



国家射箭队运动员不同技术环节的身体姿态特征研究

Research on Body Posture Characteristics of National Archery Athletes in Different Technical Links

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摘要:目的:分析国家射箭队运动员不同技术环节的身体姿态特征,为提高技术动作质量有针对性地提出建议。方法:通过文献资料调研、专家访谈、测试等方法,分析国家射箭队28名运动员举弓、开弓、固势和撒放等技术环节的身体姿态特征。结果:不同性别射箭运动员的身体姿态角无显著性差异,从开弓环节开始,运动员持弓臂肘关节俯视角始终大于165°,肩关节俯视角约为170°,拉弓臂的肘角逐渐变小、肩角逐渐变大,固势环节肘关节俯视角约为60°,肩关节俯视角约为127°。撒放环节较固势环节的上肢姿态角变化小于3°,躯干姿态角变化小于1°。结论:不同性别的运动员身体姿态角差异不显著,具有共性特征:1)举弓环节上肢自然上抬、发力小,躯干不同程度前屈;2)开弓环节持弓臂肘关节俯视角接近直线,呈现骨骼支撑与直线用力原理特征;3)固势环节拉弓臂肘关节姿态角缩小,肩关节姿态角变大,前臂与箭的延伸线呈直线;4)撒放环节仅有拉弓臂肘关节在垂直方向上出现微小变化;5)固势环节后,躯干姿态角变化极小。

关键词:国家射箭队;身体姿态;技术环节

Abstract: Objective: To analyze the body posture characteristics of the national archery team athletes in different technical links and makes targeted suggestions for improving the quality of technical movements. Methods: The body posture characteristics of 28 athletes of the national archery team in bow-lifting, bow-opening, fixing and releasing links are analyzed through the methods of literature survey, expert interview, and test. Results: There is no significant difference in the body posture angles between archers of different genders. In the bow-opening link, athletes' overlooking angle of the elbow joint of the bow-holding arm is always greater than 165° and the overlooking angle of the shoulder joint is about 170°. The elbow angle of the bow-drawing arm gradually becomes smaller and the shoulder angle gradually becomes larger. In the fixing link, the overlooking angle of the elbow joint is about 60°, and the overlooking angle of the shoulder joint is about 127°. Compared with the fixing link, the change of upper limb angle is less than 3° and the trunk angle is less than 1° in the releasing link. Conclusions: The body posture angles between athletes of different genders do not differ significantly and have the following common characteristics: 1) In the bow-lifting link, the upper limbs lift naturally with little force, and the degree of the trunk forward flexion varies; 2) in the bow-opening link, the overlooking angle of the elbow joint of the bow-holding arm is close to a straight line, presenting bone support and linear force; 3) in the fixing link, the angle of the elbow joint of the bow-drawing arm shrinks, the angle of the shoulder joint increases, and the extension line of the forearm and the arrow is straight; 4) in the releasing link, only a slight change in the vertical direction of the elbow joint of the bow-drawing arm is observed; 5) after the fixing link, the change of trunk posture angle is minimal.

Keywords: national archery team; body posture; technical link

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2008 28 16 12 1

2021 2019 Wu et al. 2022
2006
2019 Callaway et al. 2017

表1 测试对象基本信息

Table 1 Basic Information of Test Subjects

性别	年龄/岁	身高/cm	体质量/kg	满弓/kg	运动年限/年
男(n=16)	18.8± 3.4	180.6± 4.3	80.7± 11.0	20.7± 1.2	4.5± 2.1
女(n=12)	18.0± 1.4	169.5± 4.3	68.3± 7.6	17.7± 0.5	4.8± 1.3

2015 2020
2018

1.2 研究方法

1.2.1 文献资料调研

Web of Science

2021a 2021b Vendrame et al. 2022

2008

“ archery”
“ archery technique” “ kinematic”
2000

1 研究对象与方法

1.2.2 专家访谈

1.1 研究对象

10 2

表2 访谈人员信息

Table 2 Information of Interviewees

姓名(国籍)	职称/职务	单位/机构	研究方向
李××(韩国)	教练组组长	中国国家射箭队	射箭教学与训练
金××(韩国)	总教练(2016年里约奥运会期间)	韩国国家射箭队	射箭教学与训练
许××(韩国)	总教练	科龙射箭队	射箭教学与训练
肖××(中国)	领队	中国国家射箭队	运动队管理
刘××(中国)	国家级教练员	中国国家射箭队	射箭教学与训练
苏××(中国)	国家级教练员	中国国家射箭队	射箭教学与训练
何×(中国)	国家级教练员	中国国家射箭队	射箭教学与训练
薛××(中国)	高级教练员	中国国家射箭队	射箭教学与训练
吴××(中国)	高级教练员	中国国家射箭队	射箭教学与训练
潘××(中国)	高级教练员	中国国家射箭队	射箭教学与训练

1.2.3 测试

6

2020 11

7

Qualisys

1.2.4 数理统计

QTM Qualisys Track Manager

SPSS 19.0

200 Hz

1

$\bar{X} \pm S$

t

95 Hz

$\alpha=0.05$

Qualisys

3

2 结果与分析

2.1 举弓环节身体姿态特征

X

168.34°

Y

X

Z

± 7.14°

114.32°± 7.81°

127.96°± 5.19°

113.45°± 6.21°

66.62°± 5.53°

32.16°± 5.40°

3

表3 举弓环节上肢姿态角度

Table 3 Upper Limbs Posture Angle of Bow-Lifting Link

性别	持弓臂			拉弓臂		
	肘关节俯视图夹角	肩关节俯视图夹角	肩关节前视图夹角	肘关节俯视图夹角	肩关节俯视图夹角	肩关节前视图夹角
男	168.27± 7.37	115.29± 10.11	130.11± 5.65	111.81± 7.21	67.74± 5.80	33.44± 5.16
女	168.40± 6.90	113.34± 5.51	125.81± 4.73	115.08± 5.02	71.49± 5.26	30.88± 5.63

4

165°

82°

8°

77° 79°

140° 143° 5

10°

5°

5° 6°

表4 举弓环节躯干姿态角度

Table 4 Trunk Posture Angle of Bow-Lifting Link

性别	躯干扭转角	躯干前屈角	躯干侧屈角	肩姿态角	髋姿态角
男	9.57± 3.36	82.55± 2.88	84.49± 3.49	15.08± 4.07	5.79± 2.47
女	9.05± 3.06	82.03± 4.19	83.91± 2.44	15.28± 3.13	5.98± 1.87

2.2 开弓环节身体姿态特征

170° 171°

表5 开弓环节上肢姿态角度

Table 5 Upper Limbs Posture Angle of Bow-Opening Link

性别	持弓臂			拉弓臂		
	肘关节俯视图夹角	肩关节俯视图夹角	肩关节前视图夹角	肘关节俯视图夹角	肩关节俯视图夹角	肩关节前视图夹角
男	170.56± 2.96	168.62± 4.44	175.00± 3.10	82.54± 3.14	79.14± 4.58	143.91± 9.67
女	171.13± 4.99	170.38± 5.57	174.26± 2.55	82.06± 3.45	77.81± 5.30	140.61± 10.68

2.3 固势环节身体姿态特征

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58° 60°

表6 开弓环节躯干姿态角度

Table 6 Trunk Posture Angle of Bow-Opening Link

性别	躯干扭转角	躯干前屈角	躯干侧屈角	肩姿态角	髋姿态角
男	6.58± 2.01	85.66± 2.32	-83.20± 2.84	6.68± 2.04	5.88± 2.48
女	6.36± 3.00	86.25± 1.78	-84.44± 2.01	6.24± 2.15	5.50± 2.62

127° 7

161° 162°

8

表7 固势环节上肢姿态角度

Table 7 Upper Limbs Posture Angle of Fixing Link

性别	持弓臂			拉弓臂		
	肘关节俯视图夹角	肩关节俯视图夹角	肩关节前视图夹角	肘关节俯视图夹角	肩关节俯视图夹角	肩关节前视图夹角
男	164.70± 5.90	169.41± 3.99	173.91± 4.21	60.68± 4.32	127.22± 4.80	162.51± 4.35
女	169.87± 4.45	170.42± 4.55	170.70± 5.10	58.55± 3.58	127.30± 5.92	161.36± 3.94

表8 固势环节躯干姿态角度

Table 8 Trunk Posture Angle of Fixing Link

性别	躯干扭转角	躯干前屈角	躯干侧屈角	肩姿态角	髋姿态角
男	8.85± 3.21	85.83± 2.44	-84.87± 2.11	7.58± 2.49	6.64± 1.25
女	9.14± 2.92	85.19± 2.85	-85.93± 2.32	7.13± 2.72	6.65± 1.24

2.4 撒放环节身体姿态特征

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10

5

表9 撒放环节上肢姿态角

Table 9 Upper Limbs Posture Angle of Releasing Link

性别	持弓臂			拉弓臂		
	肘关节俯视图夹角	肩关节俯视图夹角	肩关节前视图夹角	肘关节俯视图夹角	肩关节俯视图夹角	肩关节前视图夹角
男	167.86± 3.60	169.21± 5.55	172.14± 3.86	60.19± 5.78	131.10± 7.67	162.02± 3.86
女	166.67± 5.07	169.80± 5.06	173.12± 4.44	58.09± 7.02	129.27± 7.71	160.61± 3.52

表10 撒放环节躯干姿态角

Table 10 Trunk Posture Angle of Releasing Link

性别	躯干扭转角	躯干前屈角	躯干侧屈角	肩姿态角	髋姿态角
男	8.88± 2.83	85.32± 1.49	-84.90± 2.35	6.22± 1.72	6.64± 2.32
女	9.24± 3.58	85.30± 1.47	-84.96± 2.20	6.32± 1.42	7.13± 2.45

3.3 固势环节身体姿态特征

3 讨论

3.1 举弓环节身体姿态特征

Sergiy 2017

Spratford 2017

2021b Lin et al. 2010

3.4 撒放环节身体姿态特征

3.2 开弓环节身体姿态特征

180°

2013

2008

29

2010

2/3

10

135° 170°

800

70 m

Sarro et al. 2021

4 结论

Kuch et al. 2020

1

2

3

10°

37

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