2019, Volume 2 (Issue 2): 10 OPEN ACCESS

Relationship Between Non-curved, Non-motorized, Resistance Treadmill Sprinting and Ground Speeds in American Football Players

Research Brief

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Abstract

Introduction: The NFL has relied heavily on speed as an indicator of readiness and future success in American football. Recent trends in speed training include the utilization of non-curved, non-motorized, resistance treadmills. Minimal data currently exists examining the use of these treadmills. Therefore, non-curved, non-motorized, resistance treadmills have been hypothesized to correlate with grounded sprints.

Methods: 17 male, American football players (26.06 ± 3.72 yr., 184.59 ± 7.95 cm, 101.88 ± 15.96 kg) sprinted at peak speeds during five different trials. Four trials consisted of non-curved, non-motorized treadmill sprints at different incline/resistance settings (i.e. 15RES8, 15RES5, 20RES3, 20RES1). One trial consisted of a 30-yard grounded sprint in which three different data points were recorded (i.e. 10YDSPLIT, 20YDSPLIT, 30YDSPLIT). Multiple correlation analyses examined relationships and significance was set at $p < 0.05$.

Results: A significant positive correlation ($p < 0.05$.) existed between 10YDSPLIT and 15RES8, 10YDSPLIT and 20RES3, 20YDSPLIT and 20RES3, 20YDSPLIT and 20RES1, and lastly 30YDSPLIT and 20RES3.

Conclusions: Moderate inclines at higher resistance settings relate to 9.14 m (10 yd) grounded sprints. Data also displayed steeper incline at lower resistance settings relate to grounded sprints through 27.43 m (30 yd).

Key Words: Running, strength, conditioning

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Introduction

The National Football League (NFL) has relied heavily on measures of physical performance, including those tested at the NFL Combine. These measures included tests of power, strength, agility and speed [1,2]. Speed has been previously researched in multiple aspects of performance and was determined as a key performance measure in American football [2,3]. The 40-yard dash (36.58 m) at the NFL combine has recently been examined and shown direct correlations to increased career performance, as the faster sprint times have been associated with all-league performer accolades (NFL Pro-Bowl) [2]. Recent trends in speed training have included resisted incline sprints, motorized treadmill training, and curved, non-motorized treadmill training. Much research has studied the beneficial effects of speed when it comes to incline training [4,5]. Other research has examined differences found in running mechanics and speed when comparing the treadmill and curved, non-motorized treadmill training [6,7]. The research analyzing curved, non-motorized treadmill training is a bit inconsistent as many measures of running performance have been shown to be altered with training. It is yet to be determined whether these alterations are beneficial in regard to speed and performance. Imbalances have been shown to exist, as fatigue accumulates during curved, non-motorized treadmills [6]. Recently, strength and conditioning facilities have been utilizing a non-curved, non-motorized resistance treadmill for speed training. However, there is minimal research examining the effects of non-curved, non-motorized resistance treadmill training as it relates to speed and performance. Therefore, the purpose of this brief investigation was to examine whether or not

correlations exist between non-curved, non-motorized treadmill speeds, and peak ground speeds during sprinting tasks. It was hypothesized positive correlations would indeed exist between each.

Methods

Participants

The data-set included 17 male, American football players (26.06±3.72 yrs, 14 professional NFL and three collegiate NCAAF) during off-season training. Inclusion criteria were collegiate or professional football players who received medical clearance prior to off-season training. Exclusion criteria included athletes unable to pass medical examinations due to health concerns and/or injuries.

Protocol

The athletes reported to the facility during an off-season, taper week, training session. They were instructed to refrain from physical activity 24 hours prior to testing. All athletes were randomly counterbalanced between five different sprinting trials including four, maximum speed sprints (Figure 1) on a non-motorized, non-curved, resistance treadmill (SHREDmill, Boca Raton, FL, USA). The peak speed (m/s) was recorded for each. The incline and resistance was adjusted for each trial in accordance with the manufacturer's recommendations to a resistance eight at a 15% incline while holding on to support rail (15RES8), a resistance five at a 15% incline while holding on to a support rail (15RES5), a resistance three at a 20% incline without holding a support (20RES3), and a resistance one at a 20% incline without holding a support (20RES1). The higher resistance number indicated a greater tension from the non-motorized belt and the higher incline percentage indicated a steeper angle of the non-curved, sprinting surface. The fifth randomized trial was a 27.43 m sprint on grounded field-turf. Top speeds were recorded utilizing a pulley system (1080 SPRINT, Motion 1080, Austin, Texas, USA) for determining peak speeds (m/s) at 3 different time points including 9.14 m (10YDSPLIT), 18.29 m (20YDSPLIT), and 27.43 m (30YDSPLIT) [8]. This report of data was approved by the University's Institutional Review Board (IRB) and all athletes provided consent to participate in the off-season training and sprint testing.

Statistical Analysis

All descriptive statistics (means and standard deviation) were calculated for physical characteristics (e.g., height, weight, and age) and peak speeds (m/s) for each data point (e.g., 15RES8, 15RES5, 20RES3, 20RES1, 10YDSPLIT, 20YDSPLIT, 30YDSPLIT). In addition, multiple correlation analyses were utilized to examine the potential relationships between speeds at each data point. All statistics were analyzed using Statistical Analysis Software (SPSS, Version 21.0, IBM INC., Armonk, NY) and significance was set at $p < 0.05$.

Figure 1. Non-Curved, Non-Motorized Treadmill (A) and SHREDmill Sprinting (B)

Results

All descriptive data including age, body height, and body mass is found for the group of male American football players in Table 1. Table 2 provides all descriptive peak speed data for each data point of the given grounded turf trial. Additional descriptive peak speed data for SHREDmill trials can be found in Table 3.

Table 1. Participant demographics.

	AGE (YRS)	HEIGHT (CM)	WEIGHT (KG)
FOOTBALL PLAYERS (N=17)	26.06 ± 3.72	184.59 ± 7.95	101.88 ± 15.96

Data are Means ± SD

Table 2. Descriptive data of ground peak speeds.

	10YDSPLIT (M/S)	20YDSPLIT (M/S)	30YDSPLIT (M/S)
FOOTBALL PLAYERS (N=17)	7.58 ± 0.28	8.55 ± 0.51	8.98 ± 0.59

Data are Means ± SD

Table 3. Descriptive data of SHREDmill peak speeds.

	15RES8 (M/S)	15RES5 (M/S)	20RES3 (M/S)	20RES1 (M/S)
FOOTBALL PLAYERS (N=17)	6.73 ± 0.37	7.19 ± 0.38	7.63 ± 0.28	8.10 ± 0.29

Data are Means ± SD

Table 4 demonstrates results, which relate peak SHREDmill speeds and peak ground speeds. The correlation analysis revealed a significant moderate positive correlation (r = 0.486, P = 0.048) between 15RES8 and 10YDSPLIT and a significant strong positive correlation (r = 0.724, P = 0.001) between 20RES3 and 10YDSPLIT. Additionally, the correlation analysis (Table 4) revealed a significant strong positive correlation (r = 0.645, P = 0.005) between 20RES 3 and 20YDSPLIT and a significant strong positive correlation (r = 0.621, P = 0.008) between 20RES1 and 20YDSPLIT. Lastly, the correlation analysis revealed a significant moderate positive correlation (r = 0.491, P = 0.045) between 20RES3 and 30YDSPLIT.

Table 4. Correlational data of peak ground speeds and peak SHREDmill speeds.

	15RES8 (M/S)	15RES5 (M/S)	20RES3 (M/S)	20RES1 (M/S)
10YDSPLIT				
R	.486*	.462	.724**	.434
P	.048	.062	.001	.082
20YDSPLIT				
R	.261	.422	.645**	.621**
P	.311	.092	.005	.008
30YDSPLIT				
R	.356	.436	.491*	.439
P	.161	.080	.045	.078

Data are means ± SD

*Denotes significance p≤0.05; ** Denotes significance p≤0.01

Discussion

Speed training has been determined to play a vital role in American football performance. Relationships exists between NFL combine speed and future success as a professional American football player [2]. Multiple modalities of training have been utilized to increase speed in American football players, including treadmills. Recent research has determined treadmill training under resistance may have less of an impact on biomechanical measures when compared to resisted ground sprints [9]. Therefore, it was critical to analyze relationships between specific treadmill settings and peak ground speeds during sprinting. The data demonstrated positive correlations between non-motorized, resisted treadmill settings and peak ground speeds during short sprints. This can be crucial for programming and progression, as short sprints (9.14-m) have been researched and determined very reliable in monitoring performance

improvements in collegiate athletes[10]. The results indicate both 15RES8 and 20RES3 demonstrated a positive correlation with 10YDSPLIT. This may suggest either setting could be utilized for improving start times and short sprints. 20RES3 and 20RES1 demonstrated a positive correlation with 20YDSPLIT. Again, this may be suggestive of alternate settings utilized when improving peak speeds at 18.29m. Finally, 20RES3 demonstrated a positive correlation with 30YDSPLIT time and may be suggested as the general setting for improving all aspects of a 27.43 m sprint. In conclusion, non-curved, non-motorized, resistance treadmill speeds showed positive correlations to grounded sprint speeds. The findings highlighted the continuous need for individualized programming based on incline and resistance in regards to speed training.

Media-Friendly Summary

Non-curved, non-motorized, resistance treadmill sprinting in collegiate and professional American football players have shown to relate with grounded sprint times. Different settings, including both incline and resistance can be modified for specific speed training purposes. The current data displayed moderate incline, higher resistance SHREDmill settings positively correlate with 10-yard split times and/or sprint starts. Data also displayed steeper incline, lower resistance SHREDmill settings positively correlate with grounded sprinting up to 30 yards.

Acknowledgements

The authors thank Tony Villani and XPE Sports, FL, USA for training and treadmill application.

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