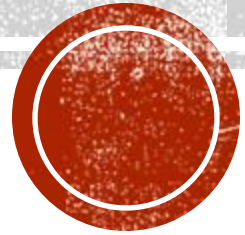
ATHLETE TESTING REPORT



SNOWBOARDING FREESTYLE

Physiological Requirements:

1. **Lower body eccentric strength**

Essential for absorbing high-impact landings on varied and sloped terrain.

2. **Reactive Strength & Joint Stiffness**
Enhances rebound ability and stability during transitions between jumps and rails.

3. **Core & Trunk Stability**
Supports posture, rotation control, and mid-air orientation.

4. **Aerobic Capacity**
Supports recovery between high-intensity efforts (e.g., heats, practice rounds).

5. **Anaerobic Power**
Required for short, intense bouts of performance (e.g., competition runs <60 seconds).

6. **Limb Symmetry & Landing Mechanics**
Reduces injury risk and ensures consistency on variable terrain.

wer and jumping ability in snowboarders reported in the literature.

Competitive level	Discipline	Sample size	Isometric quadriceps force (N)	Leg press power (W·kg^{-1})	Jumping height (cm)		Jumping power (W·kg^{-1})		Jumping force (N·kg^{-}	
					CMJ	SJ	CMJ	SJ	CMJ	SJ
Elite	–	16 (women)	–	range: 4.46–6.54	range: 23.0–37.3	–	–	–	–	–
		21 (men)	–	range: 5.42–7.69	range: 32.5–48.9	–	–	–	–	–
Elite	SBx	5 (3 women)	–	–	45 ± 9	–	53.9 ± 5.5	–	20.7 ± 2.3	–
Elite	SBx	10 (men)	680.1 ± 76.8	–	–	–	71.6 ± 3.1	68.5 ± 7.4	–	–
	SBalp	10 (men)	731.9 ± 181.9	–	–	–	73.0 ± 3.7	70.6 ± 7.3	–	–
Elite	SBfs	10 (men)	684.6 ± 137.2	–	–	–	–	–	26.8 ± 2.8	–
	SBx	11 (men)	674.1 ± 78.8	–	–	–	–	–	26.2 ± 2.8	–
	SBalp	12 (men)	754.6 ± 162.1	–	–	–	–	–	27.1 ± 3.4	–

ise, data are reported as mean ± standard deviation. SBfs (freestyle), SBx (snowboard-cross), SBalp (alpine).

Table 1. Sample size, athlete characteristics and CMJ height (mean ±SD) across sport disciplines

Sport/discipline	Men *n*	Men Age *(y)*	Men BM *(kg)*	Men CMJ height *(cm)*	Women n	Women Age *(y)*	Women BM *(kg)*	Women CMJ height *(cm)*
Strength & power sports								
Athletic sprinting (100/200 m)	13	25 ± 4	79 ± 10	62.7 ± 4.8	11	24 ± 4	60 ± 5	48.4 ± 6.0
Long jump/triple jump	9	24 ± 4	81 ± 7	56.2 ± 7.4	11	22 ± 5	60 ± 5	44.1 ± 5.2
Speed skating sprint	19	24 ± 4	81 ± 8	51.3 ± 5.4	8	25 ± 5	68 ± 7	40.9 ± 7.0
Bobsleigh	18	26 ± 4	91 ± 9	50.0 ± 10.1				
Athletics throwing	20	23 ± 5	103 ± 15	48.5 ± 9.3	13	21 ± 4	76 ± 9	35.6 ± 4.6
Weightlifting	27	22 ± 3	91± 18	47.4 ± 7.4	15	22 ± 5	63 ± 11	35.8 ± 4.9
Ski jumping	26	24 ± 3	65 ± 4	47.1 ± 5.4	28	20 ± 4	59 ± 3	35.0 ± 3.6
Powerlifting					9	25 ± 6	65 ± 8	35.0 ± 7.8
Skeleton	8	24 ± 4	81 ± 7	38.9 ± 9.7				
Team sports								
Beach volleyball	38	26 ± 6	88 ± 9	48.1 ± 6.7	20	25 ± 4	71 ± 6	35.7 ± 6.6
Volleyball	43	22 ± 3	89 ± 8	44.5 ± 5.8	19	21 ± 3	71 ± 7	33.0 ± 4.9
Handball	83	22 ±4	92 ± 11	42.1 ± 5.4	68	25 ± 4	73 ± 7	35.5 ± 4.7
Ice hockey	136	24 ± 4	86 ± 8	41.2 ± 5.6	29	22 ± 4	66 ± 9	28.5 ± 4.8
Soccer	21	27 ± 3	87 ± 11	39.9 ± 3.3	95	24 ± 4	65 ± 6	31.8 ± 4.2
Indoor bandy	15	23 ± 3	72 ± 6	39.7 ± 3.5	24	22 ± 3	64 ± 5	28.6 ± 3.9
Bandy	73	22 ± 5	80 ± 9	39.5 ± 5.0	20	24 ± 7	68 ± 8	24.7 ± 4.4
Downhill winter sports								
Alpine skiing	25	27 ± 3	87 ± 8	44.9 ± 5.5	29	25 ± 3	67 ± 5	36.1 ± 4.5
Freestyle skiing	13	21 ± 3	71 ± 7	41.8 ± 7.1	6	21 ± 2	63 ± 9	32.5 ± 4.5
Skicross	6	24 ± 3	87 ± 7	41.5 ± 6.1	5	24 ± 2	70 ± 3	33.3 ± 3.4
Snowboard	42	21 ± 3	75 ± 10	41.0 ± 5.6	5	22 ± 2	63 ± 6	33.8 ± 3.7
Telemark skiing	24	21 ± 4	81 ± 7	40.9 ± 4.0	8	22 ± 3	63 ± 5	28.8 ± 3.4
Combat sports								
Wrestling	30	23 ± 3	80 ± 15	42.0 ± 6.6	12	20 ± 2	66 ± 10	28.2 ± 6.6
Judo	5	21 ± 2	72 ± 8	41.7 ± 4.8	5	21 ± 2	65 ± 5	28.8 ± 4.9

NORMATIVE VALUES

DROP JUMP

Metric	Rep 1	Rep 2	Rep 3	Average
Reactive Strength Index	1.24	1.07	2.07	**1.46**
Jump Height (cm)	43.2	42.3	44.6	**43.37**
Contact Time (ms)	0.35	0.4	0.22	**0.32**

Interpretation

- RSI: 1.46 – reflects moderate elastic ability.
- Contact Time: 0.32s – indicates balanced neuromuscular stiffness.
- Strategy aligns with a reactive jumper
- This aligns with the needs of freestyle snowboarders, where precision, impact absorption, and aerial transition are critical (Gathercole et al., 2015).
- **Training direction**: raise RSI through short-contact plyometric work.

Metric	Rep 1	Rep 2	Rep 3	Average
Modified Reactive Strength Index	0.43	0.47	0.42	**0.44**
Countermovement Depth (mm)	-42.5	-40.3	-52.7	**-45.17**
Jump Height (cm)	36.4	38.2	37.1	**37.23**
Braking Duration (ms)	400.0	299.0	291.0	**330.0**
Braking Impulse (N·s)	50.3	84.7	115.7	**83.57**
Concentric Duration (ms)	310.0	291.0	297.0	**299.33**
Concentric Impulse (N·s)	240.1	245.9	242.4	**242.8**
Impulse Ratio (Con / Braking)	4.77	2.9	2.1	**3.26**
Peak Power per Body Mass (W/kg)	50.9	53.9	50.7	**51.83**
Landing Asymetry	28% R	22% R	28 % L	

COUNTERMOVEMENT JUMP

Interpretation

- Jump Height: 37.2 cm – good vertical output.
- RSI Mod: 0.44 – moderate explosiveness; room for improvement.
- Concentric Impulse: 243 N·s vs. Braking Impulse: 83 N·s.
- Impulse Ratio (Con / Brake): ~2.93 – concentric-dominant jumper.
- Braking Duration: 0.32 s – moderately long, with limited capacity
- Braking Impulse: 83 N·s – low relative to concentric impulse (~243 N·s), underutilizing eccentric loading.
- Countermovement Depth: 29 cm – deep countermovement strategy.
- Combining deep ROM with low braking impulse suggests mechanical reliance over neuromuscular efficiency.

- Excessive asymmetry post-jump may indicate side dominance, compensation, or incomplete recovery.

Training Considerations:

1. Emphasize eccentric overload and braking force to improve SSC utilization within the available range

2. Include landing mechanics in both bilateral and unilateral formats.

ISOMETRIC BACK SQUAT

Metric	Rep 1	Rep 2	Average
Peak Force (N)	2552.0	2534.0	2543.0
Asymmetry (%)	3.0	5.0	4.0

Interpretation

- Peak Force: 2543 N – strong bilateral isometric output.
  - Indicates a solid strength foundation for performance and injury mitigation
- Asymmetry: 4% – within healthy range (<10%).
  - Consistently low asymmetry suggests symmetrical neuromuscular control.
  - Important for freestyle snowboarding where uneven terrain and landings challenge bilateral control.
- Supports effective landing and takeoff strength.

DYNAMIC STRENGTH INDEX

- **Dynamic Strength Index (DSI)**
- DSI Calculation:

CMJ Peak Force = 2112 N
ISO Back Squat Peak Force = 2543 N
DSI = 2112 / 2543 = 0.83

- Interpretation:
  - A DSI of 0.83 indicates a high dynamic strength index.
  - The athlete is effectively converting maximal strength into explosive performance, which is ideal for the demands of freestyle snowboarding.
  - **Training Consideration: Maintenance of strength and improved stiffness may optimize performance further**

KEY TAKE AWAY

The athlete demonstrates a force- and control-dominant neuromuscular profile. CMJ results show a concentric impulse of 243 N·s and braking impulse of 83 N·s, indicating a concentric-dominant strategy with an impulse ratio of ~2.93. While the countermovement depth is deep (29 cm), the braking impulse remains low, suggesting a need for improved eccentric utilization

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