THE VALIDITY AND RELIABILITY OF AN ON-ICE MAXIMAL AEROBIC SKATING PROTOCOL WITH MALE AND FEMALE HOCKEY PLAYERS

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Objective
The purpose of this study was to determine the reliability and validity of an on-ice maximal aerobic skating protocol administered to both male and female hockey players.

Setting
Human Performance Laboratory (HPL), University of Calgary, AB.
Olympic Oval, Calgary, AB

Participants
10 subjects, 8 male and 2 female (25.8 ± 3.5 yrs; 81.4 ± 14.3 kg; 177.8 ± 9.4 cm) participated in the study.

Methodology

Each subject completed 2 on-ice maximal skating tests and a maximal cycle ergometer test. Each test was separated by at least 48 hours.

On-ice Protocol: The on-ice shuttle protocol consisted of an incremental skating test with shuttles of 34.75 meters in length. The test was incremental in nature in that for each successive stage, the skating velocity increased. Each stage was approximately one minute in length. In combination with the increase in velocity for each stage, every second stage increased in total distance by adding one extra shuttle. The subjects were required to match the speed of each stage by arriving at and leaving the end line at the sound of the pre-recorded whistle. The test was terminated when the subject could no longer maintain the speed of the shuttle. Expired air was analyzed using a Cosmed K4b^2 portable gas analyzer (Cosmed, Rome, Italy) on their backs while skating.

Cycle Ergometer: The cycle ergometer protocol was an incremental, maximal test performed to achieve $\dot{V}0_{2max}$. For the purposes of the present study, $\dot{V}0_{2max}$ was defined as an increase in $\dot{V}0_2$ no greater than 0.15 L•min^{-1}, with an increase in workload. The initial workload for each subject was selected so as to achieve $\dot{V}0_{2max}$ within a time frame of 8-12 minutes, which would closely replicate the length of the on-ice test. The workload increments were 25 watts per minute until volitional fatigue. Subjects were free to choose the cadence at which they pedaled. Expired gases were analyzed using the Cosmed K4b^2 (Cosmed, Rome, Italy) which was carried on the subject's back throughout the test

Main Results
The on-ice test showed good reliability in both maximal heart rate (r = 0.870) and $\dot{V}0_{2peak}$ (r = 0.664).

There was a high correlation (r = 0.860) between maximal heart rate achieved during the on-ice skating shuttle test and the cycle ergometer test and no statistical difference between these two values (p = 0.337).

During the on-ice skating test, the subjects achieved a mean maximal heart rate of 184.6 ± 9.2 bpm while a mean maximal heart rate of 183.1 ± 8.1 bpm was recorded during the cycle ergometer test.

$\dot{V}0_{2peak}$ measured during the skating test was 45.5 ± 3.7 ml•kg^{-1}•min^{-1}, while mean $\dot{V}0_{2max}$ while cycling was 49.6 ± 2.2 ml•kg^{-1}•min^{-1}. There was a poor correlation (r = 0.329) for $\dot{V}0_{2max}$ between the on-ice test and the cycle ergometer test and there was a significant difference (p = 0.021) in $\dot{V}0_{2max}$ between the two tests. The relationship between the skating and cycling tests can be seen in Figure 1.

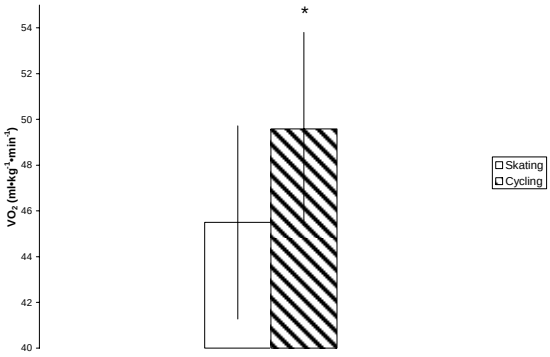

Figure 1. Comparison of maximal $\dot{V}0_2$ achieved during skating and cycling tests expressed relative to body weight. * denotes statistical significance (p < 0.05)

Discussion/Conclusion
The on-ice test was reliable in the measures of maximal heart rate and $\dot{V}0_{2peak}$, however the validity of the test could not be established as a significant difference (p = 0.021) existed between the on-ice and cycling $\dot{V}0_{2peak}$. A regression equation was developed to predict $\dot{V}0_{2max}$ from the on-ice skating protocol. The regression equation has a very high correlation to $\dot{V}0_{2max}$ (r=0.980). The prediction equation is $\dot{V}0_{2max}$ (ml•kg^{-1}•min^{-1}) = 0.507*age + 0.117*shuttles - 0.096*weight (kg) + 0.217*height (cm) + 0.516.

References
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2. Simard, P. (1975). *Master's Thesis. University de Montreal*

Source of funding: Sport Science Association of Alberta (SSAA) through the ASRPWF.

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