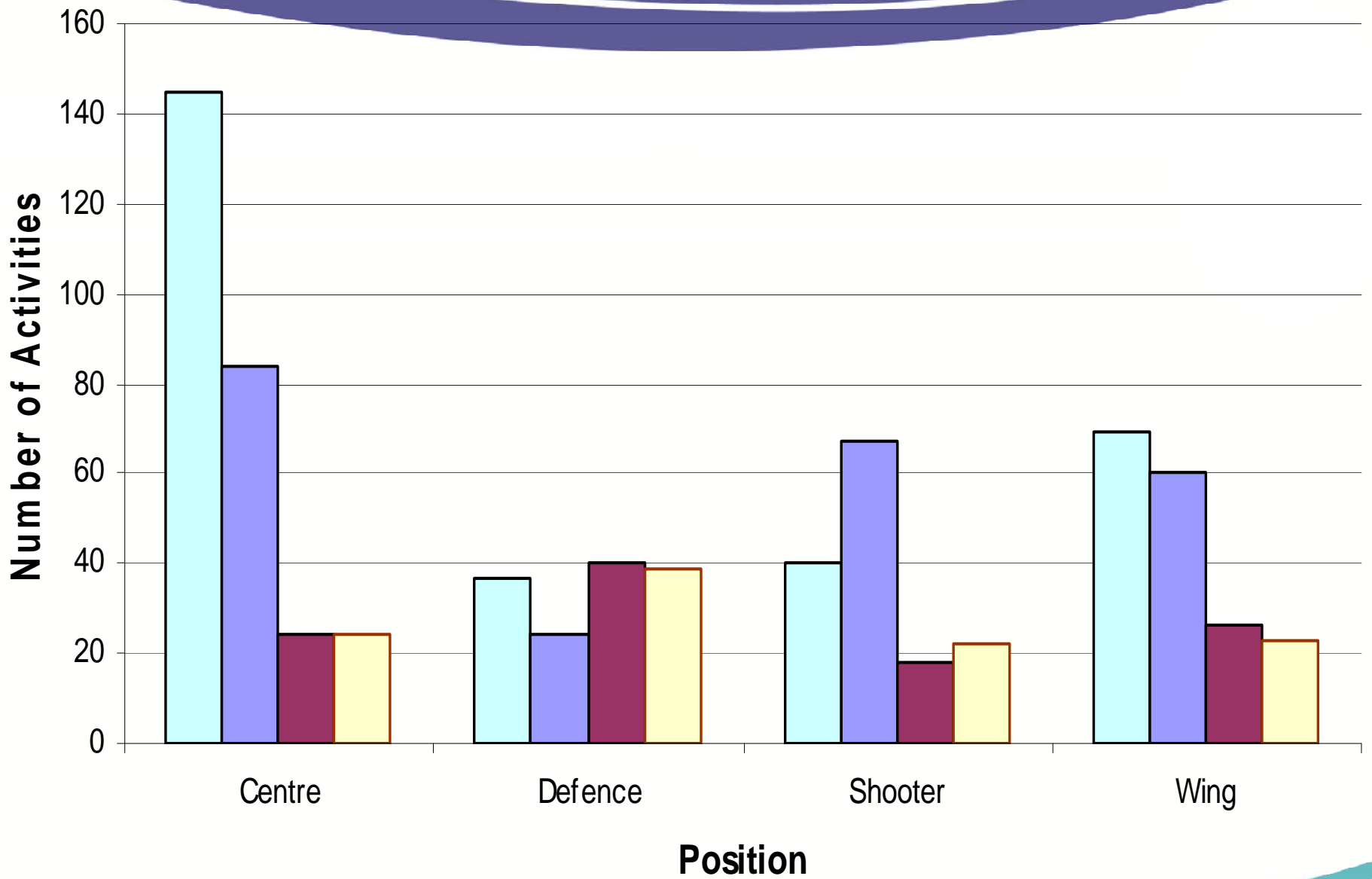
- jump
  - pivot
  - catch
  - pass
  - shoot
  - defending
  - landing (1 foot/2 feet),
  - change of direction
- 

## Movements and activities - games

Position	Movements	Activities
Centre	1012 (979-1046)	300 (285-321)
Wing	736 (704-769)	201 (160-233)
Shooters	663 (609-725)	200 (163-231)
Defence	636 (566-665)	180 (145-233)



Utility Cruising Jogging Sprinting Standing Walking



Passes Catches Defends Jumps

<b>Position</b>	<b>High intensity movements</b>			<b>Low intensity movements</b>		
	<b>Number</b>	<b>Time in seconds</b>	<b>% of game</b>	<b>Number</b>	<b>Time in seconds</b>	<b>% of game</b>
<b>Centre</b>	<b>125</b>	<b>251</b>	<b>7</b>	<b>887</b>	<b>3311</b>	<b>93</b>
<b>Wing</b>	<b>129</b>	<b>222</b>	<b>6</b>	<b>607</b>	<b>3349</b>	<b>94</b>
<b>Defence</b>	<b>60</b>	<b>122</b>	<b>3</b>	<b>576</b>	<b>3537</b>	<b>97</b>
<b>Shooter</b>	<b>80</b>	<b>153</b>	<b>4</b>	<b>583</b>	<b>3445</b>	<b>96</b>

## Work to rest ratios

	Mean rest period (s)	Mean work period (s)	Mean work-to-rest ratio	Max Rest Duration (s)	Max work duration (s)	Max work-to-rest ratio
<b>Centre</b>	4	2	1:2	69	9	1:8
<b>Defence</b>	6	2	1:3	221	11	1:20
<b>Shooter</b>	6	2	1:3	174	8	1:22
<b>Wing</b>	6	2	1:3	96	9	1:11



## Distances covered in a game (metres)

<b>Position</b>	<b>Utility</b>	<b>Cruise</b>	<b>Jog</b>	<b>Sprint</b>	<b>Walk</b>	<b>Total</b>
<b>Centre</b>	<b>384</b>	<b>1310.4</b>	<b>4593.6</b>	<b>136</b>	<b>2417.4</b>	<b>8841.4</b>
<b>Wing</b>	<b>396</b>	<b>1030.4</b>	<b>3088.8</b>	<b>304</b>	<b>3567.6</b>	<b>8386.8</b>
<b>Defence</b>	<b>1664</b>	<b>509.6</b>	<b>1573.2</b>	<b>248</b>	<b>3247.2</b>	<b>7242.0</b>
<b>Shooter</b>	<b>880</b>	<b>739.2</b>	<b>1742.4</b>	<b>168</b>	<b>3474.0</b>	<b>7003.6</b>




## Significant findings - TMA

- Significant differences between positions
- Similarities between
  - centre and wings;
  - and defences and shooters.






## Phase 3 – Performance test

- Simulates 10mins of high level netball play
  - Proportions of activities based on TMA data
  - 3 laps each comprising three “circuits”
    - jogging & passing
    - utility movements
    - cruising, sprinting, & passing
  - Two tests
    - centres & Wings
    - shooters & Defenders
- 




## Design of the Performance Test

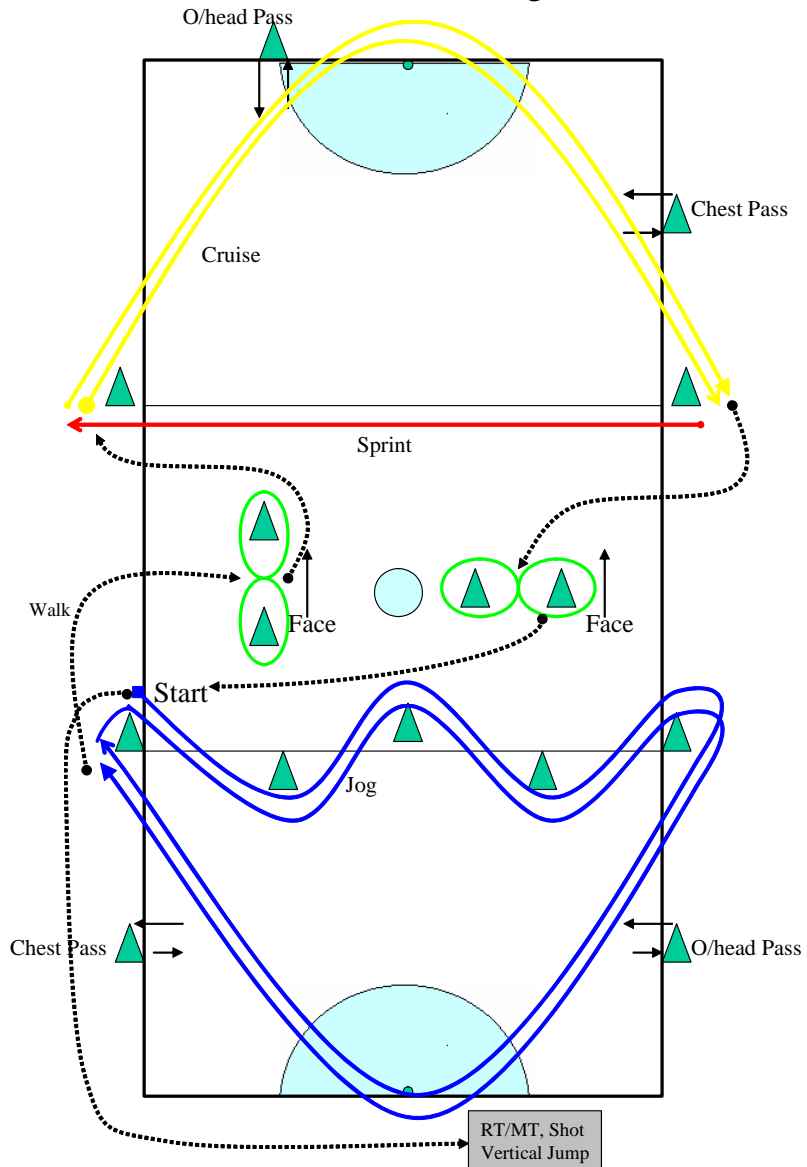
- elements completed as quickly as player chooses
  - walking transitions btwn elements and btwn laps
  - passive rest btwn end of the lap and start of next lap after elapsed time of 4min
- 



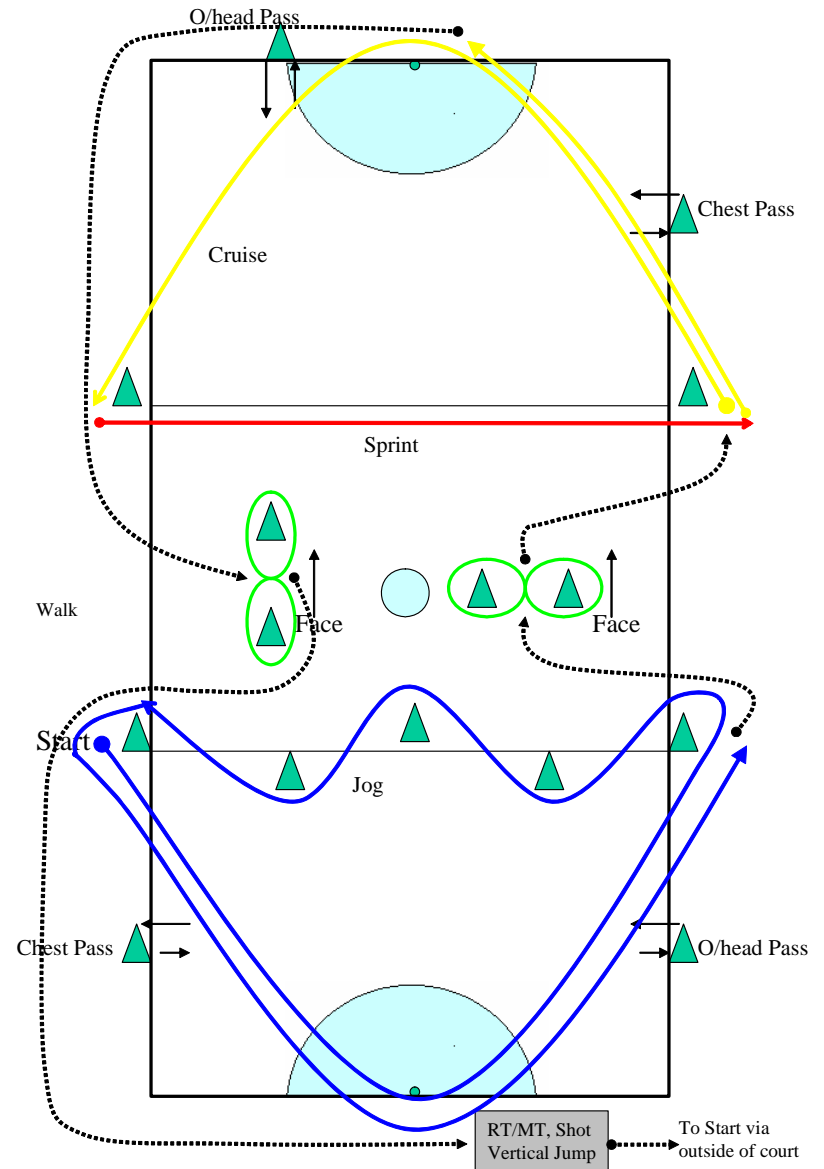
## NPT Timed Elements

- Each lap contains 6 timed elements
    - total time for circuit 1 (start & end of lap)
    - time for each of the two utility sets
    - time for 1<sup>st</sup> cruise + sprint of circuit 3
    - time for 2<sup>nd</sup> cruise of circuit 3
- 

### Centres and Wings



### Defence & Shooters






# Reliability

- Test 1            familiarisation
- Test 2 & 3        within 7 days
  
- Completed pre-season
  
- 19 players (7 centre/wings, 12 defence/shooter)
  
- Raw times for each element of each lap log transformed to stabilise variance
  
- Reliability –  $r=0.71$  to  $0.79$  on all elements





# Conclusions

- Total time for each lap show good reliability for player groups and for sample as a whole
  - Elements of the test moderately reliable
  - A larger sample of players with a more homogeneous level of playing ability may show the test elements to be more reliable
- 



# Acknowledgements

- Funding bodies
    - Western Australian Health Promotion Foundation (1997-2003)
    - National Health and Medical Research Council (2001-2003)
  - Co Investigators – Sp Injury Prevention Study 1997-2003
    - Professor Mark Stevenson, University of Sydney
    - Professor Caroline Finch, NSW University
    - Professor Bruce Elliott, University of WA
    - Professor Peter Hamer, Notre Dame University
    - Ms Anne Johnston, Sports Medicine Australia (WA)
  - Netball Performance Test
    - Jon Fletcher and players, WA Institute of Sport
    - Brendan Appleby, Biomechanist, WA Institute of Sport
- 

# Camera crew extraordinaire

