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ORIGINAL

SPORTS PERFORMANCE ACCORDING TO ALTITUDE IN SOCCER PLAYERS ACCORDING TO SOMATOTYPE

RENDIMIENTO DEPORTIVO SEGÚN ALTITUD EN JUGADORES DE FÚTBOL ACORDE A SOMATOTIPO

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ABSTRACT

The objective of this study was to analyze the effect of altitude on physical performance in professional soccer players during matches played in Liga MX according to somatotype. Twenty-nine professional soccer players were evaluated, classified by somatotype, and aerobic and anaerobic variables were measure in the regular competitive phase through the WIMU GPS device. Sports performance was related to the altitude of the place where they played. No differences were find according to the

somatotype of the players. In the performance component, significant correlations were find for the variables of acceleration of 3m / s2 and 2m / s2, deceleration of 3m / s2, intensity, and metabolic load based on the games played at the highest altitude. The physical performance of the players is affected in anaerobic processes according to the altitude during the matches when the execution of game actions with higher intensity is required.

KEYWORDS: Anaerobic, Competition, Soccer, GPS, Performance Monitoring.

RESUMEN

El objetivo del estudio fue analizar el efecto de la altitud sobre el rendimiento físico en jugadores profesionales de fútbol durante los partidos jugados en la liga MX según su somatotipo. Para ello, se evaluaron 29 jugadores de fútbol profesional, se clasificó por somatotipo y se midieron acciones anaerobias durante la fase regular competitiva a través del dispositivo GPS WIMU. Se relacionó el desempeño deportivo según la altitud del lugar donde jugaron. No se encontraron diferencias según el somatotipo de los jugadores. En las variables de rendimiento se encontraron correlaciones significativas para las variables de aceleración de 3m/s^2 y 2m/s^2, desaceleración de 3m/s^2, intensidad y carga metabólica con base en los partidos jugados a mayor altitud. El rendimiento físico de los jugadores evaluados se ve afectado en procesos anaerobios según la altitud durante los partidos cuando se exigen ejecuciones de acciones de juego a mayor intensidad.

PALABRAS CLAVE: Anaeróbico, Competición, Fútbol soccer, GPS, Monitorización del Rendimiento.

INTRODUCTION

Soccer has evolved on a large scale in various areas, trying to increase the performance of soccer players in the competition to provide a better competitive spectacle through the technical-tactical strategies presented during the matches (International Federation of Football Association, 2020), soccer is a sport that involves an intermittent exercise of variable intensity, where about 88% of the performance in a soccer game involves aerobic activities along with the remaining 12% are high-intensity or anaerobic activeness (Jacob, 2017) which are less reported but just as developed during practice, being these essential during the plays in the match.

While training is a fundamental part of player development (Ardá & Casal, 2003), training periodization plays a crucial role in achieving the goal of having better players (Rivas & Sánchez, 2013), taking into account aspects such as the influence of the size of the field and the match schedule (Gutierrez et al., 2018), the external and internal load (Rojas-Inda, 2018), body composition, its somatotype and with it the correct development of physical performance, also this is based on an adequate process of developing conditional and coordinative capacities (Benítez-Jiménez, Falces-Prieto &

García-Ramos, 2020). In addition to this, there is a large number of tests to evaluate physical performance, as well as technological evaluation methods (Reche-Soto, et al., 2019), nonetheless, more specific procedures are required to assess physical abilities (Ramos-Álvarez, Jiménez-Borrero, Paredes-Hernández, Gallardo, Romero-Moraleda, & Cid, 2021) as presented in the current study, since this may largely determine the final result of the marker.

Despite the monitoring of the kinematic variables in competition, aspects related to exercise physiology, such as the identification of the volume and intensity of exercise in matches, periodic assessments of physical, nutritional, and anthropometric capacities should be considered as intervening variables within the development of competition (Padulles, 2017), in addition to external factors such as weather, altitude, and time change, among others, which are necessary to carry out a better scheme, game approach, and correct strategic technical-tactical development that is reflected in the match (Álvarez-Kurogi, 2020) as well as the influence of the competition itself (Sánchez, García, Carcedo, Hernández, Carretero, & Sanchez-Sanchez, 2019).

Soccer is increasingly demanding from the physical point of view (León-Ariza, Ramírez, & Sánchez, 2015), and each movement on the field involves specific mechanical actions at a different rhythm from the physical sphere. The good incorporation of this component with the technical-tactical, strategic, psychological, and nutritional ones lead to optimal control of the game.

The exercise pattern in soccer can be stated as interval and acyclic, with overlapping maximal efforts (Toscano, 2013) that require high intensity in intermittent or discontinuous exercises (Coutts & Sirotic, 2018), Which include actions in short spaces and/or broad, where executions of accelerations and decelerations, jumps, turns, changes of direction, and high-intensity speed actions in different speed zones above a threshold of 18 km/h this is also known as a high speed Running or Sprint (Sánchez-García, Sánchez-Sánchez, Rodríguez-Fernández, Solano, & Castillo, 2018).

The distance covered in a game reaches 10 to 13 km, with an average of 150-250 high-intensity actions and which in turn constitute the moment of highest energy expenditure using the lactic anaerobic energy system since these changes can influence their total performance at the end of the match (Bustos, Rodríguez, & Acevedo, 2017). This same ability to repeat high-intensity efforts for prolonged periods is crucial for the final development of the competition (Sañudo, Muñoz, Bartolomé, Sola, De-Hoyo, Aceña & García, 2017; Brocherie, Girard, Fais, & Millet, 2016).

When matches are at a higher altitude, instability can be generated in the athlete, manifesting a decrease in the recovery capacity of the phosphagen pathway in the face of high-intensity intermittent activity and a loss in VO_2max (Gutiérrez, Guillen, Perlaza, Guerra, Capote & De la Rosa; 2018; Lee & Ian, 2014). High-performance players native to sea level suffer a decrease in physical performance when playing soccer above 1200m according to Lee & Ian (2014), so one of the conditions to consider during training and matches is the altitude, given that under these conditions, physiological

responses and adaptations will occur, causing improvement in physical performance in lactate thresholds, by increasing in the amount of hemoglobin and hematocrit as well as an increase in the supply of ATP (Chacón, González, Mirror, Doors, Moreno & Cachón, 2017).

Because altitude produces a decrease in the partial pressure of oxygen, it is expected that the main affectation of energy production will be oxidative, yet, the anaerobic, lactic, and alactic energy production pathways have been little studied, which are frequent during matches and required during games, so their evaluation is remarkably necessary. That is the relevance of having a high performance during the game, it is meaningful to monitor and follow up on the physiological adaptations made during the games so that the player can reach his maximum physical performance regardless of the place where the game takes place (González, 2018), as well as the classification of the somatotype of the players according to their position, to generate higher physical performance at the time of the game. It is worth mentioning that, nowadays, the somatotype of professional soccer players has not been established according to the game category in Mexico, yet, there is a predisposition towards mesomorphy in different leagues worldwide (Zúñiga, Gutierrez, Dominguez, & Perea, 2018; Gutierrez, 2005).

OBJECTIVES

To analyze the effect of altitude on physical performance in professional soccer players during matches played in the MX league according to their somatotype.

MATERIALS AND METHODS

A correlational descriptive study of sports performance where the valuation of the anaerobic physical capacities assessed in the soccer games played during the competition of the Mexican league as visitors to a different altitude classification was initially carried out on a team participating in the BBVA MX league. The games played were determined according to the tournament schedule. To determine the height of the game, they were classified as low altitude (0 to 1,000 meters above sea level), medium-altitude (1,000 to 2,000 meters above sea level), high altitude (2,000 to 5,000 meters above sea level), and very high altitude > 5,000 meters above sea level (Bernal & Cruz, 2014). The player's somatotype was too assessed using the Heath and Carter (1990) method based on ten anthropometric variables (body mass, height; triceps, subscapular, supraspinal, and medial leg adipose folds; circumference of the flexed and tense arm and maximum leg; humeral and femoral diameters). The sample was selected for convenience and was integrated by 29 professional soccer players who are native and carry out their training at a low altitude (20 meters above sea level). They were checked during the competitive period in 10 days of the regular phase of the Clausura 2020 tournament of the Liga BBVA MX, with an average chronological age of 25 years (25 ± 4.8 years). All participants have their training in the city of Tijuana, Mexico. All players participated voluntarily, were informed about the study, and provided their informed consent following the Declaration of Helsinki (World Medical Association, 2020).

The anthropometric assessment is established by the team's sports nutritionist, who is certified by the International Society for the Advancement of Kinanthropometry (ISAK), level I, where the technical measurement standards determined for a restricted profile must be followed according to the guidelines of the international protocol for anthropometric assessment (Esparza-Ross, Vaquero-Cristobal & Marfell-Jones, 2019). The anthropometric material used was previously approved and calibrated, wall height rod (precision, 1 mm); Tanita BC-568 scale (precision, 100 g); Rosscraf metal tape measure, narrow and inextensible (accuracy, 1 mm); Holtain small bone diameter pachymeter (accuracy, 1 mm); Holtain caliper (precision, 0.2 mm), complementary material (demographic pencil to mark the subject) and anthropometric bench of 40x50x30 cm. The technical intraobserver measurement error indicated by ISAK (2019) was taken into account; 5% for folds and 1% for perimeters and diameters). The fat percentage was estimated by Faulkner's formula (Corvos, Rangel & Salazar, 2020). To calculate the somatotype, the mean somatotype was determined, following the Heath-Carter method and its classification according to the somatotopic categories of Duquet and Carter (Cabañas and Esperanza, 2009).

To determine the physical performance of variables, the WIMU GPS device Pre-certified by FIFA was used to ensure the EPTS (Electronic Performance and Monitoring Systems) which measures and reports speed, orientation, and gravitational force, during the match using a combination of accelerometers, gyroscopes, and magnets.
The variables studied were: Total distance traveled (DT) in meters: Total length (meters) traveled in the match; (M/MIN) Meters per minute: Total distance traveled per minute, m min-1; (AVGVEL) average speed in kilometers per hour, (Player load) player load concerning anterior-posterior acceleration, medial-lateral acceleration, and vertical acceleration; (acce /dec 3m/s²) high-intensity accelerations and decelerations from 3m/s²; (acce / dec 2m/s²) high-intensity accelerations and decelerations from 1 to 2 m/s²; (Sprint) Number of actions and distance performed in sprint actions (24 km/h ++); (Z4-Z5-Z6) High-Intensity Speed Zones Zone 4; speed of 18-21 km/h, Zone 5; speed of 21 – 24 km/h and Zone 6; velocity from 24 km/h to ++; (Dissprints) Distance sprints in minutes, (Intensity) distance traveled in HMLD (in metabolic power from 25.5 w kg^{1}) plus speed zone 6 divided by the total distance traveled by the player.
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The Shapiro Wilks test was used to check the normality of the variables and descriptive statistics were performed where the results are presented as mean and standard deviation, median and interquartile range (IIC) 25 and 75. One factor variance analysis was done to identify differences by game altitude and Tukey's post hoc analysis accepting a value of $p > 0.05$, in annexation to the correlation coefficient through Spearman's Rho for the altitude and somatotype variables contrasted with each of the sports performance variables. The analysis was accomplished in the statistical package SPSS V. 11 for MAC.

RESULTS

Chart 1 shows the mean and standard deviation of the characterization variables of the sample divided by game position. In the comparison by position, no statistical difference was found in any of the variables.

Chart 1. Characterization of the sample divided by game position
SD =´Standard Deviation; %= porcentaje; kg= Kilogramos.

	Goalkeeper		Fender		Midfielder		Forwards	
	Mean	SD.	Mean	SD	Mean	SD	Mean	SD
Age (years)	28.6	10.9	23.5	3.8	24.0	2.7	26.3	4.2
Weight (kg)	76.7	3.4	74.8	5.1	74.3	6.7	77.6	6.6
Height (cm)	182.9	0.9	180.4	7.2	177.3	6.0	179.3	6.6
Sitting height (cm)	95.8	1.4	94.8	3.0	93.8	2.0	94.7	4.0

Regarding the comparison by the game position of the variable of the sum of 6 folds, fat mass, and lean mass in percentage and kilograms per game position, there was no statistically significant difference (Chart 2). Likewise, the somatotype values are presented by game position and their graph in the somatochart where it can be seen that the somatotype classification is between balanced Mesomorph or Ecto-Mesomorph (table 2 and figure 1).

CHART 2. Sample characterization in body composition and somatotype divided by game position.

	Goalkeeper		Fender		Midfielder		Forwards	
	Mean	DS.	Mean	DS	Mean	DS	Mean	DS
Sum of 6 folds (mm)	49.8	16.1	43.3	11.4	42.7	8.1	46.6	14.1
Fat mass (%)	11.6	1.8	10.7	1.3	10.4	0.8	11.0	1.5
Fat mass (kg)	8.9	1.7	8.0	1.1	7.8	1.0	8.6	1.9
Lean mass (%)	88.3	1.8	89.2	1.3	98.8	0.8	88.9	1.5
Lean mass (kg)	67.7	2.3	66.7	4.7	66.5	5.8	68.9	4.9
Endomorphy	2.2	0.5	1.9	0.5	1.8	0.3	2.0	0.4
Mesomorphy	4.8	0.5	4.5	0.7	4.8	0.5	5.0	1.4
Ectomorphy	2.9	0.3	2.7	0.8	2.4	0.5	2.2	0.6

DS. =Standard deviation; Sum of 6 folds: Triceps, Subscapularis, Supraspinalis, Abdominal, Mid-Thigh, and Calf; %= percentaje; kg= Kilograms

Figure 1 shows the results of the somatotype of the players differentiated by game positions.

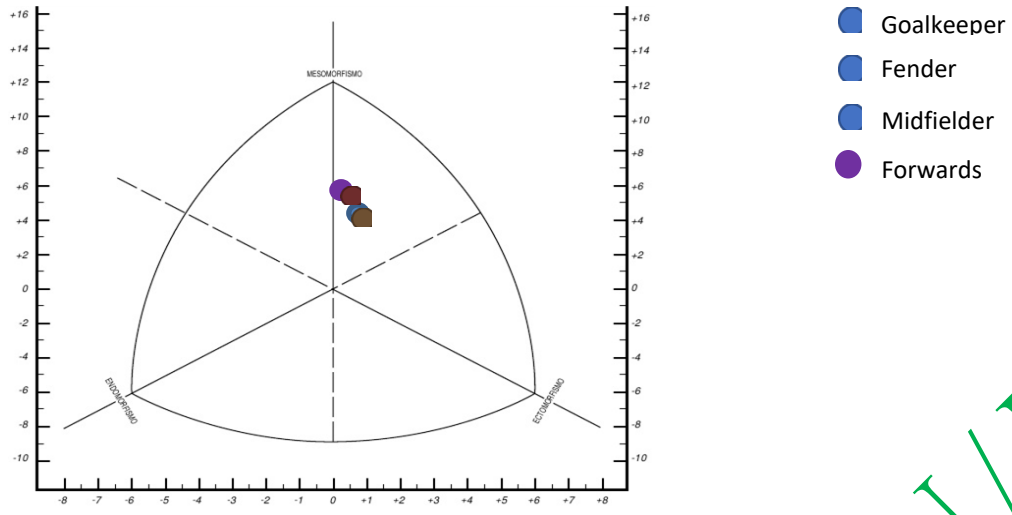

Figure 1. Somatotype graph by game position

Chart 3 shows the median and the 25th and 75th percentile range of the variables studied divided by the games played at low altitude, medium-altitude, and high altitude. The ANOVA showed significant differences ($p<0.05$) in the variables related to high-intensity actions (Z4, Z5, Avegel, Dce3ms2, and intensity). And in post hoc analysis, point out that for the variables Z4, Z5, Avegel the difference was found between low altitude and high altitude, while in the variables Dce3ms2 and intensity the difference was found in the 3 altitudes. For these variables, the change percentage was calculated where, for the variable of Z4 a decrease of 25.27% in performance was seen, for Z5 at 22.78%, for Avegel at 10.29%, for Dce3ms2 at 31.62%, and the intensity of 15.38% of the decline, all when comparing low-altitude and high-altitude performance.

CHART 3. Descriptive statistics of each of the variables divided by the altitude of the game as visitors

	Low altitud		Medium altitud		High altitud		
	Median	**(IIC 25-75)**	**Median**	**(IIC 25-75)**	**Median**	**(IIC 25-75)**	**P**
DT	8827.0	7057.2 - 9861.7	8911.0	6163.0 - 9541.4	8593.5	5809.7 - 9633.0	.675
M/MIN	101.0	94.0 - 109.0	104.0	95.0 - 108.7	97.5	91.0 - 109.2	.313
Z4	411.5	287.0 - 514.5	353.0	227.3 - 479.5	307.5	210.2 - 450.5	**.033***
Z5	219.5	140.7 - 296.5	194.0	110.5 - 264.0	169.5	118.2 - 250.5	**.049***
Z6	156.0	80.7 - 228.5	137.0	65.50 - 225.5	131.0	60.7 - 186.5	.178
Sprints	13.0	7.0 - 17.2	11.0	6.0 - 15.5	9.5	5.0 - 16.0	.051
Dissprint	233.4	120.5 - 325.0	220.0	103.0 - 326.0	203.5	99.5 - 286.0	.138
Avgel	6.8	6.2 - 7.1	6.6	6.16 - 7.1	6.1	5.84 - 7.0	**.013***
Acce3ms^2	52.5	41.0 - 64.0	41.0	31.0 - 51.5	43.5	32.2 - 66.25	.032
Acce2ms^2	106.0	80.7 - 133.2	101.0	69.0 - 126.0	93.0	63.0 - 116.2	.086
Dce3ms^2	68.0	52.0 - 93.0	60.0	36.5 - 75.5	46.5	32.7 - 70.2	**.000*** ***
Intensidad	26.0	22.0 - 30.0	23.0	20.0 - 27.0	22.0	18.7 - 27.0	**.000*** ***
Playerload	116.0	87.7 - 133.2	106.0	54.5 - 123.0	109.5	70.0 - 122.7	.111

*Difference > 0.05 from posthoc analysis between low altitude and high altitude. *** Difference > 0.05 from the post hoc analysis between the three elevations. DT: Total distance covered: Total length (meters) route in a match; (M/MIN) Meters per minute: Total distance traveled per minute, m min-1; AVGVEL average speed; Player load; (acce /dec 3ms^2) high-intensity accelerations and decelerations from 3ms^2; (acce 2ms^2) high-intensity accelerations from 1 to 2 ms^2; Sprint Number of actions and distance performed in sprint actions (24 km/h ++), Z4-Z5-Z6 High-Intensity Speed Zones Zone 4; speed of 18-21 km/h, Zone 5; speed of 21 – 24 km/h and Zone 6; speed from 24 km/h to ++; (Intensity) distance traveled in HMLD (in metabolic power from 25.5 w kg^1) plus speed zone 6 divided by the player's total distance traveled.

Chart 4 shows the correlation between altitude and somatotype concerning each variable performance analyzed. Where the correlations found with altitude were inverse for the variables of Z4 (-.179), Z5 (-.166), Sprints (-.162) Dissprints (-.133) Avgvel (-.210), Dce3ms^2 (-.258), and intensity (-.248). Correlations with endomorphy were similarly inverse with m/min (-.233), Z4 (-.249), Z5 (-.207), Avgvel (-.281) and intensity (-.135) while with mesomorphy were positive in the variables of Z4 (.206), Z5 (.217), Z6 (.166), Sprints (.194) Dissprints (.180) Avgvel (.194), Acce3ms^2 (.130) and intensity (.222). Ectomorphy only correlated with Z6 (-.158) and player load (.139).

Chart 4. Correlations between performance variables and game altitude

	DT	M/MIN	Z4	Z5	Z6	Sprints	Disprint	Avgel	Acce3 ms²	Acce2 ms²	Dce3 ms²	Intensidad	Playerload
Altitude	-.067	-.073	-.179*	-.166*	-.129*	-.162*	-.133*	-.210*	-.159	-.147	-.258*	-.248*	-.125
Endomorphy	-.093	-.233*	-.249*	-.207*	-.023	-.075	-.085	-.281*	.037	-.092	-.012	-.135*	-.060
Mesomorphy	.062	.136	.206*	.217*	.166*	.194*	.180*	.194*	.130*	.091	.020	.222*	.047
Ectomorphy	-.033	-.016	.006	.027	-.158*	-.099	-.124	-.025	-.043	.001	.043	-.028	.139*

*Difference > 0.05 SD: Total distance covered: Total distance (meters) covered in match; (M/MIN) Meters per minute: Total distance traveled per minute, m min-1; AVGVEL average speed; Player load player load; (acce /dec 3m/s²) high intensity accelerations and decelerations from 3m/s²; (acce / dec 2m/s²) high intensity accelerations and decelerations from 1 to 2 ms²; Sprint Number of actions and distance performed in sprint actions (24 km/h ++); Z4-Z5-Z6 High Intensity Speed Zones Zone 4; speed of 18-21 km/h, Zone 5; speed of 21 – 24 km/h and Zone 6; speed from 24 km/h to ++; (Intensity) distance traveled in HMLD (in metabolic power from 25.5 w kg¹) plus speed zone 6 divided by the player's total distance traveled

DISCUSSION

The main findings show us a decrease in the intensity component that is broken down into the ability to repeat and sustain high-intensity actions in accelerations and deceleration, in speed zones of 18 to 21 km/h and 21 to 24 km/h, which are metabolic and mechanical components of high intensity. However, no significant differences are replicated in speeds greater than 24 km/h, and the total distance traveled. The aforementioned is related to what was mentioned by Aughey, et al., (2013), where they did not find a decrease in the total distance traveled when comparing sports performance at sea level compared to a high altitude. On the other hand, they did find significant decrease in speed variables at high intensity. Understanding these findings, a longitudinal study carried out by Alanís, (2019), with the Tigres team of the Autonomous University of Nuevo León (medium-altitude), did not find a significant presence in the total distance traveled, as in high-speed actions at, thresholds of 24 km. /h or well called Sprint, like the present study where a decrease in performance was noticeable in zone 4 and zone 5 according to the evaluation carried out during the games played at low altitude and high altitude, so that in both investigations the average elevation does not represent a decrease in sports performance in the games played.

A study carried out by Williams (2011), mentions that there is a percentage advantage of the local team compared to the visitor that travels to compete at altitude, so that, for the team that moves to play at a high altitude, the tactics, strategy and the actions of low and medium intensities of the game can represent the main aspect to influence for a good result on the variables of greater intensity during the game, as mentioned by Serrano, Gómez-Carmona, Bastida-Castillo, Rojas-Valverde, & Pino-Ortega (2020) where loads differ significantly as a function of altitude.

Regarding the basic measures expressed in Chart 1, we observe that there are similarities with what is reported in the other articles. Our sample by playing position presents height values between 177.33 and 182.97 cm and weight between 74.38 and 76.70 kg. Several studies observed reported height values of 180 cm and 78.28 kg in Brazilian players (Herdy, 2015), 173 cm and 69.2 kg for Chilean players (Rodríguez-Rodríguez, López-Fuenzalida, Holway & Jorquera, 2019), values of 181.2 cm and 81.4 kg for goalkeepers, 178.1 cm and 77.1 kg for defenders, 172.9 cm 71.7 kg for midfielders and 176.6 cm and 75.2 kg Chilean strikers (Joruqera et al., 2013), and 182.5 cm and 76.8 kg in Spanish players (López, Fernández-Luna, Viejo, & Sénchez, 2017). This indicates similar values of size and weight among the players of the Xolos team from Tijuana with those reported in the literature, although in most of these studies, are significant differences in in-game position. However, in this research, no differences were observed in the game position for these measures.

Regarding body composition, Arana, Gordillo, Vielma, León, Mora & Rengel, (2021) report mean values of 23.74% fat mass and 44.11% muscle mass in Venezuelan players. An article published in 2005 on selected Mexican players (Rodríguez and Echegoyen, 2005) indicates that the values of percentage of fat were 10 ± 1.65 and muscle mass of 49 ± 1.39 values very similar to those reported for Spanish players (López et al ., 2017) as well as weight and height in goalkeepers (López-Gajardo, González-Ponce, Pulido, García-Calvo, & Leo, 2020) In the case of our sample, the values by position do not present statistical differences when comparing them (goalkeepers 11.61 ± 1.88, defenders 10.79 ± 1.33, midfielders 10.48 ± 0.84, forwards 11.04 ± 1.56); In the case of fat mass, the values are similar to those reported by Rodríguez & Echegoyen (2005), López et al., (2017) and Ceballos-Gurrola (2021) but lower than the Venezuelan players (Arana et al., 2021).

For muscle mass, our study presents the limitation that only the two-component model, fat mass and lean mass, was calculated, which does not differentiate muscle mass from bone mass, skin, and residual tissue, a difference that is narrated in other works on soccer players, so we could not make a comparison with alternative samples, in addition to this, the body composition based on equations is considered, which may represent a bias due to the low specificity of these equations on the different types of athletes, however, the study carried out by Lozano-Berges, Matute-Llorente, Gómez-Bruton, González-Agüero, Vicente-Rodríguez, & Casajús (2019), indicates that there are no differences when comparing different equations, including Faulkner's that was used in this study to calculate the percentage of fat in soccer players, despite this, its proposal is to use equipment with higher technology such as dual-energy X-ray absorptiometry (D EXA) to ensure a more accurate measurement.

When evaluating the sum of folds and in the somatotype, there were no differences when comparing by game position in the evaluated sample, since the predominance is mesomorphic, as in various studies presented in soccer players (Rodríguez and Echegoyen, 2005; López et al., 2017; Joruqera et al., 2013; Zúñiga et al., 2018;

Hernández-Mosqueira, 2022; Rodríguez, Montenegro & Petro, 2019; Joruqera, Rodríguez, Torrealba, Gracias & Holway, 2013).

Within the limitations of the study, it is possible to mention that the statistical data may seem weak due to two factors. The first is that it is a team sport that must be evaluated during the competitive matches of the tournament, so the selected sample was those starting players in all the matches. Despite this, the results give us the beginning to continue studying variables related to the sports performance of soccer players and how the altitude associated with other variables influences sports performance.

CONCLUSION

Due to the above, it is possible to conclude that physical performance in-game actions that require greater intensity are affected when compared to low and high altitudes when playing, specifically in players who train at sea level. In turn, the relationship between somatotype and sports performance is inverse when comparing endomorphy with high-intensity executed variables.

Sports performance during soccer matches may be affected by competing at different altitudes concerning where training is frequently carried out, since it inferred decreases in the physical capacities of the players evaluated in the MX League, mainly in the anaerobic variables that require higher speed.

Consequently, data such as technical-tactical and strategic data must be considered for further study to obtain from this grouping effects and interactions with greater apogee for a successful game approach.

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