January 2018

Reliability Of Trimp And Training Effect In Collegiate Ice-Hockey Players

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TEST-RETEST RELIABILITY OF TRIMP AND TRAINING EFFECT IN COLLEGIATE ICE-HOCKEY PLAYERS

by

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Bachelor of Science, University of North Dakota, 2000

A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master of Science in Kinesiology

Grand Forks, North Dakota

May

2018

This thesis, submitted by Jason Ulmer in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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Department	Kinesiology and Public Health Education
Degree	Master of Science in Kinesiology

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ACKNOWLEDGEMENTS

I would first like to thank my wife, my kids, my parents, and all of my family for providing support and encouragement throughout this entire process. This would not have been possible without them.

I would like to especially thank my advisory committee chair Dr. John Fitzgerald for the numerous hours he spent providing feedback and guidance throughout the entire process of developing this thesis, and helping shape it into the final product.

ABSTRACT

Due to the unique demands of ice hockey and limited reliability data, the utility of the heart rate derived variables TRIMP and Training Effect for assessing internal training load in ice hockey players is not clear. Having a reliable measure of internal training load with the capability of quantifying and detecting meaningful change, especially between on-ice training sessions, would help coaches program exercise training. The primary purpose of this study was to determine the reliability of TRIMP and Training Effect during on-ice training sessions in ice hockey players. Twenty-two Division I collegiate male ice hockey players (aged 18-23 years) wore HR monitors during two on-ice practice sessions (n=12) and two off-ice circuit training workouts (n=19) and HR data was collected and analyzed. TRIMP and Training Effect, along with other descriptive HR variables were compared between the sessions. TRIMP and training effect demonstrated acceptable reliability during on-ice training sessions. Systematic errors, quantified as standardized bias were negligible to small (-0.19-0.23). Random errors quantified as the % TE were moderate (10.9-12.2%). Test-retest ICCs were very strong (0.70-0.75). Reliability results were similar for the lower-body circuit training sessions. Our results indicate that TRIMP and Training Effect are suitable measures of internal training load during on-ice evaluation in male collegiate hockey players. The results from our study can be used to determine the threshold for meaningful change in TRIMP and Training Effect, which may aid in informing decisions by coaches and strength training staff regarding on-ice training session difficulty and composition.

Keywords: TRIMP, training effect, reliability, training load, sport, athlete

Chapter 1

INTRODUCTION

Ice hockey is a complex intermittent sport played at a high speed. The sport of ice hockey involves quick bursts, sudden changes in direction, finesse to make plays with the puck while also dealing with body contact. The physical nature of ice hockey requires an athlete to play an aggressive style during 30-80 second shifts (composed or repeated sprints and sub-maximal work) and recover quickly between shifts (10). Thus, the sport of ice hockey is predominately supported by anaerobic metabolism (69% anaerobic) (10), however aerobic factors appear to be important for fatigue resistance during repeated shifts (19, 21, 25). Programing training in hockey is challenging as multiple components of fitness need to addressed (eg. speed, strength, endurance, skill) along with game tactics and team play. In season, this is primarily accomplished during on-ice training sessions and is supplemented by off-ice training sessions, usually consisting of resistance training. Typical on-ice practice consists of a combination of systems drills, skill drills, battle drills and conditioning drills. The amount of time spent on these different components varies weekly and monthly during a season. Furthermore, physical activity during on-ice practice differs between playing position and line status of the player. Coordinating the training load between off-ice and on-ice work adds to the complexity of programming training. Due to these unique demands, coaches, trainers, and athletes themselves have difficulty quantifying training load in hockey (7), especially during on-ice sessions.

Having a tool to aid in quantifying training load may improve programming. Many coaching staffs will rely on performance results or past habits to determine training plans. By having an objective measure of on-ice session training load coaches and strength and conditioning professionals may be better able to assess the difficultly of training sessions and be able to link periods of increased or decreased training stress with changes in sport-specific fitness (eg. skating speed, acceleration and repeated sprint ability). Once team norms are established, it may also be useful to help achieve the intended training load during on-ice sessions, which changes within and between microcycles. Heart rate (HR) monitoring systems are frequently used in sport to provide objective measures of training load and aid teams in providing daily feedback about training sessions (24). Beyond traditional HR descriptives (eg. HRmax, HRmean, time spent in HR zone), the HR derived variable Training Impulse (TRIMP) has been used in cycling (34) and has more recently gained favor in team sport as a means to quantify total session training load (2, 28).

TRIMP and Training Effect are currently being used by professional and collegiate ice hockey clubs as a way of assessing training load in practice and game settings. The TRIMP calculation is based on the magnitude of HR increase in context of resting HR, maximal HR and duration of activity (11). Thus, the TRIMP score accumulates over the course of a training session. Excess post-exercise oxygen consumption (EPOC) can also be estimated from HR data and measures the increased rate of oxygen intake after exercise (13). EPOC increases with both the intensity and duration of the exercise and decreases during within session recovery periods (9). EPOC is then reported relative to training status as Training Effect using a 0.0-5.0 scale, which may aid interpretation by the end-user.

Automated HR monitoring systems allow for simple data collection and automatic variable calculation. Both TRIMP and Training Effect are presented as scores a practitioner can easily track on a daily basis. These variables appear to provide complementary data on total training load accumulated and density of work performed during the training session, both of which are meaningful from a programming standpoint.

Past research has used TRIMP as an internal measure of training load in sports such as soccer, football, field hockey, and rugby (11, 20, 28, 31) and has been used in both individual and team/intermittent sports (2, 5). To our knowledge, the reliability of TRIMP has only been tested in a laboratory setting during cycling (34) and has demonstrated moderate reliability (TE 10.7-15.6%). Limited evidence exists evaluating the reliability of HR derived EPOC estimates and the authors are unaware of any studies assessing the reliability of Training Effect in athletes, which is calculated from EPOC (1). Furthermore, the reliability of TRIMP and Training Effect is not known for on-ice and off-ice sessions in hockey. Since this data is currently being used by professional and collegiate hockey clubs, it would be very useful for both the coaches, staff, and athletes to know the thresholds for real or meaningful change for both training variables. Knowing this information may help coaches and strength and conditioning professionals coordinate exercise programming both on and off the ice. The primary aim of this study was to evaluate the test-retest reliability of TRIMP and Training Effect during training sessions on ice in Division I collegiate male ice hockey players. The secondary aim was to evaluate the test-retest reliability of both variables during off-ice circuit training sessions. We hypothesize that TRIMP and Training Effect will demonstrate acceptable reliability (ICC. > .7, TE. < 20%).

Chapter 2

METHOD

Experimental Approach to the problem

A repeated measures design was used in this study. Athletes participated in two on-ice sessions and two off-ice training sessions. Test and re-test sessions were scheduled for the same time each week. On ice sessions were two weeks apart and off ice training sessions occurred one week apart. Training sessions were selected during the beginning portion of the season when the exercise intensity and duration were as similar as possible (intended to be identical). Both on-ice practices occurred on a Thursday when the work load would be considered light to moderate as game days are Friday and Saturday. Thursday on-ice practices were more similar than other days as they often contain the same drills each week, allowing for the selection of two sessions with identical practice plans. On-ice training occurred from 1:45pm until 2:30pm. Off ice training occurred in the team weight room and used the same lower body circuit each session. The circuit training was performed at 3:30pm and finished at 4:00pm. The off-ice sessions were selected when all players performed the same exercises in the same amount of time one week apart. HR data were recorded for each training session.

Participants

Twenty-two male ice hockey players, aged 18-24 years and playing at the Collegiate Division I level participated in this study. The participants were recruited as a convenience sample and were members of one college ice hockey team. Data were available for 12 athletes (7 forwards, 5 Defense, age = 20.3 years ± 1.0 years, range = 18 to 21 years, height = 182.6 cm ± 5.1 cm, weight = 87.9 kg ± 6.8 kg)) for the two on-ice training sessions and 19 athletes (11 forwards, 6 defense, 2 goalies, age = 21.1years ± 1.6 years, range = 18 to 23 years, height = 182.5cm ± 4.5 cm, weight = 86.9 kg ± 6.3 kg)) for the two off-ice lower body circuit training sessions. Data was not included for goalies during the on-ice session due to variability in playing time and position. Inclusion criteria for the study was being male, aged 18 years or older and being on the official team roster. Exclusion criteria included any type of injury or receiving special instructions from coach or staff to limit exercise intensity during a session. All testing procedures were approved by the University of North Dakota Institutional Review Board and written consent was obtained from all participants before the start of the study.

Procedures

On the first on-ice testing day athletes were fitted with Firstbeat™ HR monitors (FirstBeat SPORT, Jyvaskyla, Finland) before taking the ice. Once all players were on the ice the heart rate system was turned on and data collection started. The athletes participated in a light to moderate ice hockey practice consisting of warmup drills, shooting drills, system drills and battle drills. The HR system was turned off after the last training drill. The same procedure was followed on the second on-ice testing day. The following HR data were recorded for each session: TRIMP, Training Effect, EPOC, maxHR, AverageHR, percent time spent in each training zone (1-5) and percent time spent in aerobic component or anaerobic component.

For off-ice testing, athletes put the same heart rate monitors on as they entered the weight room. The workout circuit lasted approximately half an hour and then the HR system was shut down. The off-ice training session consisted of a warmup and followed by a lower body circuit workout. Players were partnered together and rotated working for 30 seconds and resting for 30 seconds. The circuit was performed 2 times for each off-ice session and contained 12 different exercises. The exercises included kettle bell swing, dumbbell lateral lunge, single arm dumbbell snatch, single leg squats, stability ball hyperextension, figure 8's, straight leg dead lift, hamstring sliders, jump rope, wall dead bugs, reverse planks and lateral jumps. The same procedure was followed on the second session. As during the on-ice sessions, HR data were recorded for each off-ice training session.

TRIMP and Training Effect

FirstBeat SPORT HR monitors (FirstBeat SPORT, Jyvaskyla, Finland) and Firstbeat SPORT software (FirstBeat SPORT, Jyvaskyla, Finland) were used to calculate and record heart rate variables. Total values were recorded for each training session. TRIMP is a measure of training impulse and was calculated using the Banister equation: Duration of the workout * ((HR during workout - resting HR/ maximum HR - resting HR)) X 0.64 (2,718)^1.92 ((HR during workout - resting HR/maximum HR-HR resting)) (Banister, 1991). Training Effect is a proprietary calculation based on peak EPOC values achieved during exercise and is further scaled based on the individuals' fitness or activity level (Levels 0-10 with 0 being no activity and 10 being more than 15 hours per week of physical activity). According to the manufacturer, EPOC is calculated by integrating data from both an aerobic and anaerobic estimation equation for EPOC. TE is reported as a 0-5 scale with 0 representing no effect of training and 5 denoting a temporary overreaching effect of training. In addition, maximal and average HR for each session was recorded along with time in each training zone. Training zone 1 consisted of a heart rate ranging from 28-110 beats per minute (bpm). Zone 2 ranged from 111-144 bpm. Zone 3 had a range between 145-155 bpm. Zone 4 ranged between 156-167 bpm and zone 5 ranged between 168-

240 bpm. Training effect is further broken down by the software into aerobic and anaerobic percentages based on the HR data.

Statistical Analysis

Systematic error (bias), random error (within subject) and test-retest correlation were used to assess test-retest reliability. A Microsoft Excel spreadsheet that is publically available was used for all calculations (16). Data normality was assessed and session descriptive statistics were presented as means and standard deviations. Systematic errors were quantified using the absolute and standardized change in mean (Bias) between session 1 and session 2. Random errors were quantified using the raw, percent and standardized typical errors. Percent typical errors were considered to represent good, moderate and modest to poor reliability when percent TE was <10%, 10.1-20% and >20%, respectively (30). Standardized values were evaluated per Cohen 1988 recommendations with values < 0.2, 0.2, 0.5 and 0.8 used as the threshold for negligible, small, medium and large. Test-retest correlation was examined using the Intra-class Correlation Coefficient (ICC). All variables were calculated using Ninety-five percent confidence intervals (95%CI). Intraclass correlations of 0.1, 0.3, 0.5, and 0.7, were used as thresholds for weak, moderate, strong, and very strong. (15). Though no standardization for acceptable reliability exist, we considered a variable to possess acceptable reliability if percent TEs were good to moderate and ICCs were very strong.

Chapter 3

RESULTS

Overall, TRIMP and Training Effect demonstrate acceptable reliability during on-ice sessions. Systematic errors, quantified as standardized bias were negligible to small (-0.19-0.23; Table 1). Random errors quantified as the % TE were moderate (10.9-12.2). Test- retest ICCs were very strong (0.70-0.75). Reliability data for EPOC and other descriptive HR measures during on-ice sessions is presented in Table 1.

[Table 1 here]

For the lower body circuit sessions systematic errors for TRIMP and Training Effect were small to moderate (0.48 - 0.60; Table 2). Percent TEs were good to moderate (9.7 - 19%) and the test-retest ICCs were strong to very strong (0.62 - 0.84). Reliability data for EPOC and other descriptive HR measures during off-ice lower-body circuit training sessions is presented in Table 2.

[Table 2 here]

Chapter 4

DISCUSSION

The primary aim of this study was to evaluate the test-retest reliability of TRIMP and Training effect during training sessions both on and off the ice in Division I collegiate male ice hockey players. During on-ice training sessions TRIMP and Training Effect appear to have similar TEs and ICCs (TE=10.2%,12.9%; ICC= 0.75, 0.70). However, during off ice training TRIMP appears to demonstrate a lower TE (9.7%) and better ICCs (0.84) when compared to Training Effect

(TE=19%; ICC=0.62). Although not a primary outcome variable in this study, EPOC was associated with poor reliability during on-ice and off-ice sessions (TE: 26.4 -27.4%). Descriptive data for HRmax, HRaverage and HR zones indicate that both on- and off-ice sessions were highly comparable, though standardized bias tended to be higher for off-ice sessions.

TRIMP measures have been used in various individual and team sports to measure internal training load (3, 7, 11, 22, 28) and have demonstrated moderate reliability in the laboratory (34). During steady state aerobic cycling, Wallace et al. (2014) reported TEs for TRIMP ranging from 10.7% to 15.6% depending on the method used for the calculation and the sessions compared. The results from our investigation in hockey athletes are consistent with that described in cycling. The good to moderate session to session reliability (TE: 9.7-12.2%) in our study indicates that TRIMP is suitable for use during intermittent work with a substantial anaerobic component, and both on- and off-ice in hockey athletes. Furthermore, the moderate reliability (TE: 10.9-19%) found for training effect indicate utility to assess training load in hockey athletes, especially during on-ice sessions. The poor reliability of the HR based EPOC measure during both on- and off-ice session suggest limited usefulness for ice hockey. The standardized TEs confirm this interpretation for on-ice sessions as both TRIMP and Training Effect can detect a moderate effect size, while EPOC appears only useful for detecting large effects (> 0.8 effect size). The difference in reliability between Training Effect and EPOC suggest a beneficial effect on reliability of the scaling of EPOC which is performed when calculating Training Effect. However, this beneficial effect seems to be negated during off-ice circuit training sessions. The authors are unaware of any studies assessing the reliability of training effect and HR based EPOC measures in athletes.

The unique demands of ice hockey and the difficulty it creates in programming training (23, 32), underscores the need for objective measures of training load, such as TRIMP and Training Effect, to assist in assessing the difficulty of a session. Our reliability data suggest that both TRIMP and Training Effect are suitable for use in evaluating training load during on-ice sessions, which make up the vast majority of in-season training and pose the biggest challenge when assessing training difficulty. After normative data are established for a typical in-season microcycle (Monday-Friday training), the reliability data presented here can be used to establish threshold for real or meaningful change. Therefore, the practitioner can be more confident when evaluating the data to determine if real change occurred and the magnitude of the change. Thresholds for meaningful change should improve the utility of TRIMP and Training Effect to inform decisions regarding on-ice training session difficulty and composition. This may help the coach better align the intended training load of the session to the actual training load administered, and this data can be easily passed on to strength and conditioning staff to inform off-ice programming. Thresholds for HR variables may also be useful for evaluating an individual's response to a given workload to gain insight into the individuals training status or to set thresholds for specific individuals due to overtraining concerns or return to play after injury (14). By monitoring TRIMP and Training Effect, coaches may be better able to prescribe increased or decreased training to meeting the individual needs of team sport athletes, which may increase the likelihood of maintaining a high trained state without overtraining.

This study is not without limitations. The results are generalizable to only male hockey athletes at the collegiate level. The small sample size of collegiate athletes reduces the confidence in the precision of our reliability estimates, but does not bias them. Future research should evaluate the reliability of this technology in athletes competing in other sports involving intermittent work with a substantial anaerobic component. It is likely that some additional error can be attributed to differences in the on-ice practice sessions composition inflating the TEs. However, every effort was made to select identical sessions and our descriptive HR information confirms that we were successful in doing this. Our testing sessions enhance the ecological validity of our data due to assessing actual on-ice practices and off-ice conditioning sessions and not in a laboratory setting.

In conclusion, the results from our study suggest that TRIMP and Training Effect can be a reliable tool for monitoring internal training load in the sport of ice hockey. TRIMP was found to show good to moderate reliability in on and off-ice sessions. Training Effect showed moderate reliability in both sessions. This data can be used to establish thresholds for real or meaningful change in TRIMP and Training Effect, which may aid in informing decisions by coaches and strength training staff regarding on-ice training session difficulty and composition. Using TRIMP and Training Effect may benefit coaches, strength and conditioning staff, and the athletes as a tool for training and performance preparation.

Chapter 5

PRACTICAL APPLICATION

First, our data indicate that coaches, practitioners and scientist can use TRIMP and Training Effect to evaluate internal training load during on-ice practices and games in collegiate hockey players. Routine HR monitoring of practices and games can be used to establish norms for typical microcycles and games. To determine if real or meaningful changes in training load have occurred during a particular session, coaches can multiple the percent TE provided in this study by 1.5 (15). This approach offers the user of this technology an objective threshold to determine if real change has occurred and insight into the degree of change. Using this data, a coaching staff or strength and conditioning staff can better align the intended training load of the session to the actual training load administered. For example, based on athlete-specific normative data for Thursday practice sessions, the goal could be set to have a TRIMP score of around 70 AU and a Training Effect of 2.5 to provide adequate taper of training for Friday and Saturday games. Threshold for TRIMP and Training Effect could be quickly calculated prior to the training session. For example, to calculate this threshold for TRIMP we multiply the percent TE (12.2%) by 1.5 (15) to determine the percent change in TRIMP needed to indicate real change. Next, the product from the previous calculation (18.3%) is multiplied by the TRIMP goal (70), which yields 12.8 AU. Lastly, add 12.8 AU to the TRIMP goal to set the threshold. Thresholds for Training Effect thresholds could be set in a similar manner. Having the TRIMP and Training Effect data, along with thresholds for real change, allows the ability to track team and individual training load and adjust accordingly throughout a season.

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Table 1. Results of the reliability analysis of HR variables during on-ice sessions (n=12).

Measurement	Session 1 Mean (SD)	Session 2 Mean (SD)	Bias (95%CI)	Standardized Bias (95%CI)	TE (95%CI)	Percent TE (95%CI)	Standardized TE (95%CI)	ICC (95%CI)
TRIMP (AU)	70.3 (16.4)	67.7 (15.1)	-2.58 (-10.2, 5.0)	-0.19(-0.76, 0.38)	8.4 (5.9, 14.3)	12.2 (8.5, 20.7)	0.63 (0.45, 1.08)	0.75 (0.34, 0.92)
Training Effect (AU)	2.7 (0.5)	2.8 (0.5)	0.09 (-0.17, 0.4)	0.23 (-0.41, 0.87)	0.3 (0.2,0.5)	10.9 (7.3, 18.2)	0.72 (0.51, 1.22)	0.70 (0.24,0.90)
EPOC (AU)	58.2 (25.3)	58.5 (23.4)	0.33 (-13.5,14.1)	0.02 (-0.71, 0.75)	15.4(10.9,26.1)	26.4 (18.6, 44.7)	0.81 (0.57, 1.38)	0.65 (0.15, 0.88)
Max heart rate (%)	87.1 (3.7)	88.0 (3.6)	0.92 (-1.2, 3.1)	0.42 (-0.6, 1.4)	2.9 (2.2, 4.5)	3.3 (2.5, 5.1)	1.34 (1.0, 2.1)	0.39(-0.10,0.73)
Average heart rate (%)	69.9 (5.2)	69.6 (4.8)	-0.33 (-2.9, 2.3)	-0.08 (-0.71, 0.55)	2.9 (2.0, 4.9)	4.2 (2.9, 7.0)	0.70 (0.50, 1.19)	0.71 (0.26, 0.91)
Time in HR zone 1 (min)	8.2 (5.2)	7.7 (4.1)	-0.43 (-3.4, 2.5)	-0.13 (-1.01, 0.75)	3.3 (2.3, 5.6)	41.5 (28.9, 70.4)	0.98 (0.69, 1.66)	0.55 (0.00, 0.85)
Time in HR zone 2 (min)	12.1 (2.7)	11.8 (2.5)	-0.24 (-2.1, 1.6)	-0.15 (-1.33, 1.02)	2.1 (1.5, 3.5)	17.6 (12.5, 29.3)	1.31 (0.93, 2.22)	0.40 (-0.19,0.78)
Time in HR zone 3 (min)	16.2 (4.9)	16.1 (5.5)	-0.16 (-2.0, 1.7)	-0.03 (-0.42, 0.36)	2.1 (1.5, 3.5)	13.0 (9.3, 21.6)	0.43 (0.31, 0.74)	0.87 (0.61, 0.96)
Time in HR zone 4 (min)	9.7 (6.9)	8.5 (6.4)	-1.22 (-6.0, 3.5)	-0.30 (-1.48, 0.88)	5.3 (3.8, 9.0)	58.2 (41.2, 98.9)	1.31 (0.93, 2.22)	0.40 (-0.19,0.78)
Time in HR zone 5 (min)	0.6 (1.5)	0.1 (0.2)	-0.46 (-1.4, 0.5)	ICC=0	1.1 (0.8, 1.8)	367 (267, 600)	ICC=0	0.00 (-0.56,0.55)
Percent aerobic (%)	67.2 (8.4)	69.8 (10.0)	2.58 (-4.3,9.4))	0.50 (-0.82, 1.82)	7.6 (5.4, 12.9)	11.1 (7.9, 18.8)	1.47 (1.04, 2.49)	0.35(-0.25 ,0.76)
Percent anaerobic (%)	32.8 (8.4)	30.3 (10.0)	-2.58(-9.4, 4.3)	-0.50 (-1.82, 0.82)	7.6 (5.4, 12.9)	24.1 (17.1, 40.9)	1.47 (1.04, 2.49)	0.35 (-0.25,0.76)

Table 2. Results of the reliability analysis of HR variables during lower-body circuit training (n=19).

Measurement	Session 1 *Mean (SD)*	Session 2 *Mean (SD)*	Bias (95%CI)	Standardized Bias (95%CI)	TE (95%CI)	Percent TE (95%CI)	Standardized TE (95%CI)	ICC (95%CI)
TRIMP (AU)	34.9 (8.3)	39.5 (8.8)	4.63 (2.17, 7.10)	0.60 (0.28,0.92)	3.6 (2.7, 5.4)	9.7 (7.3, 14.5)	0.47 (0.35, 0.69)	0.84 (0.63, 0.93)
Training Effect (AU)	2.0 (0.5)	2.2 (0.6)	0.21 (-0.030.44)	0.48 (-0.07,1.04)	0.4 (0.3, 0.5)	19.0 (14.3, 23.8)	0.82 (0.62, 1.21)	0.62 (0.25, 0.84)
EPOC (AU)	29.2 (13.5)	36.6 (18.3)	7.42(1.29,13.55)	0.56 (0.10,1.02)	9.0 (6.8,13.3)	27.4 (20.6, 40.4)	0.67 (0.51, 1.00)	0.71 (0.39, 0.88)
Max heart rate (%)	84.1 (3.8)	86.2 (3.1)	2.11 (0.67, 3.54)	0.77 (0.24,1.29)	2.1 (1.6, 3.1)	2.5 (1.9, 3.6)	0.77 (0.58, 1.14)	0.65 (0.29, 0.85)
Average heart rate (%)	64.4 (4.2)	66.7 (4.3)	2.37 (0.93, 3.81)	0.64 (0.25, 1.03)	2.1 (1.6, 3.1)	3.2 (2.4, 4.7)	0.57 (0.43, 0.85)	0.77 (0.50, 0.91)
Time in HR zone 1 (min)	8.1 (2.8)	7.3 (2.9)	-0.79 (1.72,0.14)	-0.32 (-0.69, 0.06)	1.4 (1.0, 2.0)	18.1 (12.9, 25.9)	0.55 (0.41, 0.81)	0.79 (0.53, 0.91)
Time in HR zone 2 (min)	9.9 (2.5)	9.8 (2.0)	-0.14(-1.16,0.88)	-0.08 (-0.68, 0.51)	1.5 (1.1, 2.2)	15.2 (11.1, 22.2)	0.87 (0.66, 1.29)	0.59 (0.20, 0.82)
Time in HR zone 3 (min)	8.2 (3.1)	8.9 (2.2)	0.71 (-0.67, 2.08)	0.40 (-0.38, 1.17)	2.0 (1.5, 3.0)	23.3 (17.4, 34.8)	1.14 (0.86, 1.68)	0.46 (0.02, 0.75)
Time in HR zone 4 (min)	2.5 (2.4)	4.2 (3.5)	1.71 (0.83, 2.59)	0.64 (0.31, 0.97)	1.3 (1.0, 1.9)	38.2 (29.4, 55.9)	0.48 (0.37, 0.72)	0.83 (0.61, 0.93)
Time in HR zone 5 (min)	0.0 (0.1)	0.1 (0.2)	0.05 (-0.04, 0.15)	0.51 (-0.37, 1.38)	0.1 (0.1, 0.2)	14.0 (100, 200)	1.28 (0.97, 1.90)	0.40 (-0.06,0.72)
Percent aerobic (%)	90.2 (8.8)	83.9 (8.6)	-6.32 (-9.60, -3.03)	-0.88 (-1.33, -0.42)	4.8 (3.7, 7.1)	5.5 (4.2, 8.2)	0.67 (0.51, 0.99)	0.71 (0.39, 0.88)
Percent anaerobic (%)	9.8 (8.8)	16.1 (8.6)	6.32 (3.03, 9.60)	0.88 (0.42, 1.33)	4.8 (3.7, 7.1)	37.2 (28.7, 55.0)	0.67 (0.51, 0.99)	0.71 (0.39, 0.88)