

Impact of Bra Usage on Upper Body Measurements and Biomechanical Performance in Tennis Athletes.

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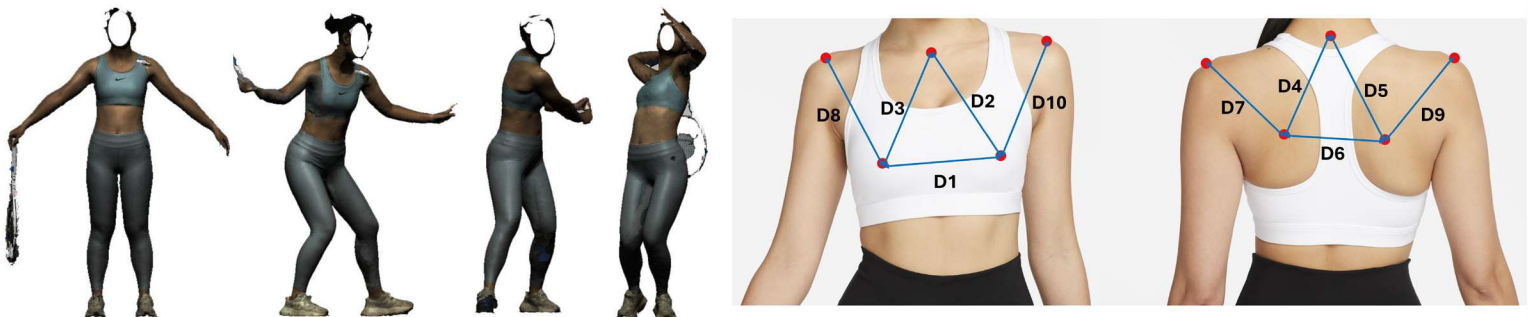
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BACKGROUND

- Objective:** To investigate the impact of sports bras on dynamic deformations and kinematic changes of the upper body during tennis movements.
- Sports bras are essential for providing support and comfort to female athletes. In tennis, the asymmetrical movements of the dominant arm can lead to discomfort and reduced performance if excessive pressure from the bra is applied.
- Research Questions:** How do sports bras affect upper body measurements and kinematic performance in tennis athletes?
- Hypotheses:** Wearing a sports bra will reduce breast movement but may limit shoulder and elbow motion.
- Gaps:** Limited understanding of how sports bras can be optimized for performance in racket sports.

METHODS

- 6 female tennis athletes were recruited for 4D body scanning and motion capture under 2 conditions: braless and wearing a commercial sports bra. Related anthropometric measurements and kinematic performance were analyzed during serve, forehand, and backhand strokes.



RESULTS

- Measurements:** Both breast-related measurements (**D1, D2, D3**) and shoulder-related measurements around the dominant side (**D8, D9**) decreased with the sports bra.
- Kinematic Parameters:** The range of elbow and shoulder angles was **reduced** by **3.3-11.7** degrees, and power **decreased** by **0.3-10.9** % with the sports bra.

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Commercial Bra	Forehand	150.5	163.6	150.8	146.7	142.3	146.3	175.7	208.1	172.2	216.2
Braless	Forehand	170.1	179.2	177.1	144.1	141.5	147.7	183.1	224.3	179.1	219.4
Commercial Bra	Backhand	144.3	161.8	161.5	138.6	147.1	154.0	190.7	206.4	181.0	212.1
Braless	Backhand	159.2	172.0	169.4	140.4	147.4	156.9	190.9	226.7	191.2	230.4
Commercial Bra	Serve	156.8	162.1	158.1	143.1	149.6	143.7	192.6	216.0	179.4	223.7
Braless	Serve	175.0	176.3	175.9	142.4	145.4	145.3	185.0	231.8	182.0	219.3
Commercial Bra	Static	158.6	159.9	155.4	143.1	150.5	127.3	180.5	214.1	172.9	209.1
Braless	Static	183.3	185.1	181.5	143.2	150.0	129.5	180.2	229.4	180.4	213.6

		Elbow Angle (deg)	Elbow Power (W/kg)	Shoulder Angle (deg)	Shoulder Power (W/kg)
Commercial Bra	Forehand	26.8	0.4	73.4	1.1
Braless	Forehand	33.3	0.5	85.1	1.1
Commercial Bra	Backhand	27.8	0.4	63.6	0.5
Braless	Backhand	31.2	0.5	69.1	0.6
Commercial Bra	Serve	99.5	1.2	31.5	1.0
Braless	Serve	108.5	1.2	41.7	1.1

DISCUSSION

- Sports bras provide necessary breast support, but also limit the motion range and power of the dominant shoulder and elbow during tennis strokes.
- Future research should explore a larger sample size and investigate different sports bra designs tailored for racket sports to enhance performance without compromising comfort and support.

IMPACT STATEMENT

- The findings highlight the need for sports bras that balance effective breast support with minimal restriction on upper body motion, which is crucial for optimizing performance in tennis and similar sports.
- This research can guide the design of more effective sports bras for athletes, enhancing both comfort and performance.