DIFFERENCES IN SPATIOTEMPORAL VARIABLES AND JOINT ANGLES FOLLOWING RESISTED SPRINT TRAINING IN YOUTH ICE HOCKEY PLAYERS

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Introduction

Ice hockey training often implements overground sprint training. Understanding the impact of different training programs on sprint spatiotemporal variables can be key for optimal ice hockey performance.

Purpose

This study explored the impact of resisted sprint training (RST) on spatiotemporal variables and joint angles at toe-off (TO) and touchdown (TD) in male youth ice hockey players

Methods

Twenty-four competitive youth ice hockey players participated in the study. Participants were separated into three equal groups: bodyweight training (group 1); off-ice RST (group 2); on-ice RST (group 3). The training program lasted 8 weeks (2 sessions/ week).

Training program for both on-ice and off-ice RST groups

- Repetitions: 6-9 sprints depending on week
- Distance: 20-meters
- Rest Period: 3 minutes between repetitions
- Sled Load: Off-ice= ~50-60% of bodyweight; On-ice= ~70-80% of bodyweight

The load for RST was provided by sleds loaded with weight plates.

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Training program for bodyweight group

- The bodyweight training program incorporated high velocity body weight exercises.

Day 1

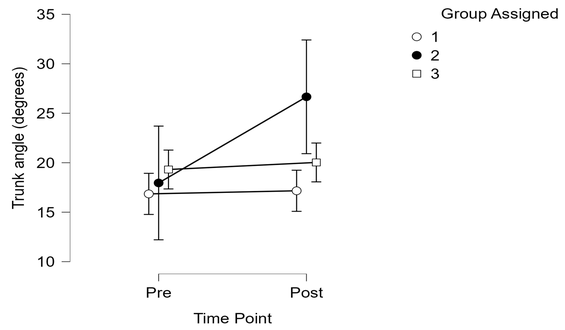
Exercise	Time/Reps	Rest Time	Rounds
Squats	1 min	30 seconds	2
Push Ups	1 min	30 seconds	2
Planks	1 min	30 seconds	2
Glute Bridge	1 min	30 seconds	2
Broad Jumps	5 reps	30 seconds	2
Dead Bugs	1 min	30 seconds	2
Squat Jump	5 reps	30 seconds	2

Day 2

Exercise	Time/Reps	Rest Time	Rounds
Skaters	5 reps each leg	30 seconds	2
SL RDL	5 reps each leg	30 seconds	2
Bird/Dog	1 min	30 seconds	2
Superman	1 min	30 seconds	2
Burpees	1 min	30 seconds	2
Plank	1 min	30 seconds	2
Alternating lunges with arm reach	1 min	30 seconds	2

At pre- and post-testing, participants completed two 30-meter acceleration maximal overground sprints. Video recordings of the sprint trials were obtained using a high-speed camera (iPad Air, Apple Inc., USA, 240 fps). The video files were then imported into the Kinovea motion analysis software (Kinovea v0.9.5) to calculate spatiotemporal variables (step length, step rate, contact time, flight time) during the first complete step (TO to TD) taken within the 10-20-meter sprint distance. Joint angles (trunk, hip, knee) at TO and TD during the first step taken within the 10-20-meter sprint distance were also obtained.

Figure 1. Changes in Trunk Angle at TD. Group 1 = Bodyweight, Group 2 = Off-ice RST, Group 3 = On-ice RST. Group means and 95% confidence intervals.



A two-way repeated measures ANOVA with follow up analysis measured the differences in spatiotemporal variables and joint angles across groups and time point.

Results

There was a group by time point interaction effect for trunk angle at TD ($p=0.03$, $\eta^2_p=0.31$). Follow up analysis indicated off-ice RST increased trunk angle (Cohen's $d=1.45$; 95%CI [0.07,2.86]; $p=0.03$). (Figure 1)

There was a group by time point interaction effect for step rate ($p=0.02$; $\eta^2_p=0.33$). Off-ice RST decreased step rate (Cohen's $d=-0.30$; 95%CI [-0.23,-0.83]; $p=0.02$) whereas the on-ice RST increased step rate (Cohen's $d= 0.40$; 95%CI [0.18,0.99]; $p= 0.02$).

There was a main effect of time point on contact time ($p=0.03$; $\eta^2_p =0.21$). There was a main effect for time point on knee swing angle at TO ($p=0.01$; $\eta^2_p=0.29$).

There was a main effect for time point on knee swing leg angle at TD ($p<0.01$; $\eta^2_p=0.35$), hip stance leg angle at TD ($p<.001$; $\eta^2_p=0.44$) and knee stance leg angle at TD ($p<0.01$; $\eta^2_p=0.32$).

Conclusion

Step rate during overground sprinting decreased following off-ice RST yet increased following on-ice RST. Off-ice RST increased trunk angle at TD. Knee swing leg angle at TO and knee swing leg angle at TD increased following bodyweight and RST. Contact time, hip stance leg angle at TD and knee stance leg angle at TD decreased following bodyweight and RST.

Practical Application

Coaches seeking to alter step rate and trunk angle during overground sprinting in ice hockey players may consider incorporating RST as a component of an ice hockey training program.

Full abstract and graphs

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