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Control of the intensity of effort. heart rate or rate of perceived effort
Control de la intensidad del esfuerzo. frecuencia cardiaca o percepción de esfuerzo percibido

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Abstract. Objective: the goal of the present study was to compare the oxygen uptake between three experimental sessions of the Air Bike PRO® class, which the difference between sessions was the method used to control intensity of effort: SL) external load corresponds to ventilatory thresholds and 90% peak VO_2; SRPE) rate perceived effort; SHR) heart rate. Methods: Ten physically active young men aged between 21 and 30 years old (mean ± standard deviation: 25.4 ± 4.81) participated in 3 study sessions, where they performed 3 Air Bike PRO® classes, in a randomized way. VO_2 was measured in all sessions during the Air Bike PRO® class. Results: The values of absolute VO_2 (l/min) were significantly higher in the SL compared to the SHR in the 20 to 30 minute block and in music tracks 5 and 8 ($p<0.05$). Relative VO_2 (ml / Kg / min) was significantly higher in the SL compared to the SHR in the 10 to 20 minute and 20 to 30 minute block and in music tracks 5, 6, 7, 8 and 9 ($p<0.05$). In the SRPE, significantly higher values were also observed compared to the SHR, in the 20 to 30 minute block and in music tracks 5 and 8 ($p<0.05$). Conclusion: According to the data of the present study, it is possible to conclude that the SRPE presents more similarities with the SL.
Key-words: Oxygen uptake; Interval training; Indoor cycling; OMNI-Cycle scale; Borg scale.

Resumen. Objetivo: el objetivo del presente estudio fue comparar el consumo de oxígeno (VO_2) entre tres sesiones experimentales de la clase Air Bike PRO®, cuya diferencia entre sesiones fue el método utilizado para controlar la intensidad del esfuerzo: SL) Carga Externa corresponde a umbrales ventilatorios y 90% VO_2 pico; SRPE) percepción subjetiva del esfuerzo; SHR: frecuencia cardiaca. Métodos: Diez jóvenes físicamente activos de entre 21 y 30 años (media ± desviación estándar: 25.4 ± 4.81) participaron en 3 sesiones de estudio, donde realizaron 3 Air Bike PRO® clases, de forma aleatoria. El VO_2 se midió en todas las sesiones durante la clase Air Bike PRO®. Resultados: Los valores de absoluto VO_2 (l/min) fueron significativamente más altos en SL en comparación con SHR en el bloque de 20 a 30 minutos y en las músicas 5 y 8 ($p<0.05$). Lo VO_2 relativo (ml / Kg / min) fue significativamente mayor en el SL en comparación con el SHR en el bloque de 10 a 20 minutos y de 20 a 30 minutos y en las músicas 5, 6, 7, 8 y 9 ($p<0.05$). En el SRPE también se observaron valores significativamente más altos en comparación con el SHR, en el bloque de 20 a 30 minutos y en las músicas 5 y 8 ($p<0.05$). Conclusión: De acuerdo con los datos del presente estudio, es posible concluir que el SRPE presenta más similitudes con el SL.
Palabras clave: Consumo de oxígeno; Entrenamiento de intervalo; ciclismo de interior; OMNI-Cycle; escala de borg.

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Introduction

The practice of group exercise with the use of the Air Bike Revolution equipment has emerged with the goal of promoting an improvement in cardiorespiratory capacity and physical condition in general, serving the individual needs of each user, while at the same time motivating them for the practice of physical exercise (1,2).

The heterogeneity of fitness levels in individuals who practice exercise in groups and the difficulty of controlling the internal load in an individualized way creates a need to do so (3). In traditional group exercise practices, the rhythm of music is present to motivate (4) and to maintain the rhythm of the tasks that must be performed. Thus, in group classes such as aerobic or step dance, the external load regulation is related to the rhythm of the music, along with the range of motion and the higher or lower amount of muscle mass involved, as well as with the execution velocity of the respective choreography movements (5,6). On the other hand, in Indoor Cycling (IC) beyond the pace, the magnetic brake can also be used, which induces more or less resistance on the cyclo-ergometer (7). A group class was created using the Air Bike Revolution, Air Bike PRO®, where the music was present to motivate and to generate feelings in the practitioner, with the kind of music reflecting the intensity of the block (4). Besides determining the rate of perceived effort (RPE), these feelings can allow the participant to control the intensity of effort in an individualized way (8).

However, in the context of intermittent intensity training, such as IC, the use of RPE to monitor and control intensity can be controversial. There are studies that show a positive correlation for its use, compared with HR, showing it to be safe and effective for use (8,9), while other studies show a low correlation, and advise against the use of RPE to monitor and control the internal load in group classes (10–13).

Therefore, the goal of the present study is to verify which of the internal load measurements of intensity of effort, HR or RPE, promotes an identical VO_2 compared to the standard session, in which the intensity control is carried out by an external load.

Material and Methods

Each participant was subjected to a total of five evaluated moments (figure1). The first two visits consisted of the anthropometric measurements to characterize the

sample and maximum test and re-test for the evaluation of VO_2 peak at Air Bike Revolution, through an incremental load ramp protocol with the analysis of inspired and expired gases, using a portable gas analyzer (COSMED K4, Rome, Italy). The order of the three experimental sessions was random, separated by 7 days from each other and always performed at the same time. The three experimental sessions consisted of performing a group class from the training program Air Bike PRO®, varying only in the way the intensity of the effort was controlled, using HR (SHR), RPE (SRPE) and the external load corresponding to ventilatory thresholds I and II and 90% peak VO_2 (SL).

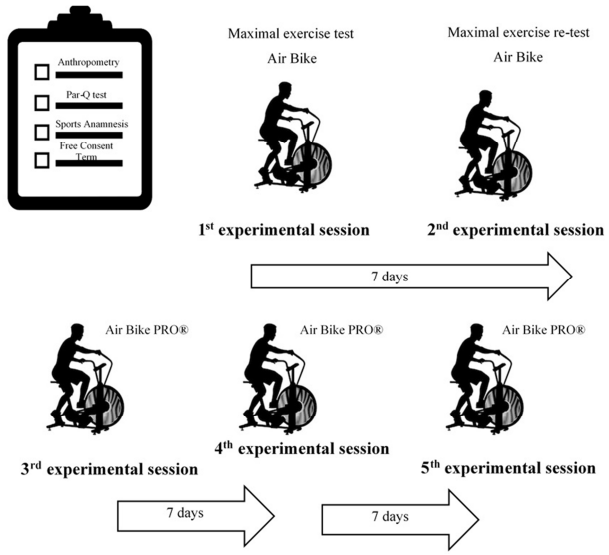

Figure 1. Experimental sessions

All participants in the present study were informed about the need to avoid alcohol and/or caffeine during the data collection period and not to exercise in the 72 hours preceding the experimental sessions. They agreed to maintain an identical food intake and to a water intake of at least 330ml, in the 2 hours preceding each experimental session.

Subjects

Ten physically active young men were integrated in the present study, with an average age of 25.4 ± 4.81 years, height of 176.8 ± 6.58 cm and body mass of 77.20 ± 98 kg. As a criterion for inclusion, participants had to be familiar with performing exercises with intermittent and cyclical intensities for at least 12 months, with a frequency of at least twice a week. Dietary supplements were not allowed. In addition, they needed to be apparently healthy and without injuries that would make the activity impossible and/or put themselves at risk during the study.

The representativeness of the sample was adjusted by the sample calculation based on the G-Power software (14), which estimated a number of at least 30 in total, i.e.10 participants for each group, by choosing the effect size 0.76 (15), maintaining a 95% statistical power. All the participants met the inclusion criteria, which were the following: not responding positively to any question in the PAR-Q test (14); not taking medication or dietary supplements capable of interfering with the variables under study; and not having any type of osteoarticular, muscle and tendon injuries. After all the questions were clarified, and after accepting to participate in the study, each participant filled out and signed the declaration of free and informed consent, prepared in accordance with the declaration of Helsinki (17). This study was approved by the institution's research ethics committee.

Procedures

The collection of all data it was mandatory for all participants to complete two weeks of familiarization with the Air Bike Revolution ergometer, with continuous and intermittent intensities, at least twice a week with a duration of twenty minutes per session.

Maximum oxygen uptake measurement test

The Air Bike Revolution cycloergometer was used for the measurement of the VO_2 peak, following the protocol mentioned above. The individual adjustment of the vertical saddle of the ergometers was standardized, this being determined by the point where the individual had the knee near to its maximum extension during each pedaling. The maximum test and re-test were carried out by increasing the load, where in its initial part the participants remained at rest on the ergometer for 2 minutes (18), then starting the test at 30 rotations per minute (rpm), with an increment of 5 rpm every minute (Table 1).

Table 1.
Maximal exercise test Air Bike Revolution

AIR BIKE REVOLUTION	
RPM	WATTS
30	27
35	44
40	65
45	89
50	121
55	156
60	205
65	306
70	377
75	466
80	558
85	778
90	930

The tests were carried out up to the individual's exhaustion point, with the interruption criterion being the subject's inability to maintain speed and/or load, as the HR and VO_2 do not increase when the intensity increases continuously, a respiratory ratio value (RER) ≥ 1.10, inability and a subjective perception of effort ≥ 8 (on the 0 to 10 Borg scale) (19). To optimize their familiarization with the RPE, the participant was told that the start of the test, when he was just sitting on the ergometer, corresponded to a 0, and when the test was interrupted for the reasons mentioned above, the scale value would be 10, because the participant was not able to continue the test, so it was his maximum. In addition to this process, the visualization of the OMNI CYCLE scale of 10 values was made available throughout the test and the subject was

asked to make an internal connection between the exercise and their memory and achieve anchors of what would be felt and what this could represent in the values on the scale (20). A verbal and sound stimulation was used in order to motivate and help the participants to keep the pace in the test, because if they were not able to maintain the stipulated cadence, the test would also be interrupted (21).

Respiratory markers

The measurement of respiratory markers was carried out using a portable open circuit system (COSMED® K4b2, Rome, Italy). Before starting, this device was calibrated according to the manufacturer's instructions. This device was used during all sessions, in a breath by breath analysis, and with an average analysis of 20 seconds (18), thus obtaining data regarding time, ventilation, VO_2 absolute (abs) and relative (rel), carbon dioxide production and HR. After the aforementioned procedure, the flexible face mask of the gas analyzer was also placed on the sample subjects. From the beginning of the maximum test and re-test and the experimental sessions, measurements of VO_2, excretion of carbon dioxide (VCO_2), VE and HR also began, until the end of all session protocols. In order to maintain the reliability of the measurements in all the sessions, the gas analyzer was previously switched on for 45 minutes before use, until it reached the internal temperature of 36°C of the device, following the standards established by the manufacturer (22). Subsequently, the device was calibrated before each session with a mixture of ambient gas and a mixture of gas of the known calibration (16.00% oxygen (O_2) and 5.00% carbon dioxide (CO_2)). The device's turbine was also calibrated with a 3-liter syringe (22), supplied by the manufacturer and taking into account the procedures established by the same. The room air and the delay were also calibrated following the same standards. The analysis of O_2 concentrations was carried out through a zirconium sensor and those of CO_2 through an infrared sensor. The peak VO_2 values, the ventilatory thresholds I and II of each subject were found through graphic analysis. The ventilatory threshold (LV) I is characterized by the loss of linearity between ventilation (VE) and oxygen uptake (VO_2), while ventilatory threshold II is characterized by the respiratory compensation point. Thus, as a practice to obtain the LVI, it is necessary to observe the lower oxygen equivalent (VE / VO_2) before its progressive increase, while the LV2 is necessary to realize when the QR is equal to 1 and there is also an exponential increase in the VE (23). The different values obtained from the LV1, LV2 and 90% of the participants' peak VO_2, correspond to a respective rotation per minute, which in turn is the external load that the individual is subjected to expressed in watts. Therefore, in the SVO_2, participants were informed of the rotations per minute that they had to respect at the different levels of intensity of the Air Bike PRO® class. This was the only session that the individuals had the possibility to see the display of the ergometer with the indication of the rotations per minutes at which they were.

Heart Rate

The HR was obtained through a strap (Wireless Double Electrode, POLAR®, Kempele, Finland) placed on the sample subjects' chest in all experimental sessions. The HR values were obtained beat by beat. In the peak VO_2 measurement session, HRmax was also obtained, which was the highest HR obtained, until the end of the maximum test. Subsequently, the percentages to be used during the SHR, 50%, 75% and 90% of the theoretical HRmax were calculated. The HR of the participants was measured in all sessions. In the SHR, in addition to its measurement, the evaluator required more or less intensity from the participant, meaning more or less rotation per minute, depending on the specific intensity that was intended for that moment of the exercise session using the Air Bike PRO®. Thus, the intensity was controlled through the HR.

RPE Scale

The OMNI CYCLE scale of 10 values (20)) associates the values from 0 to 10 with an image indicative of the effort the individual is making and with an anchor phrase related to the different levels of effort, with values of 0 corresponding to 0% of the maximum load, which is extremely easy and 10 to 100% of the maximum load, which is extremely difficult and impossible to continue the task. This was used and shown during the maximum test and re-test to familiarize the participant with it and also to validate the test completion criterion, which is to ensure that the value reached at the end of each maximum ramp test is not under 8 values. Likewise, this was used and shown in the SRPE for the participant to self-regulate its intensity according to the intensity values that are said by the evaluator. This means that the individual had the ability to increase or decrease his rotations per minute to reach the goals for the different RPE values of the exercise session using Air Bike PRO®. For the purpose of learning and familiarizing participants with the scale, the instructions were as described below (24).

Cycloergometer

The Air Bike Revolution cycloergometer was used in the five evaluation moments: test, maximum re-test and experimental sessions with different intensity control methods. With this material, it is possible to have the exact control of the rpm, expressed in the display of the monitor, as well as the watts produced instantly. This cycloergometer has a particular characteristic, since the mechanism that offers resistance to the subject is air, causing the intensity to be increased when the rotations per minute increase. This being the only possibility to increase the intensity, if the rotations were maintained for a few minutes, the intensity would remain constant.

Experimental sessions

The 30 minutes of the Air Bike Pro® training program were performed in the last 3 sessions and the effort intensi-

ties where controlled through the following steps: i) in the SL, standard session, throw the external load, corresponding to 90% of the maximum oxygen uptake, VT I and II; ii) through the HRmax percentages in the SHR; and iii) through the RPE, using the OMNI-CYCLE scale and their respective values, in the SRPE. All the planning of intensities that is presented in table 2, suggests that for an intensity in VT I, in SRPE an intensity of 4 in the RPE scale and in SHR would be requested, reaching about 50% of HRmax. In VT II, SRPE an intensity of 6 on the RPE scale would be requested and in SHR approximately 75% of the HRmax reached and for 90% of the peak VO_2, in the SRPE an intensity of 8 would be requested in the RPE scale and in the SHR achieved about 90% of HRmax (14,18).

Table 2.
Air Bike PRO®

Music	Total time	Parcial time	RPE	HR	VO_2
1	3:00	3:00	4	50%	LV1
2	5:30	2:30	6	75%	LV2
3	9:30	4:00	30'' 6	30'' 75%	30'' LV2
			30'' 8	30'' 90%	30' 90%
			1' 6	1' 75%	1' LV2
			30'' 8	30'' 90%	30' 90%
			1' 6	1' 75%	1' LV2
			30'' 8	30'' 90%	30' 90%
4	12:30	3:00	4	50%	LV1
5	15:00	2:30	6	75%	LV2
6	19:00	4:00	30'' 6	30'' 75%	30'' LV2
			30'' 8	30'' 90%	30'' 90%
			1' 6	1' 75%	1' LV2
			30'' 8	30'' 90%	30'' 90%
			1' 6	1' 75%	1' LV2
			30'' 8	30'' 90%	30'' 90%
7	22:00	3:00	4	50%	LV1
8	24:30	2:30	6	75%	LV2
9	28:30	4:00	1' 6	1' 75%	1' LV2
			30'' 8	30'' 90%	30' 90%
			1' 6	1' 75%	1' LV2
			30'' 8	30'' 90%	30' 90%
			1' 6	1' 75%	1' LV2
			30'' 8	30'' 90%	30' 90%
10	30:00	1:30	Return to calm		

Statistical analysis

The analysis of all data was performed using the treatment software and statistical analysis SPSS (Statistical Package for the Social Sciences, SPSS Science, Chicago, USA), version 25. An exploratory analysis of all data was performed to characterize the values of the different variables in terms of central tendency and dispersion. A graphic observation was also carried out in order to detect possible outliers and incorrect data inputs for all variables used. Having performed the referred procedures, normality, homogeneity and sphericity assumptions were confirmed with Shapiro-Wilk, Levene´s and Mauchly tests, respectively. A univariate ANOVA was used to verify if there are significant differences between the three experimental sessions analyzed with Bonferroni's post-hoc. The size effect of the ANOVA and post-hoc were calculated using the partial square Eta (η_p^2) and Cohen's d for paired samples, respectively. The low, medium and high effect size values reflect η_p^2 values greater than 0.0099, 0.0588 and 0.1379, respectively, and Cohen's d values greater than 0.2, 0.5 and 0.8 respectively (15). The relationship between the differences and the mean of the differences in the values in the three analyzed moments were analyzed using a Bland-Altman graph. The use of parametric statistics was ensured, as well as the assumptions for the realization of the Bland-Altman graph. The level of significance was set at 5%. This entire process was carried out by a researcher with no knowledge of the sample participants and confidentiality was fully ensured since the individual data treatment did not have the names of the different participants, but their identification codes.

Results

ANOVA revealed a significate group effect on the VO_2 abs (l/min) in the 20 to 30 minutes block ($F_{(2,27)}$= 3.468; p=0.046; η_p^2= 0.204) and in track 5 and 8 ($F_{(2,27)}$= 3.77; p=0.036; η_p^2= 0.218 and $F_{(2,27)}$= 7.644; p=0.002; η_p^2= 0.362, respectively). Group effect was also significant in VO_2 rel (ml/Kg/min), on the 10 to 20 minutes block and on the 20 to 30 minutes ($F_{(2,27)}$= 5.105; p=0.013; η_p^2= 0.274 and $F_{(2,27)}$= 7.645; p=0.002; η_p^2= 0.362;) and in track 4, 5, 6, 7, 8 and 9 ($F_{(2,27)}$= 3.718; p=0.037; η_p^2= 0.216 and $F_{(2,27)}$= 7.385; p=0.003; η_p^2= 0.354 and $F_{(2,27)}$= 4.72; p=0.017; η_p^2= 0.259 and $F_{(2,27)}$= 5.575; p=0.009; η_p^2= 0.292 and $F_{(2,27)}$= 16.418; p=0.0001; η_p^2= 0.549 and $F_{(2,27)}$= 5.233; p=0.012; η_p^2= 0.279, respectively).

Concerning the values of VO_2 abs (l/min), significantly higher values were observed in the SL relative to SHR in the 20 to 30 minute block, according to table 3, (IC95%= 0.007 – 1.46, p=0.047, d=1.03) and in track 5 and 8, according to table 4, (IC95%= 0.01 – 1.5, p=0.046, d=1.04; IC95%= 0.30 – 1.58; p=0.02; d=1.51, respectively).

Table 3.
Absolute oxygen uptake (VO_2 abs) average and standard deviation of each 10 minutes of 3 experimental sessions.

VO_2 abs (l/min)	SL	SHR	SRPE
0-10	2.59±0.63	2.17±0.72	2.47±0.58
10-20	3.13±0.76	2.47±0.8	2.98±0.51
20-30	3.05±0.75*	2.32±0.66	2.82±0.47

*p<0.05 **p<0.01 relative to hear rate session; SHR – session in which intensity control was performed by; SL – session in which intensity control was performed by external load; SRPE – session in which intensity control was performed by RPE.

In VO_2 rel (ml/Kg/min), significantly higher values were observed in the SL in relation to the SHR in the block of 10 to 20 minutes and from 20 to 30 minutes, according to table 5, (IC95%= 0.001 – 0.016, p=0.018, d=1.02; IC95%= 0.003 – 0.016, p=0.002, d=1.56, respectively) and in track 5, 6, 7, 8 and 9 according to table 6, (IC95%= 0.003 – 0.017, p=0.004, d=1.45; IC95%= 0.001 – 0.017, p=0.02, d=1.23; IC95%= 0.002 – 0.015, p=0.011, d=1.28; IC95%= 0.006 – 0.018, p=0.0001, d=2.3; IC95%= 0.002 – 0.017, p=0.012, d=1.3, respectively). In SRPE, significantly higher values were also observed in relation to the SHR, in

the block of 20 to 30 minutes, according to the table 5 (IC95%= 0.0005 – 0.013, p=0.029, d=1.25) and in track 5 and 8 (IC95%= 0.001 – 0.015, p=0.014, d=1.47; IC95%= 0.004 – 0.015, p=0.001, d=2.02, respectively).

Table 4.
Absolute oxygen uptake (VO_2 abs) average and standard deviation of each track from 3 experimental sessions

VO_2 abs (l/min)	SL	SHR	SRPE
T1	1.52±0.46	1.34±0.43	1.53±0.47
T2	2.45±0.65	1.98±0.68	2.25±0.64
T3	3.36±0.78	2.8±0.99	3.22±0.74
T4	2.69±0.72	2.15±0.75	2.63±0.49
T5	2.84±0.76*	2.08±0.7	2.69±0.45
T6	3.54±0.82	2.83±0.92	3.32±0.54
T7	2.72±0.71	2.11±0.71	2.55±0.4
T8	2.91±0.70**	1.97±0.53	2.66±0.39
T9	3.58±0.81	2.83±0.82	3.32±0.57
T10	2.58±0.67	2.18±0.68	2.42±0.56

*p<0.05 **p<0.01 relative to hear rate session; SHR – session in which intensity control was performed by; SL – session in which intensity control was performed by external load; SRPE – session in which intensity control was performed by RPE; T 1-10 – Track at 1-10.

Table 5.
Relative oxygen uptake (VO_2 rel) average and standard deviation of each 10 minutes from 3 experimental sessions

VO_2 rel (ml/Kg/min)	SL	SHR	SRPE
0-10	33.3±4.96	28.25±8.23	32.32±6.95
10-20	40.24±8.89*	31.77±7.76	38.88±5.16
20-30	39.2±5.55**	29.87±6.38	36.76±4.5*

*p<0.05 **p<0.01 relative to hear rate session; SHR – session in which intensity control was performed by; SL – session in which intensity control was performed by external load; SRPE – session in which intensity control was performed by RPE.

Table 6.
Relative oxygen uptake (VO_2 rel) average and standard deviation of each track from 3 experimental sessions

VO_2 rel (ml/Kg/min)	SL	SHR	SRPE
T1	19.59±4.52	17.44±5.33	20.1±5.96
T2	31.41±5.41	25.87±8.13	29.54±8.07
T3	43.26±5.89	36.33±11.14	42±8.04
T4	34.55±6.08	27.77±7.61	34.2±4.76
T5	36.42±6.53**	26.75±6.84	35.15±4.77*
T6	45.52±5.94*	36.39±8.66	43.39±5.89
T7	35.05±5.77*	27.04±6.71	33.37±4.21
T8	37.43±5.43**	25.45±4.96	34.84±4.31**
T9	46.16±6*	36.57±8.5	43.31±5.55
T10	33.24±5.26	28.24±6.49	31.35±4.33

*p<0.05 **p<0.01 relative to hear rate session; SHR – session in which intensity control was performed by; SL – session in which intensity control was performed by external load; SRPE – session in which intensity control was performed by RPE; T 1-10 – Track at 1-10.

Statistically significant differences were not observed between exercise sessions SL and SRPE from 0 to 10 minutes, 10 to 20 minutes and 20 to 30 minutes for the VO_2abs (2.59±0.63 vs 2.47±0.58, 3.13±0.76 vs 2.98±0.51, 3.05±0.75 vs 2.82±0.47; p=0.4; IC95% = -178.86 – 408.13; d=0.09, p=0.281; IC95% = -143.73 – 439.04; d=0.11 e p=0.09; IC95% = -43.75 – 503.85; d=0.18, respectively) and VO_2rel (33.3±4.96 vs 32.32±6.95, 40.24±8.89 vs 38.88±5.16, 39.2±5.55 vs 36.76±4.5, p=0.634; IC95% = -3.49 – 5.44; d=0.08, p=0.487; IC95% = -2.87 – 5.58; d=0.09 e p=0.182; IC95% = -1.38 – 6.25; d=0.24), has the graph Bland Altman confirms (figure 2).

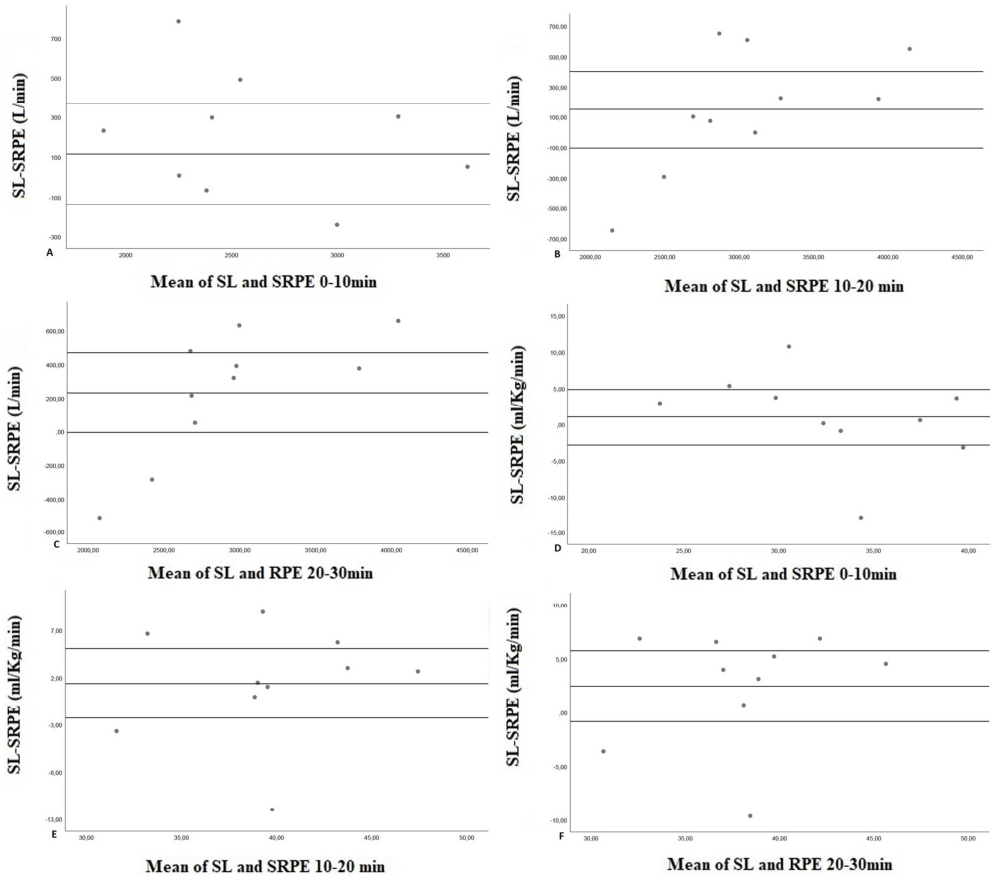

Figure 2. Bland Altman from VO_2: A) VO2abs 0-10 minutes SL and SRPE; B) VO_2abs 10-20 minutes SL and SRPE; C) VO_2abs 20-30 minutes SL and SRPE; D) VO_2rel 0-10 minutes SL and SRPE; E) VO_2rel 10-20 minutes SL and SRPE; F) VO_2rel 20-30 minutes SL and SRPE.

Discussion

This study uses VO_2 as a physiological marker to control and monitor the internal load. In addition, the HR and RPE, which are the physiological markers widely used in the practical context, were used. These are direct and indirect, respectively, with regards to the control of internal load. Thus, the objective was to verify which of the intensity control methods, the HR and / or RPE, was more like the values of VO_2 abs and rel of the SVO_2 during the practice of the exercise performed with the Air Bike Revolution equipment. It is possible to verify that only the SHR obtained significantly lower values when compared with the SVO_2. Thus, there are no statistically significant differences between the SVO_2 and the SRPE. It is suggested that for physical exercise sessions performed with the Air Bike Revolution equipment, where the typology of session is identical to that of the present study, with individuals trained and familiarized with the ergometer, the intensity control should be done through the RPE. This is because at no moment the values of VO_2 abs and rel proved to be significantly different when compared with SVO_2, which is then safe and effective. On the other hand, the HR underestimates the intensity of the class, as it shows statistically lower values of VO_2 abs and rel, especially in the 2/3 and 3/3 of the exercise session.

This statistically lower value in the SHR of the VO_2 may be justified by the HR delay until obtaining a steady state relative to intermittent stimulus (25), which sometimes causes the subjects to be at a higher level of intensity in order to reach some intensity levels, or in lower intensities in order to lower HR to a lower level of intensity. This may be the reason why VO_2 in the SHR is only lower in the 2/3 and 3/3 of the Air Bike PRO® training program. This delayed response is verified, for example, in a high intensity interval training of twenty seconds at maximum intensity (higher power output), compared with four minutes at submaximal intensities (lower power output), in which the HR peak is lower in the twenty seconds intervals (26). After this change is observed, the body reacts in an acute adaptation, perhaps due to the homeostasis regulation. However, with a twenty seconds duration, it is not enough time to be a decent response.

Another limiting factor of prescribing training intensity through the HR is their highly variability. Although all factors were controlled during this study, it is important to highlight that neurophysiological factors may influence the normal HR response, such as stress or emotion. Another aspect to consider are the contextual factors, such as this being and evaluation/scientific study performed in a laboratory environment, which may influence the HR response to training (27,28).

Nevertheless, the use of RPE usually generates some controversy in the existing literature that advises the use of RPE, as well as that of HR for the control and monitoring of intensity (8). On the other hand, and contradicting the results of this study, there is literature that does not recommend the use of RPE (6,10–13), or that suggests the use of HR, instead of the RPE scale for intensity control (12,13) in IC classes.

The reason why there is a discrepancy between these results may not be just in the method that controls and monitors the intensity of the training, in this case HR and RPE. The difference may be in the quality and methodological applicability of the studies. When the objective is to control and monitor the intensity throughout the activity, as in this study, it is advised that with each change of intensity the participant be alerted and advised to adjust the intensity, increase, maintain or lower it. The applied training methodology should be taken into account, as well as the subjective perception of the individual effort of the participant at that specific moment (8). These recommendations differ from those made in the aforementioned studies, as they did not specify the intensity that the participants should self-adjust, leaving it up to their discretion during the class and only asked what they were feeling in pre-established periods (6,10–13,29).

An important matter for the use of the RPE scale is familiarization with it, both in theory and in practice. This will reinforce the anchoring of the different intensities in relation to the values that this scale presents (20). In order to do so, we can use familiarization and improvement of anchoring during class (9) and / or during a maximum test previously performed (8,30). As was done in this investigation, all subjects underwent a maximum test and re-test, where they were randomly asked throughout the test if they were wondering what the value that effort would represent. In addition, when they finished the test, they would necessarily be at a value of 10. On the other hand, when the scale was only taught in theory and shown in practice, without familiarization and anchoring with the values during the effort, the reported values were biased (10,12,13,29)

There are many problems that need to be clarified regarding the use of RPE to control the intensity of effort. However, the ergometer on which the present study was carried out, the Air Bike Revolution, is distinct from the ergometer where studies were carried out that compared and evaluated the effectiveness of RPE in the control and monitoring of training, such as the exercise bike (8–13,29). Thus, the use of the Air Bike Revolution ergometer in this investigation is an innovative point. However, it makes the results quite specific and difficult to compare and extrapolate to other realities. Another possible limitation of the current study includes the sample size.

Conclusions

In the present study it is possible to conclude that the experimental session with the Air Bike PRO® group class with intensity control through RPE shows more similarities with the standard session, controlled by an external load.

Practical Application

Instructors and coaches can use the RPE in trained subjects as a cheaper, effective way to control the intensity of Air Bike PRO® group class. In the same way, Air Bike PRO® instructors must be warned that use HR for control the intensity in Air Bike PRO® group class underestimates the intensity.

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