Body weight high-intensity functional training enhances anaerobic performance in American football players

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Purpose: High-intensity functional training is a near-maximal effort workout that stresses the body to improve muscle mass and function. This training style has also been reported to improve anaerobic performance in team sports; however, there is a lack of information on this training method in collegiate American-style football players. This study examined the impact of 12 body weight high-intensity functional training sessions on anaerobic performance and body composition in collegiate American-style football players.

Methods: Nine male athletes (mean ± SD = age, 22 ± 1 years; body mass, 101 ± 15 kg; height, 179 ± 8 cm; FFM, 156 ± 15 kg) participated in this investigation. The participants completed four weeks of training consisting of 12 body weight high-intensity functional training sessions **(Figure 1)**.

Results: We found no significant differences in anaerobic performance between pretests 1 and 2; however, posttest values significantly differed from the pretests ($P < 0.05$). Vertical jump height increased ($\eta^2 = 0.595$), pro-agility time ($\eta^2 = 0.574$) and 40-yard dash time ($\eta^2 = 0.788$) decreased, and Wingate peak power ($\eta^2 = 0.622$) and average power ($\eta^2 = 0.636$) increased at posttest **(Table 5)**. We observed no significant differences in body composition when comparing pretests 1 and 2 to the posttest. However, large effect sizes suggested trending increases in bone-free fat-free mass ($\eta^2 = 0.208$) and decreases in body fat percentage ($\eta^2 = 0.195$).

Table 1:

Body Composition Measures

	Pre-Test 1	Pre-Test 2	Post-Test	*P*-Values	Partial-eta squared
Body Weight (kg)	101 ± 15	101 ± 16	102 ± 15	0.615	0.059
Bone-free fat-free mass (kg)	156 ± 15	156 ± 15	158 ± 13	0.154	0.208
Fat mass (kg)	59 ± 26	58 ± 26	58 ± 26	0.433	0.099
Body fat percentage (%)	26 ± 8	26 ± 8	26 ± 8	0.176	0.195

Note: Values are mean ± SD (n = 9). There was no significant (p > 0.05) difference from pretest 1, pretest 2 to posttest for body weight, bone-free fat free mass, fat mass, and body fat percentage.

Table 2:

Overview of workout protocols used in the body weight high-intensity functional training program.

[a]Week	Sets per exercise	Repetitions per set	E:R	[b]Time per exercise	[c]Time per week	[d]Work intensity	RPE
1	3	AMRAP	20:10	60	1,080	68% ± 12%	5 ± 1
2	3	AMRAP	30:10	90	1,620	68% ± 14%	5 ± 1
3	3	AMRAP	40:10	120	2,160	70% ± 15%	5 ± 1
4	3	AMRAP	50:10	150	2,700	74% ± 9%	6 ± 1

Note: AMRAP, as many repetitions as possible; E:R, exercise-to-rest ratio (s); RPE, ratings of perceived exertion (mean ± standard deviation); [a]three training sessions per week; [b]total exercise time per exercise (s); [c]total exercise time per week (s); [d]percent of the estimated maximal heart rate (220-age; mean ± standard deviation)

Figure 1:

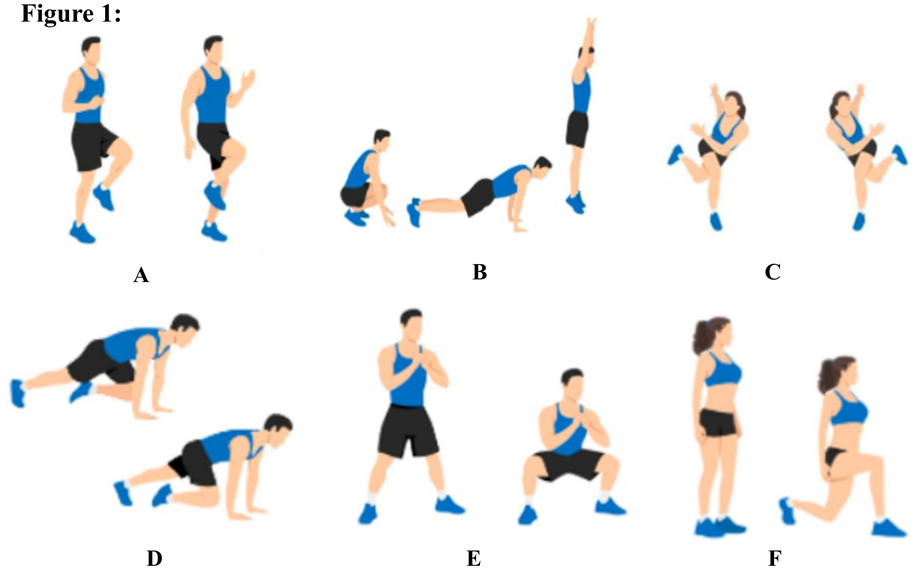

Figure 1: High-intensity bodyweight functional training (BWHIFT) was conducted three times a week for four weeks, totaling 12 sessions. Each BWHIFT session began with a 5-minute warm-up that included self-led dynamic exercises. The main part of each session consisted of six BWHIFT exercises: high knees (A), burpees (B), skater jumps (C), mountain climbers (D), squats (with squat jumps introduced in weeks 3 and 4) (E), and lunges (with jumping lunges introduced in weeks 3 and 4) (F). At the beginning of each week, the work-to-rest ratio was adjusted by increasing the exercise duration by 10 seconds for each exercise, while the rest time remained the same. Each exercise was performed three times per training session.

Table 3:

Rating of Perceived Exertion	Mean ± SD
Week 1	5 ± 1
Week 2	5 ± 1
Week 3	5 ± 1
Week 4	6 ± 1

Note: Values are mean ± SD (n = 9)

Table 4:

Percent of Maximal Heart Rate	Mean ± SD
Week 1	68% ± 12%
Week 2	68% ± 14%
Week 3	70% ± 15%
Week 4	74% ± 9%

Note: Values are mean ± SD (n = 9)

Table 5:

Anaerobic Performance Measures

	Pre-Test 1	Pre-Test 2	Post-Test	*P*-Values	Partial-eta square
Vertical Jump (cm)	60 ± 12	59 ± 15	65 ± 13#	< 0.001	0.595
Pro-Agility (sec.)	5.17 ± 0.46	5.15 ± 0.40	4.93 ± 0.46*	0.001	0.574
40-yard Dash (sec.)	5.47 ± 0.44	5.58 ± 0.46	5.16 ± 0.47*	< 0.001	0.788
Peak Power (W)	778 ± 289	808 ± 237	1137 ± 214#	< 0.001	0.622
Average Power (W)	593 ± 217	613 ± 187	861 ± 162#	< 0.001	0.636

*Note: Values are mean ± SD (n = 9). There was no significant (p > 0.05) difference from pretest 1 to pretest 2 for all anaerobic performance measures. *The posttest for pro-agility and 40-yard dash times were significantly (p < 0.05) reduced compared to pretest 1 and pretest 2. # The posttest for vertical jump, peak power, and average power significantly (P < 0.05) increased compared to pretest 1 and pretest 2.*

Conclusion: Twelve sessions of bodyweight high-intensity functional training effectively improved anaerobic performance in American football players while maintaining their body composition during the collegiate football preseason. This program shows a promising for off season training and on-ramping athletes in their return to campus to begin team training sessions.

Practical Applications:: Certified strength and conditioning specialists who work with collegiate American football teams can utilize these findings to train their athletes and establish performance goals during the pre-season training phase. Body weight high-intensity functional training may help reduce the risk of injury as athletes transition into football-specific activities.