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Comparison of Effort Intensities Between Canyoning Guides and Assistant Guides

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ABSTRACT

Objectives: This study analyzes the variation of internal and external intensities, well-being measures, and subjective perception of effort in 13 professional canyoning guides with guide and assistant guide roles (34.38 ± 7.27 years; 77.82 ± 10.31 kg; 24.35 ± 3.26 BMI) over 117 identical canyoning routes.

Methods: Daily recordings on Polar V800 watches during the routes were used to measure internal and external intensity variables. Before the activity, the Hooper Index questionnaire was used as a well-being measurement tool, and the Borg Rating of Perceived Exertion scale was used to determine the perception of activity intensity at the end of the activity.

Results: Significant evidence was found for external variables (distance, duration, speed), well-being measures (muscular pain, fatigue, stress, and Hooper Index), and Rating of Perceived Exertion. Maximum heart rate (heart rate max) is the only internal variable that stands out ($p < 0.05$). Minimum and average heart rate showed $p > 0.05$, as did external and perceptual variables.

Conclusions: Intensity variability is highlighted in heart rate max due to different roles during the routes; specifically, higher heart rate max values were recorded for the assistant guides due to the type of work performed. Additionally, muscular fatigue and stress influenced the perception of effort during activities, emphasizing the importance of psychophysiological factors in professional canyoning practice.

Keywords: Canyoning; Monitoring; Internal and External Variables; Well-Being Measures; Subjective Perception of Effort.

Abbreviations: AI: Activity intensity; BMI: Body Mass Index; BPM: Beats Per Minute; GPS: Global Positioning System; HI: Hooper Index; HR: Heart Rate; NS: Nature Sport; RPE: Rating of Perceived Exertion; sRPE: Session-RPE; UA: Arbitrary units

Introduction

Sports practice has evolved and gained social and economic importance, similar to the growing availability of nature sports as an alternative to conventional sports activities (Durán-Sánchez [1]). (Melo & Gomes, [2,3]) reveal that these sports are phenomena in continuous evolution concerning sports tourism. In particular, in canyoning, a nature sport (NS), it possesses unique and distinct characteristics (Hardiman [4]) and risk factors (Ayora, et al. [5-7]). Characterized by exploring and enjoying natural mountain spaces with uneven terrain (Brandão, et al. [8]), traversing water lines using specific equipment, appropriate rope techniques, hiking, swimming, jumping, and rappelling (M Costa [9]). With the increasing number of participants, there is a need for greater organization and safety practice in NS (R Melo & Gomes, [3]). Therefore, conducting these activities with a guide (leaders) provides greater safety (M Costa [9]). Thus, guides must be knowledgeable about equipment and specific techniques for practice

(M Costa [9]), as well as master parameters related to planning, operational, emotional, physiological, cognitive aspects (Brandão, et al. [7]), and communication skills for professionalism and the well-being of all involved (M Costa [9]). Leaders/guides can be called guide and assistant guide when performing distinct functions during activities, where the guide has greater responsibility for the group and decision-making, as mentioned by the (Fédération Française de Spéléogie [10,11]).

Regardless of the role in an activity (i.e., canyoning), it is essential to consider one's psychophysiological capacity, as physical activity motivates various physiological responses (Impellizzeri, et al. [12]). The psychophysiological response capability may be related to episodes of fatigue and performance decline (Ferreira, et al. [13]). Psychological well-being is related to autonomy, environmental knowledge, self-development, self-acceptance, and communication type with others (Ruff, [14]). To assess the overall well-being perception of the athlete, the Hooper Index questionnaire (subsets: sleep quality, stress, fatigue, and muscular pain) is a self-report tool, simple to use, non-invasive, and cost-effective (Hooper & Mackinnon, [15]). Recently applied in athletes in individual (Matos, et al. [16,17]) and team sports (Rabbani, et al. [18-22]) it appears suitable for detecting activity-influenced fatigue (Rabbani [23]). Morning ratings of well-being variables are sensitive to changes in training intensity (Kaukonen [24]).

Regarding external intensity, it presupposes a certain internal intensity. In other words, any sports activity has an external intensity, expressed in measures like distance covered, average speed, etc., demanding physical capacity contributing to activating psychophysiological processes/responses corresponding to internal intensity (Gabbett, et al. [25,12]). The required intensity in sports practice can be classified into two levels:

(i) Physical requirements (i.e., locomotor and mechanical), also called external intensity variables; and

(ii) Psychophysiological requirements (i.e., organic and biological responses to external demands), also known as internal intensity variables (Bourdon, et al. [26,12]).

When monitored and analyzed, internal and external intensities allow a comprehensive analysis of the overall physical and psychological state of an athlete (Impellizzeri, et al, [12]). Despite being a complex task to accurately obtain the psychophysiological state (Impellizzeri, et al, [12]) due to the interaction of internally motivated intensity with externally induced intensity (Bourdon, et al, [26]), there are different sensitive monitoring instruments (objective and perceptual/subjective) that adequately assess intensities in each athlete (Rabbani [18]). In order to objectively assess both intensities, heart rate monitors offer easy use and reading (Roos, et al. [27-29]), undergoing study processes for validation (Caminal, et al. [8]) and reviews concluding an acceptable error threshold (Dobbs, et al. [29]). These devices record external variables such as speed, acceleration, distance covered, and time (Bourdon, et al, [26]), as well as internal variables like maximum, minimum, and average heart rate (Caminal, et al. [8]). Heart rate variability is a sensitive and objective physiological process for monitoring responses to physical activity (Da Silva, et al. [30-32]).

Assessments of subjective internal variables also allow us to understand the perceptual variation of physiological behaviors and physical performance (G A V Borg [33]). Borg's Rating of Perceived Effort (RPE) subjective scale is a method for perceiving the intensity of physical effort that can be compared with physiological responses (heart rate and lactate concentration) of individuals (G Borg [34]). This scale is a frequently used method, easy to apply, cost-effective (Pauline Louise Kellermann Kaercher, et al, [35]), and allows quantification by levels of perceived intensity in an activity (G Borg [34]). Recent studies confirm its use in athletes from various areas (Bourdon, et al. [16,22,26,36-38]). RPE also allows the calculation of session-RPE (sRPE) by multiplying it in arbitrary units (AU) by the duration of physical activity (training, competition) (Foster, et al. [39]). sRPE serves as an indicator of the magnitude of the stimulus demanded from the athlete (Foster, et al. [39]).

In summary, canyoning is seen as one of the mountain sports with less competitive potential but significant growth potential (R J E S de Melo & Gomes, [2]). In a psychophysiological analysis, combining activity intensity variables with well-being measures provides an overview of the participants' overall state (Gabbett, et al. [25,35]). suggest that Borg's classification can be used as an indicative tool for activity intensity (AI), along with heart rate used in conjunction with other tools to control AI (Pauline Louise Kellermann Kaercher, et al. [35]).

Until our research, the nonexistent literature regarding the intensities felt by guides and their well-being determines the objective of this study. Analyzing the variability of required intensities under the same conditions between guides and assistant guides, through RPE, Hooper Index, and Polar V800, will determine if they exhibit similar or dissimilar behaviors. This research can enhance awareness among guides at the psychophysiological level in canyoning routes, maximizing their performance with these tools.

Methodology

Study Design

We implemented a descriptive observational cohort study. Over nine weeks, from July to September, we observed intensities and conducted anthropometric and physical fitness assessments on canyoning guides affiliated with a tourism animation company in Northern Portugal. The study took place in the Ribeira de Carcerelha canyon, characterized by granite rock, difficulty grade II/VIII/AIII, a 150m elevation drop, low flow (typical for this time of year), and an average recorded temperature of 28.5°C. Handgrip strength analysis was con-

ducted in the 1st and 9th weeks using the Saehan SH5001 Handgrip Dynamometer. Body composition assessment was performed with the Tanita BC-418. Both devices were consistently used in the same enclosed location with natural light. Procedures, such as the time of day (9-10 a.m.) and post-breakfast assessment (approximately two hours after), were standardized. The participants' training status (rest day or not) the day before assessments was not recorded.

Temperature and other variables were recorded using the Polar V800 watch worn by guides during the experimental period. In the first week, participants were accompanied to familiarize themselves with the equipment. Additionally, they completed the Hooper Index questionnaire (subjective perception of well-being) half an hour before activities and the RPE half an hour after activities. Prior to the study, all guides were informed of the procedures and assessments, unanimously agreeing to participate. Subsequently, we conducted a correlation analysis between internal and external variables obtained from the Polar watch and questionnaires. We also performed a descriptive analysis based on Handgrip Dynamometer and Tanita.

Participants

We employed a non-probabilistic convenience sampling method, considering the following eligibility criteria:

i. A minimum of three years of experience as a canyoning guide.

ii. A minimum of 200 hours of training in the field.

iii. A minimum of three guiding sessions in both guide and assistant guide roles, and

iv. Knowledge of and agreement to sign the informed consent form for the study protocol.

This study adhered to the principles of the Declaration of Helsinki for research involving human subjects (World Medical Association [40]). Twenty canyoning guides initially participated in the study, of which 35% were deemed ineligible (n=7). Consequently, the eligible participants (n=13) had the following characteristics: an average age of 34.38±4.27 years, height of 178.77±6.52 centimeters, body mass of 77.82±10.31 kilograms, body mass index (BMI) of 24.35±3.26 kg/m^2, and fat-free mass of 14.07±6.27 kilograms.

Body Composition and Handgrip Evaluation Tests

Handgrip Dynamometer – Maximum Isometric Force: The Handgrip Dynamometer - Saehan, SH5001, a tool for assessing handgrip strength, is validated and reliable (Reis, [41]), used to determine the maximum isometric gripping force of the hand.

Procedure: The assessment was recorded in kilograms (kg), with the equipment adjusted to a 4.8 cm range (2nd position). The guide sat on a chair with no armrests, shoulders neutral, the assessed arm flexed at 90° (in the sagittal plane), adducted (in the frontal plane), and in semi-pronation (in the transverse plane). The opposite arm rested on the leg on the same side, the lower limbs flexed at 90º, and the feet supported on the ground. The isometric contraction lasted 3 seconds, with 30 seconds of passive rest between repetitions and verbal encouragement (Blakemore, [42]). Three repetitions were performed on each hand (Jordre, [43]), alternating between right and left (Reid, et al, [44]), and the best result of the three was considered in the analysis (Mahoney, et al, [45]).

Tanita – Body Composition Analyzer: The Tanita BC-418 electronic scale (measured with an accuracy of 0.1 kg, Tokyo, Japan) was used for body composition assessment. The model in question demonstrates validity and accuracy for body composition evaluation (Kelly, [46]).

Procedure: The assessment was recorded in kilograms, with a single repetition, in the anatomical position, barefoot, and wearing only swim trunks.

Monitoring of Effort Intensities During Touristic Routes

Objective Monitoring of Internal and External Intensities: The Polar V800 watch with a strap (37 mm x 56 mm x 12.7 mm, weight = 79 g, Polar, Finland) complies with the International Standard ISO 22810/IEC 60529 (Polar Electro Oy, [47]) and is validated for running and mountain sports (Roos, et al. [8,27]). Internal variables such as maximum heart rate (HR max), minimum heart rate (HR min), and average heart rate (bpm), as well as external variables such as duration (h/min/s), distance covered (km), average and maximum speed (km/h), and average and maximum pace (min/km), were recorded on this device and subsequently analyzed.

Procedure: The watch was worn on the left wrist by all guides during all activities, and the strap was placed around the chest beneath the chest, adjusted, and paired correctly. The equipment was turned on and placed at the beginning of the activity and turned off at the end.

Subjective Perception of Effort (RPE) Assessment: RPE quantifies the effort of the activity using the Borg CR-10 scale (0 - no intensity, and 10 - extreme effort intensity) (G Borg, [33,34]). Taking into account the information collected in RPE and the time of each activity, the session-RPE (sRPE) was determined, representing the overall internal intensity of the activity. The calculation involves multiplying the RPE rating by the activity time in minutes, expressed in arbitrary units (AU) (Foster, et al, [39]). sRPE is a valid and reliable measure of internal intensity (Brãndão, et al. [48,49]).

Procedure: The questionnaire was administered online to all guides individually, 30 minutes after the end of all activities, to quantify the RPE based on a scale of 0-10. Introduction: "How was today's activity? Relate the subjective intensity of effort, tension, discomfort, and/or fatigue felt in today's canyoning activity. Rate this intensity on a scale of 0 to 10, where: 0 - no intensity; 1 - very light; 2 - light; 3 -

moderately light; 4 - a little light; 5 - with moderate intensity; 6 - with some intensity; 7 - intense; 8 - very intense; 9 - extremely intense, and 10 - excessively intense (maximum)."

Well-Being Monitoring

The Hooper Index (HI) is a self-report questionnaire for assessing well-being perception on a scale of "1 to 7" across the variables of stress, fatigue, muscle soreness, and sleep quality (Hooper, [15]). To obtain the overall well-being result, the sum of the four variables is calculated (Clemente, et al, [13,50]).

Procedure: Guides answered the HI 30 minutes before the start of each activity (Nakamura [51]) via a provided link. For the variables stress, fatigue, and muscle soreness, "1" represents "very, very low," and "7" represents "very, very high." For sleep quality, "1" represents "very, very good," and "7" represents "very, very bad" (Hooper, [15]).

Statistical Procedures

Descriptive statistics were performed using mean, standard deviation, and median. Preliminary analysis of sample normality and homogeneity was conducted using the Kolmogorov-Smirnov and Levene tests, respectively. Given the non-normality of the sample, the Wilcoxon test was used to compare the variables between guides and assistant guides. Statistical tests were conducted using SPSS software (version 27.0.0.0., IBM, Chicago, USA) with a significance level set at $p < 0.05$.

Results

Thirteen canyoning guides with three or more years of experience in guiding this type of tourist activity were monitored during 117 activities.

Comparison of Physical and Anthropometric Assessments Between Time Points

(Table 1) presents data from the initial and final physical and anthropometric assessments provided by Tanita and Handgrip. Guides had an average age of 34.38±4.27 years and a height of 178.77±6.52 cm. All parameters collected in the body composition analysis showed a slight decrease between the initial and final assessments. Grip strength demonstrated an increase in isometric maximum strength (kg) in both hands (right: initial=39.23±1.83; final=40.46±2.22; left: initial=37.69±1.49; final=38.69±1.84).

Table 1: Description of body composition and handgrip tests for canyoning guides.

	M ± SD Initial	M ± SD Final	Difference
Age (years)	34,38±4,27	-	-
Height (cm)	178,77±6,52	-	-
Body Mass (kg)	77,82±10,31	77,35±9,88	0,47
Body Mass Index (BMI) (kg/m^2)	24,35±3,26	24,18±3,00	0,17
Body Fat (%)	17,55±5,55	16,52±4,82	1,03
Fat Mass (kg)	14,07±6,27	13,08±5,30	0,99
Fat-Free Mass (kg)	63,76±5,75	64,28±6,23	0,52
Total Body Water (TBW) (kg)	44,65±4,77	45,28±4,74	0,63
Visceral Fat Rating (A.U.)	8,46±3,20	8,31±2,98	1,02
Handgrip Right Hand (kg)	39,23±1,83	40,46±2,22	1,23
Handgrip Left Hand (kg)	37,69±1,49	38,69±1,84	1

Descriptive Values of Intensities and Well-Being

The descriptive statistics obtained from the Polar V800 data are presented in (Table 2). On average, the guide completed canyoning routes in a longer time compared to the assistant guide (3h12min; 3h02min), respectively. Conversely, a lower total distance (guide=2.21 km; assistant guide=2.26 km) and average speed (guide=0.76 km/h; assistant guide=0.77 km/h) were identified for the guide compared to the assistant guide.

Table 2: Description of data obtained through instruments used during canyoning routes.

	Guide		Auxiliary Guide	
	M±DP	Mediana	M±DP	Mediana
Total distance (km)	2,21±0,30	2,14	2,26±0,25	2,22
Total duration (min)	188,2±35,01	197,29	189,2±34,67	184,14
Total duration (h:min:sec)	3:12:41±0:27:52	3:17:29	3:02:11±0:27:10	3:04:14
Average speed (km/h)	0,76±0,31	0,70	0,77±0,16	0,80
Maximum speed (km/h)	12,80±10,98	9,40	11,13±8,35	8,55
Max HR (bpm)	142,69±18,24	138	157,3±14,62	157,50
Min HR (bpm)	64,54±11,62	64	62,6±9,54	62
Average HR (bpm)	97,15±16,33	94	97,15±16,33	96

Note: HR: Heart Rate.

Regarding the internal variables obtained through the same equipment, it was observed, on average, that the guides had a lower maximum heart rate (142 bpm) compared to the assistant guides (157 bpm). In contrast, the minimum heart rate (64 bpm; 62 bpm) showed a higher average. These findings provide insights into the

temporal and physiological aspects of canyoning activities, highlighting differences between guides and assistant guides in terms of time spent, distances covered, and heart rate responses. In (Table 3), the data collected through the Hooper Index (before the start of the activity) and RPE (after the end of the activity) questionnaires are observed. There was a difference in values in terms of the collected ratings between guides and assistant guides, with guides having higher rating values.

Table 3: Description of the data obtained through the questionnaires used before and after canyoning activities.

	Guide		Auxiliary Guide	
	M±DP	Mediana	M±DP	Mediana
Hooper-Índex (HI)	9,49±3,73	10	9,21±3,56	9
Quality of sleep	2,46±1,27	2	2,51±1,199	2
Stress	2,23±1,04	2	2,26±1,25	2
Fatigue	2,56±1,0	3	2,44±0,94	2
Muscle pain	2,23±1,04	2	2±0,92	2
RPE	3,33±2,13	3	3,21±1,82	3
sRPE	626,3±438,78	460	618,5±399,19	580
Clients Nº	6±3,9	-	-	-
Grups Nº	-	-	2±1,8	-

Note: RPE: Rating of Perceived Exertion; U.A.: Arbitrary Units; sRPE: Session Rating of Perceived Exertion (RPE*time of the session).

Satistical Comparison of Intensity Variables

In (Table 4), non-parametric Wilcoxon test statistics are presented for internal and external intensity variables of guides and assistant guides during a canyoning season. The median distance covered by the guide was equal to the median distance covered by the assistant guide (p=0.183>0.05), indicating statistical evidence not to reject H0. The same was observed for other external intensity variables, where there was also statistical evidence not to reject H0 (duration: p=0.845>0.05; average speed: p=0.157>0.05; maximum speed: p=0.362>0.05). Regarding internal intensity variables, the Wilcoxon test showed a statistically significant difference to reject H0 in maximum heart rate (p=<0.01<0.05), meaning that the median maximum heart rate of the guide (MD=138 bpm) was lower than the median maximum heart rate of the assistant guide (MD=157.50 bpm). As for the minimum heart rate, H0 was not rejected, as there was statistically significant evidence, indicating that the median minimum heart rate of the guide was equal to the median minimum heart rate of the assistant guide (p=0.096>0.05). Similarly, the median heart rate showed statistical evidence not to reject H0, meaning that the median heart rate of the guide was equal to the median heart rate of the assistant guide (p=0.469>0.05). Regarding the session Rating of Perceived Exertion (sRPE), H0 was accepted, as there was statistically significant evidence that the median RPE and sRPE were equal whether the participant was a guide or an assistant guide (RPE: p=0.654>0.05; sRPE: p=0.567>0.05).

Table 4: Wilcoxon Test for the Comparison of Internal and External Variables during the Canyoning Season between Guides and Assistant Guides.

	Decision
Distance (km)	p=0,183
Duration (min)	p=0,845
Average speed (km/h)	p=0,157
Maximum speed (km/h)	p=0,362
Max HR (bpm)	p=<0,001
HR min (bpm)	p=0,096
HR méd (bpm)	p=0,469
RPE (UA)	p=0,654
sRPE (UA)	p=0,567

Note: HR: Heart Rate; RPE: Rating of Perceived Exertion; UA: Arbitrary Units; sRPE: Session Rating of Perceived Exertion (RPE* session duration).

Comparison of Well-Being Measures - Statistical Analysis

The Wilcoxon test descriptive statistics for well-being measures during canyoning activities are presented in (Table 5). As the Wilcoxon test indicates, all well-being measures showed statistical evidence not to reject H0, meaning that the median scores for sleep quality, stress, fatigue, muscle soreness, and the Hooper Index were the same for guides and assistant guides (Sleep Quality: p=0.772>0.05; Stress: p=0.818>0.05; Fatigue: p=0.414>0.05; Muscle Soreness: p=0.115>0.05; Hooper Index: p=0.921>0.05).

Table 5: Wilcoxon Test for theomparison of Well-Being Measures During the Canyoning Season Between Guides and Assistant Guides.

	Decision
Quality of sleep	p=0,772
Stress	p=0,818
Fatigue	p=0,414
Muscle pain	p=0,115
Hooper Index	p=0,921

Discussion

To the best of our knowledge, there are no previous studies that have analyzed the variability of internal intensities in different roles of canyoning guides (guides and assistant guides) exposed to the same external conditions. One of the objectives of this study was related to the need to identify similarities or differences in internal and external intensity variables, depending on the roles performed during canyoning routes. Another objective was related to the perception of well-being and subjective perception of effort, identifying the same similarities or differences in different roles.

Comparison of Physical and Anthropometric Assessment Between Moments

Changes in body composition were observed between assessments, such as a reduction in body fat mass and an increase in lean body mass. The increase in daily physical activity may have positively contributed to these changes. (Vannuchi, [52]) state that physical exercise can modify anthropometric parameters. The combination of good morphological indicators, such as an increase in lean mass, a reduction in fat mass, and increased strength in individuals, favors increasing efficiency in adaptive capacities in sports (Andriy Chernozub, et al. [53]). The maximum muscle grip strength also increased. In certain sports where athletes use gross motor skills (Cronin, [54]), training handgrip strength is important for performance improvement (Cronin et al. [54,55]). (Cronin, et al. [54,55]) suggest that handgrip strength can be an integral part of the training program, as it is a useful parameter for coaches to enhance athlete performance. In this study, it is known that handgrip strength was frequently used in various techniques in canyoning (setting up rope systems, storing ropes, removing excess rope from the client's descender), for these reasons and others not considered, it may have contributed to the increase in this strength. Therefore, handgrip strength can also be considered by guides in their training.

Descriptive Values of Intensities and Well-Being

Tools to monitor the psychometric state of athletes prove to be useful and preventive (Fessi, [56]). In measures of well-being and RPE, both variables obtained higher results when subjects acted as guides. This perceptual differential evidence highlights the role of guides in the routes. During canyoning routes, guides have a greater sense of responsibility, leadership, and decision-making (M Costa, [9]) compared to assistant guides. It is for this reason that perceptual monitoring obtained higher results when guides. Regarding well-being subgroups, higher values are divided between roles. In the case of fatigue, in this study, guides (2.56 ± 1.0) and assistant guides (2.44 ± 0.94) show levels of fatigue considered low. This well-being measure can also be monitored through neuromuscular performance, but these are invasive and costly tests to implement (Marqués Jiménez, et al. [57]). Fatigue is the accumulated tiredness related to psychophysiological variables demanded of athletes, and if fatigue levels are high, negative adaptations may occur (Kellmann, et al, [58]).

Sleep quality can influence the athlete's behavior at a physical, psychological, and decision-making level (Kellmann, et al. [58]). For canyoning guides, it has been an important factor, as they are the ones making decisions (M Costa, [9]) during the routes. Sleep is essential for overall well-being, both physically and psychologically (Kellmann, et al. [58]). Thus, understanding the demands of the sport is crucial to properly adjust sleep (Simim, et al. [59]). In this study, both guides (guide: 2.46 ± 1.27; assistant guide: 2.51 ± 1.199) reported good sleep quality. Regarding maximum heart rate (157.3 ± 14.62), it is higher when in the role of an assistant guide, as well as the minimum heart rate (62.6 ± 9.54), which is lower in the same role. Physiological changes are entirely related to increases in intensities in activities to sustain the body's energy balance during physical activity (Andrii Chernozub, et al. [32]).

Statistical Comparison of Intensity Variables

Although methods such as heart rate monitoring only allow for a partial assessment of internal intensity and its relationship with physiological adaptations (Andriy Chernozub, et al. [53]), in internal intensity variables, the maximum heart rate variable showed statistically significant evidence to reject H0. In this case, a different median is observed when performing the role of a guide or assistant guide, where the maximum heart rate is lower in the guide role. A study conducted with professional and amateur martial arts athletes reported better physiological qualities in professional athletes (James, [60]). The results of this study corroborate the different roles during the routes. Movements with accelerations and stops in the assistant guide role presuppose a higher maximum heart rate. Physiological results are obtained through motor stimuli that translate into the development of physical capacities (Bicer, [61]). For more accurate results in the long-term adaptive process, the biochemical analysis of blood creatinine concentration is a better indicator (Andrii Chernozub, et al. [32]). Nevertheless, RPE (at the end of activities) can be used as a sensitive tool to determine internal effort intensity (Nobari, et al. [20,62]).

Statistical Comparison of Well-Being Measures

Well-being variables are similar between guides and assistant guides. This fact was validated by the statistical test, which did not show significant results for rejecting H0 for all variables. Therefore, there is statistical evidence to admit that regardless of the role during canyoning routes, the medians are equal. (Marselle, [63]) state that after walking in a natural environment, one can enjoy more positive emotional well-being due to environmental stimuli. A recent review linking running and mental health concluded that there are positive influences on mental health through running (Oswald, [64]). The associations in this study align with the mentioned evidence, and it is known that guided canyoning involves moments of walking and running if necessary. For a longitudinal perceptual assessment of individuals during a season or more, as in this case (Sioud, et al. [22]), these tests are seen as useful, simple, and non-invasive (Fessi, et al.

[56,65]). Self-report psychometric tests are simple tools, combined with others to assess the psychophysiological state of athletes (Santos-García, [66]). By researchers' recommendations, monitoring the psychometric state of athletes before each activity can determine fatigue indicators (Selmi, et al. [67]) and, with these indicators, prevent and improve their performance (Selmi, et al., [56,67]), avoiding injuries, overtraining, and overreaching (Nobari, et al. [17]).

Future Directions and Practical Implications

These findings were obtained from a small convenience sample, and the lack of information on the total number of canyoning guides may pose a limitation to the sample's representativeness. In future studies, researchers should challenge the evidence from this study, and some identified limitations should be considered, including:

1. Increase the sample size and conduct research in different companies operating in different locations (mountains, hills) for a more robust analysis.

2. Consider Daily Physical Activity: Take into account the daily physical activity of each participant.

3. Include Female Participants: Obtain results based on a female sample for future comparisons of behaviors and perceptions.

Additionally, the limited availability of equipment (Polar watches) for daily use was a constraint. This study presents unique insights, being the first to investigate not just practitioners but specifically canyoning guides. Given the variability in well-being measures, internal intensities, and RPE between guides and assistant guides, further research in this domain is warranted.

Conclusion

We conclude that, in particular the maximum heart rate (Max HR) showed inequality among guides, with the Max HR of the assistant guide being higher. We believe that this evidence manifested due to the distinct roles that canyoning guides (in this particular study) perform during the routes. The measures of well-being and RPE were perceived and classified very similarly but prove to be good indicators that could contribute to the decisions of those responsible for coordinating these activities. As (Queiroz, et al. [68]) point out, the use of the Borg scale is of paramount importance to improve the training plan, making it safer and more effective. The results of this study provide new data to researchers and enthusiasts in the field of nature sports, specifically canyoning, regarding the perception of effort, internal intensity variables, and measures of well-being [69,70].

Conflicts of Interest

The authors declare no conflicts of interest.

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