Sports Injury Prevention Project:

The Netball Performance Test

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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 1 – Analyse existing data

- WA Sports Injury Study 1997/98
- Cohort May 97 to September 98
- Baseline preseason questionnaires
- Monthly telephone interviews (n=10)
Phase 1 – 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 1 – Incidence of injury

[Graph showing incidence rates per 1000 player hours over months from May'97 to Sept'98]
## Phase 1 – Risk & Protective Factors

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

**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
4 cameras at games

<table>
<thead>
<tr>
<th>Positional groups</th>
<th>Positions within each group</th>
</tr>
</thead>
<tbody>
<tr>
<td>defenders</td>
<td>goal keeper, goal defence</td>
</tr>
<tr>
<td>wings</td>
<td>wing attack, wing defence</td>
</tr>
<tr>
<td>centre</td>
<td>centre</td>
</tr>
<tr>
<td>shooters</td>
<td>goal shooter, goal attack</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Position</th>
<th>Movements</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre</td>
<td>1012</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>(979-1046)</td>
<td>(285-321)</td>
</tr>
<tr>
<td>Wing</td>
<td>736</td>
<td>201</td>
</tr>
<tr>
<td></td>
<td>(704-769)</td>
<td>(160-233)</td>
</tr>
<tr>
<td>Shooters</td>
<td>663</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>(609-725)</td>
<td>(163-231)</td>
</tr>
<tr>
<td>Defence</td>
<td>636</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>(566-665)</td>
<td>(145-233)</td>
</tr>
<tr>
<td>Position</td>
<td>High intensity movements</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>Time in seconds</td>
</tr>
<tr>
<td>Centre</td>
<td>125</td>
<td>251</td>
</tr>
<tr>
<td>Wing</td>
<td>129</td>
<td>222</td>
</tr>
<tr>
<td>Defence</td>
<td>60</td>
<td>122</td>
</tr>
<tr>
<td>Shooter</td>
<td>80</td>
<td>153</td>
</tr>
</tbody>
</table>
## Work to rest ratios

<table>
<thead>
<tr>
<th>Role</th>
<th>Mean rest period (s)</th>
<th>Mean work period (s)</th>
<th>Mean work-to-rest ratio</th>
<th>Max Rest Duration (s)</th>
<th>Max work duration (s)</th>
<th>Max work-to-rest ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre</td>
<td>4</td>
<td>2</td>
<td>1:2</td>
<td>69</td>
<td>9</td>
<td>1:8</td>
</tr>
<tr>
<td>Defence</td>
<td>6</td>
<td>2</td>
<td>1:3</td>
<td>221</td>
<td>11</td>
<td>1:20</td>
</tr>
<tr>
<td>Shooter</td>
<td>6</td>
<td>2</td>
<td>1:3</td>
<td>174</td>
<td>8</td>
<td>1:22</td>
</tr>
<tr>
<td>Wing</td>
<td>6</td>
<td>2</td>
<td>1:3</td>
<td>96</td>
<td>9</td>
<td>1:11</td>
</tr>
</tbody>
</table>
## Distances covered in a game (metres)

<table>
<thead>
<tr>
<th>Position</th>
<th>Utility</th>
<th>Cruise</th>
<th>Jog</th>
<th>Sprint</th>
<th>Walk</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre</td>
<td>384</td>
<td>1310.4</td>
<td>4593.6</td>
<td>136</td>
<td>2417.4</td>
<td>8841.4</td>
</tr>
<tr>
<td>Wing</td>
<td>396</td>
<td>1030.4</td>
<td>3088.8</td>
<td>304</td>
<td>3567.6</td>
<td>8386.8</td>
</tr>
<tr>
<td>Defence</td>
<td>1664</td>
<td>509.6</td>
<td>1573.2</td>
<td>248</td>
<td>3247.2</td>
<td>7242.0</td>
</tr>
<tr>
<td>Shooter</td>
<td>880</td>
<td>739.2</td>
<td>1742.4</td>
<td>168</td>
<td>3474.0</td>
<td>7003.6</td>
</tr>
</tbody>
</table>
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 1st cruise + sprint of circuit 3
  - time for 2nd cruise of circuit 3
Centres and Wings
- Start
- Face
- Chest Pass
- O/head Pass
- Jog
- Cruise
- Sprint
- RT/MT, Shot
- Vertical Jump
- Walk
- To Start via outside of court

Defence & Shooters
- Start
- Face
- Chest Pass
- O/head Pass
- Jog
- Cruise
- Sprint
- RT/MT, Shot
- Vertical Jump
- Walk
- To Start via outside of court
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

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