Skills Importance across ages in Men's Volleyball.

- Volleyball
- Model
- Data
- Method of analysis
- Results
- Conclusions
- Suggestions

Skills Importance across Ages for Men's Volleyball.

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MathSport International 2015
29th June - 1st July 2015
Loughborough University (UK)

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Volleyball

- Sum zero game.
- Sets: Best of five.
  - 25 points per set 1-4 and 15 points for5th set for the winner with at least 2 points difference.
- Previous researches: Importance of skills for championships, tournaments, matches, sets, ambivalent sets.
- Levels of the game:
  - Both genders, 4 level of ages compete in world level.
    - U19, U21, U23, Men.
    - U18, U20, U22, Women.

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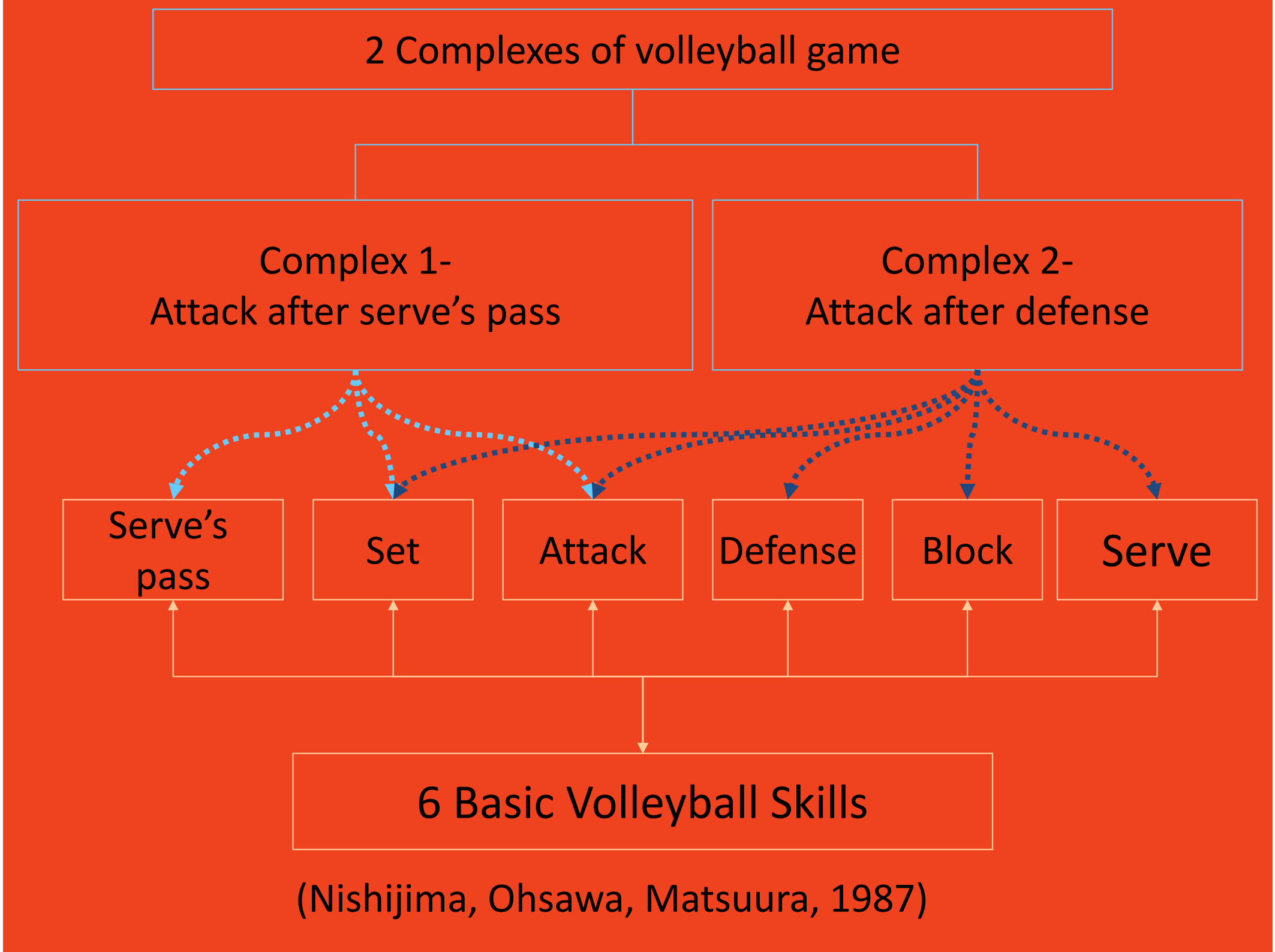
Volleyball

- Structure of the game: Hierarchical.
- Team's performance in skills connected directly with the result (Marchelino et al., 2009).
- **The main question is: are all skills equally important for the outcome of a rally at all ages in Male Volleyball?**


2 Complexes of volleyball game
Complex 1-
Attack after serve's pass
Complex 2-
Attack after defense
Serve's pass
Set
Attack
Defense
Block
Serve
6 Basic Volleyball Skills
(Nishijima, Ohsawa, Matsuura, 1987)

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Patterns & Outcomes

- Serve outcome
- Pass-set/attack 1 - outcome
- Serve-block- defense- set/attack 2- outcome.

- Win the rally
- Lose the rally
- Continuation of the rally with the ball on opponent's side.

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Data

- 3 world champions in relevant championships
  - Youth 2013(U19): Russia
  - Juniors 2013 (U21): Russia
  - Men 2014: Poland.
- Recorded and analyzed all actions of the selected team.
- Scale depended on skill.
- Serve (jump float & jump spin) and pass (vs jfloat & vs jspin) rated from 1-6 levels.
- Setting rating based on location (8) and tempo(2).
- Block rating based on effectiveness & ball's possession (3).
- Defense separated in free ball & dig.
- All skills are recorded and analyzed separately in 2 complexes except serve & pass.
- Computer Software: Data Volley system. Improve of worksheet (www.dataproject.com/Volleyball).
- Experts' opinions for prior estimations. Difficulties.

Method of analysis

- Transition Matrix 60 X 62. Last two columns are terminal moves (point + or point-)for the team under study.
- P_i is the probability for a skill to end up in a point after two subsequent game moves.

$$P_i = P(Y_{t+1} = \text{point}^+ \mid Y_t = S_i) + \sum_{k=1,k\neq 1}^{n} P(Y_{t+2} = \text{point}^+ \mid Y_{t+1} = S_k) P(Y_{t+1} = S_k \mid Y_t = S_i)$$

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Method of analysis Measure

- Importance score (I_i). Measure of impact & uncertainty for a skill (Fellingham & Reese, 2004).

$$I_i = \frac{E(P_i \mid y)}{\sqrt{V(P_i \mid y)}}$$

→ Posterior mean

→ Standard deviation

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Method of analysis Assumptions

- 1st assumption: Scoring for each skill is i.i.d.
- 2nd assumption: Patterns are first order Markov chains.

$$P_i = P(Y_{t+1} = \text{point}^+ \mid Y_t = S_i) = P(Y_{t+2} = \text{point}^+ \mid Y_{t+1} = S_k)$$

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Method of analysis
Model

- Simple multinomial model to estimate transition & success probabilities π_{ik}

$$\pi_{ik} = P(Y_{t+1} = S_k \mid Y_t = S_i)$$

- For each skill we assume multinomial likelihood

$$f(y_{i1},\ldots y_{i,n}, y_{i,n+1}, y_{i,n+2} \mid \pi_{\imath 1},\ldots \pi_{i,n}, \pi_{i,n+1}, \pi_{i,n+2}) \propto \prod_{k=1}^{n+2} \pi_{ik}^{y_{ik}}$$

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Method of analysis
Prior distribution

- We use a conjugate Dirichlet prior distribution of the type

$$f(\pi_{i1},..\pi_{i,n},\pi_{i,n+1},\pi_{i,n+2}\,|\,a_{i1},..a_{i,n},a_{i,n+1},a_{i,n+2}) \propto \prod_{k=1}^{n+2} \pi_{ik}^{\alpha_{ik-1}}$$

- Prior estimations from expert coaches. Low weight to experts/coaches opinion. Multiply 0.1X $N_{i,}$ (10% additional of data points).
- All success probabilities & importance scores were calculated using a Monte Carlo scheme of 10.000 iterations.

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Results MEN

Skill	Posterior mean	Standard deviation	Importance score
Block kill AS	0,99	0,001	948,117
Srv Jump 6	0,977	0,003	281,190
Block kill	0,973	0,004	225,156
Srv Float 6	0,959	0,008	114,423
Pass in Float 6	0,553*	0,019	27,855
Pass in Jump 6	0,568*	0,0204	27,819
Pass in Float 5	0,559*	0,0201	27,789
Pass in Jump 5	0,569*	0,021	27,039
Pass in Jump 4	0,511	0,02	24,937
Pass in Float 4	0,503	0,022	22,778

*Since variation is associated with sample size, skills are performed more often receive larger importance scores.

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Results
U21/ Juniors

Skill	Posterior mean	Standard deviation	Importance score
Block kill AS	0,979	0,003	315,514
Block kill	0,968	0,006	168,486
Srv Jump 6	0,964	0,007	139,076
Srv Float6	0,936	0,016	57,642
Pass in Float 5	0,539	0,029	18,335
Pass in Float 6	0,537	0,029	18,281
Pass in Jump 5	0,52	0,031	16,925
Set 1 MF quick	0,673*	0,041	16,536
Pass in Jump 6	0,522	0,034	15,451
Pass in Jump 4	0,481	0,034	14,114

*Since variation is associated with sample size, skills are performed more often receive larger importance scores.

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Results U19/Youth

Skill	Posterior mean	Standard deviation	Importance score
Block kill AS	0,968	0,006	164,952
Block kill	0,935	0,016	57,611
Srv Jump 6	0,935	0,016	57,200
Set 1 LS quick	0,769	0,048	15,950
Srv Float 6	0,851	0,054	15,710
Pass in Float 6	0,58	0,04	14,333
Pass in Float 5	0,56	0,043	13,183
Pass in Float 4	0,532*	0,048	11,014
Set 1 FRS quick	0,747*	0,07	10,713
Set 1 MF quick	0,614	0,065	9,386

*Since variation is associated with sample size, skills are performed more often receive larger importance scores.

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Results across teams

	Men	U21	U19
1	Block kill AS	Block kill AS	Block kill AS
2	Srv Jump 6	Block kill	Block kill
3	Block kill	Srv Jump 6	Srv Jump 6
4	SrvFloat 6	Srv Float 6	Set 1 LS quick
5	Pass in Float 6	Pass in Float 5	Srv Float 6
6	Pass in Jump 6	Pass in Float 6	Pass in Float 6
7	Pass in Float 5	Pass in Jump 5	Pass in Float 5
8	Pass in Jump 5	Set 1 MF quick	Pass in Float 4
9	Pass in Jump 4	Pass in Jump 6	Set 1 FRS quick
10	Pass in Float 4	Pass in Jump 4	Set 1 MF quick

- When comparing importance scores across teams, only the ordering should be compared.

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Results

Spearman's correlation table.

	Men	U21	U19
Men		0,964577	0,988779
U21			0,978753
U19			

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Conclusions

- Volleyball skills across ages did not vary too much.
- Serve: in men jump float (levels 2345) is more important than jump spin.
- Pass:
  - For Men better pass easier point in side out.
  - For Youth accuracy against float serve is more important than against jump serve.
- Setting & attack in complex 1:
  - Quick tempo is more important than high tempo.
  - Importance of back row attack gets higher as the age increased.
  - Out of system is more important in youth teams.
  - All levels of organized attack 1 have higher importance score than attacks 2.
- Setting & attack in complex 2:
  - Set out of system is most important.
  - Quick tempo better than high tempo sets
- Block:
  - Kill block after serve more important of blocking situations.

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Suggestions for coaches

- Men's, Junior's and youth's game in high level are not different.
- Complex 1 (side out point) is very important (Calhun et al.,2002).
- Complex 2:
  - Block and quick tempo attack.
  - More floaters than spinners servers.
  - Better preparation of unpredictable situations (attack out of system).

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Suggestions for coaches

- Improve of model.
  - Use of past data of team's performance as prior information.
  - Standardized team profile.
  - On line use.
  - Indications for coaches' decisions during match.

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- The End

Thank you for your attention!