

Influence of environmental constraints on human bimanual motor behaviour – Opposite grip preference distribution among European- vs Asian-Oceanian floorball players



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Side preferences – inborn laterality or (learned) specialization/skill?

- Usually considered as being governed by inborn, (organismic) neural constraints
- However, highly influenced by practice (sport is an excellent example)
 - Specialized Functions Kinematic Chain Model (Guiard 1986)
- Also, dependent on task constraints

Photo: Michael Peter/IFF

Photo: Ondřej Klíma/IFF









Photo: Martin Flousek/IFF

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Data collection:

	HAFIZ ZUBIR								
00	FORWARD - NO.								
)ë	Date of Birth 16-03-1990	Height 173cm	Grip Right						
	Country of Birth Singapore	Current Club SB Vantaa (FIN)	Original Club BWS						

Big Data approach

- IFF website https://floorball.sport/
- Women, Men, WU19, MU19
- > 2935 players
- > 40 countries
- 4 continents (3 confederations)
- 6 variables (grip side/throwing hand)
- Chi-squared analysis SPSS

	Men's World Championships All 15th place				Sm	itzerland, Zurich, Swias Life Aren Download official repor		
	C		11/11	/2022				
Singapore Men				rs -	Philippines Men			
5					6	ot.		
Match Start: 12:01			Match End:	Spectatora: Referenza				
			14:15	4402	urmanek, Vlastimil Solo			
Doals Pervaltises		Percelline	Seven	Rewards.	Team Lists			

STARTING LINEUPS

Singapore Men			Philippines Men	
Line 1			Line 1	
3. Sireej Remedhen		33. Vigneos Peoupethy	19. Fredrik Jeppooon Eccebel	24. Melvin Alm Mendoza
	31. Sathioh R		40. Kim Verge	Frenz
10. Jenmark Sorreda		35. Mohamad Hario Abdul	4. Ludvig Hemmingberg Porral	13. Lucao Oijvall Perez
Line 2			Line 2	
8. Ryan Michael Karl		9. Wee Guan Nicholao Chua	2. John Alicante Embile	36. Michael Hedblom
	26. Ye Shen Koh		5. Rhodell Eo	guerra
11. Juin Jie Ng		34. Kumareaa Peoupathy	77. Simon Andersoon	16. Christian Schoultze Castrillo
Line 3			Line 3	
77. Tze Wen Thaddeus Tan		88. Zong Wei Tng	7. Kristofer Jandelius Del Valle	6. Mathiao Hinder
	23. Suria R		33. Fredrik Dahm	en Cantoo
17. Junhong Sean Huang		6. Chee Yong Lee	21. Christofer Holland Bernardo	18. Patrick Hinder
Line 4			Line 4	
83. Jie Qing Cheeng		N/A	66. Mattiece Cortez Myllyperkio	9. Lucas Werelius
	N/A		N/A	
14. lohwarpal Singh		91. Yan Xun Alvan Chan	N/A	N/A
Goalkeepera			Goalkeepera	
80. Hong Jie Jared Tan			88. Victor Lindberg	
(2. Junwei Damien Wan)			(29. Patrik Neosbo)	

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Table 1 – Field players' and Goalkeepers' task specific left- and right-sided preferences															
		Women		WU19		Men		MU19		Total Female		Total Male		Total	
		L (%)	R (%)	L (%)	R (%)	L (%)	R (%)	L (%)	R (%)	L (%)	R (%)	L (%)	R (%)	L (%)	R (%)
Europe	FP	261	93	373	104	393	188	368	136	634	197	761	324	1395	521
		(73.73)	(26.27)	(78.20)	(21.80)	(67.64)	(32.36)	(73.02)	(26.98)	(76.29)	(23.71)	(70.14)	(29.86)	(72.81)	(27.19)
	G	3	44	11	49	16	51	16	45	14	93	32	96	46	189
	K	(6.38)	(93.62)	(18.33)	(81.67)	(23.88)	(76.12)	(26.23)	(73.77)	(13.08)	(86.92)	(25.00)	(75.00)	(19.57)	(80.43)
Asia-	FP	58	130	6	41	93	143	19	63	64	171	112	206	176	377
Oceania		(30.85)	(69.15)	(12.77)	(87.23)	(39.41)	(60.59)	(23.17)	(76.83)	(27.23)	(72.77)	(35.22)	(64.78)	(31.83)	(68.17)
	G	4	22	2	3	1	27	0	8	6	25	1	35	7	60
	K	(15.38)	(84.62)	(40.00)	(60.00)	(3.57)	(96.43)	(0.00)	(100.0)	(19.35)	(80.65)	(2.78)	(97.22)	(10.45)	(89.55)
America	FP	17	10	34	12	23	18	22	13	51	22	45	31	96	53
		(62.96)	(37.04)	(73.91)	(26.09)	(56.10)	(43.90)	(62.86)	(37.14)	(69.86)	(30.14)	(59.21)	(40.79)	(64.43)	(35.57)
	G	0	3	0	4	1	4	1	2	0	7	2	6	2	13
	K	(0.00)	(100.00)	(0.00)	(100.00	(20.00)	(80.00)	(33.33)	(66.67)	(0.00)	(100.0 0)	(25.00)	(75.00)	(13.33)	(86.67)
Total	FP	336	233	413	157	509	349	409	212	749	390	918	561	1667	951
		(59.05)	(40.95)	(72.46)	(27.54)	(59.32)	(40.68)	(65.86)	(34.14)	(65.76)	(34.24)	(62.07)	(37.93)	(63.67)	(36.33)
	G	7	69	13	56	18	82	17	55	20	125	35	137	55	262
	K	(9.21)	(90.79)	(18.84)	(81.16)	(18.00)	(82.00)	(23.61)	(76.39)	(13.79)	(86.21)	(20.35)	(79.65)	(17.35)	(82.65)
Note : % represents proportion of respective sex total, specific to confederation and playing position. $FP = Field$ player, $GK = Goalkeeper$. $WU19 = Women's$															

Note: % represents proportion of respective sex total, specific to confederation and playing position. FP = Field player, GK = Goalkeeper. W019 = Women sU19 junior team, MU19 = Men's U19 junior team. FPs' grip-side distributions in the 'Total' (lowest) row are not representative of the findings since all data from the different confederations are combined.



Results

100%

80%

60%

40%

20%

0%

19,57%

Europe

Throwing hand preference (%)



Goalkeepers 86,67% 80,43%



Previously found bimanual grippreference "majorities":







No research to explain the variability in floorball specific grip-preferences..



Constraints influence on motor behaviour:



Individual constraints:

- Ex. genes, unimanual handedness
- No differences





Photo: IFF, unihockey-fotos.ch/Claudio Schwarz

Task constraints:

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- Equipment, rules, playing field
- No differences





Constraints influence on motor behaviour:



Environmental constraints:

- Current sport culture when Floorball was introduced
 - Floorball ambassadors
 - Field hockey / Cricket

- Initial players
- Coaches & PE teachers
- Stick distributors



Environmental constraints:

- Right-sided floorball specific ecological niche?
 - Demonstrated/Modelled behaviour
 - «Lateralized» field of affordances?
 - Shared affordances?

- Ice-hockey (Puterman, 2010)
- Lateralized perceptive behaviour?
 - Handball (Loffing, Hagemann 2020)



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Environmental constraints influence on motor behaviour:





Laterality and performance

Fighting hypothesis = Negative frequency effect

- Benefit for «minority» lateralities in interactive sports
 - Raymond et al. (1996)
 - Puterman et al. (2010)

Reversed stance benefit

- Benefit for *right-handers* to adopt a *left-sided* bimanual grip
 - Mann et al. (2016, 2017)
 - Runswick et al. (2021)

Collected performance data:

- 8437 goals + assists
- Laterality of scorer + assist
- Majority laterality of teams
- Majority laterality of Confederation
- 4 WC + Qualifiers
- 40 National teams
- 4 Continents









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Is left right for right-handers and right right for left-handers?

- Would a left-sided grip be beneficial for right-handed individuals, thus being 'correct' in Europe and North America?
- If so, do a large part of the Asian-Oceanian floorball players play against their natural preferences / specialized unimanual functions?
 - Relative challenge when facing Left-sided teams
- Shows how environmental constraints may influence motor behaviour





Thank you for listening!

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