



Evaluation of physiotherapeutic treatments in soccer players with ankle and knee injuries of UNAN-Managua, 2017

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SUMMARY

The evaluation of four physiotherapeutic treatments in soccer players with ankle and knee injuries of UNAN-Managua in 2017 was carried out in a descriptive, correlational and analytical study. Data on sociodemographic and clinical characteristics, degree of pain, swelling of segments and body mass index were analyzed. The statistical analyzes carried out were: descriptive, Pearson Correlation, Factorial Variance Analysis, through Advanced Statistical Modeling. It was applied a Mixed Models to examine the effect of two fixed factors and their possible interaction and Fisher's test (LSD). From the analysis and discussion of the results obtained, the following conclusions were reached: Most of the athletes were from urban origin, with ages between 17 and 20 years old, secondary school and incomplete university in their majority, ligament-type lesions prevailed.

The degrees of pain were according to the BASS scale between 0 to 7; in the pre-treatment evaluation and in the post-treatment evaluation, the pain decreased in categories from 0 to 4; therefore, the pains were intermittent. It was determined in the analysis by segment and location that in the right knee the pain was manifested in the former side; the pain in the left knee was manifested in the former and back side. Regarding pain in the ankles, it appeared on

both sides of the former side. The Pearson correlation between the right and left segments of the body, provided evidence of significant correlation ($p=0.001$). It was demonstrated that there are no significant differences in the physiotherapeutic treatments, gender of the athletes, as well as their interaction (p value = 0.5026, 0.3278 and 0.7697.) The best model evaluated was the *Variance Analysis in DCA, Bifactorial with interaction effect, without the random effects of Sportsman and Team*, obtaining the lowest values of AIC and BIC.

INTRODUCTION

The sports discipline, like football is high performance, subjecting the body to intensities of loads and training that can lead to the appearance of injuries or aggravation of minor discomfort. In soccer injuries by overload or overuse are more common than acute injuries, with a frequency that is usually around 90%. In the present study, the National Human Development Plan (PNDH) was taken as a reference and as a line of research the Public Health and Biomedicine. The main purpose of this study is reducing the frequency of injuries in the sports discipline such as football. As study subjects were taken the athletes from the UNAN –Managua Major sport to whom socio-demographic characterization, and clinical characteristics were identified besides that, the relationship between body mass index and injuries was determined, as well as the analysis of the effectiveness of the four Physiotherapy treatments applied during the investigation.

The population was made up of 80 active players of the soccer sport discipline as a measurement unit, who had to fulfill the criteria such as being an active athlete of the discipline, presenting physical health in the knee and ankle, having signed an informed consent letter and agreeing to be a participant in the study.

MATERIAL Y METHODS

According to the *research method*, the present study is observational and according to the *initial level of depth of knowledge* it is descriptive (Piura, 2006). According to the classification of Hernández, Fernández and Baptista (2014), the type of study is correlational. In agreement, at the time of occurrence of the facts and record of the information, the study is prospective; for the period and sequence of the study is longitudinal and according to the analysis and scope of the results the study is analytical (Canales, Alvarado and Pineda, 1996).

In the field of physiotherapy and according to its particular characteristics, the present study was established through a Quasi-experimental Design (Pedroza, 2016). As stated by Hernández (2014). The study subjects (the athletes) were not randomly assigned to the groups in a predefined way, but these groups and their repetitions were already pre-established before the experiment, these were already formed independently, therefore, the data were organized

according to the logic of a Quasi-experimental design. On the other hand some inclusion criteria were met, such as: active sportsmen of the soccer discipline, present physical health in knee and ankle, have signed informed consent letter and agree to participate in the study.

Regarding the approach of the present research, by the use of quantitative data analysis and qualitative information, as well as its integration and holistic and systemic discussion of various qualitative and quantitative research methods and techniques, this research is carried out through the application of the Mixed Philosophical Approach, Hernandez (2014). Regarding the level of commitment of the researcher, the research adheres to the Socio-Critical Paradigm; According to this position, all knowledge depends on the practices of the time and experience. There is not, in this way, a pure theory that can be sustained throughout history Pérez Porto (2014). Because it is analytical, the present study establishes the comparison of variables between study and control groups. Hypothesis testing is done through the Analysis of Variance (ANOVA); a design was used in which the treatments are assigned completely randomized to the experimental units of treatment.

Treatment	Description
Diclofenac gel	Application of 6 mg of Diclofenac gel in the area to be treated Knees (3.5mg) and ankles (2.5mg), After 5 minutes of the absorption, the application is made 15 minutes before performing the exercise.
Sports Zepol	Application of 3 mg zepol in the area to be treated, rub with the cream for 5 minutes to cover the area to be treated; the application is made 15 minutes before the exercise.

Table continues on next page

Treatment	Description
Neuromuscular bandage	<p>Technique used in ligament-tendon.</p> <p>Knee: First tape: The base of the bandage is on the warm anterior face, diagonally towards the inner side of the thigh with a stretch of 70%.</p> <p>Second tape: The base of the bandage is on the warm anterior face, diagonally towards the outer side of the thigh with a stretch of 70%. This bandage is sent for 3 days.</p> <p>Ankle: First tape: The base of the bandage is on the internal malleolus without distension of the same, it passes under the foot with a stretch of 70% and is anchored above the external malleolus which also does not adhere without tension.</p> <p>Second tape: goes from the internal malleolus to the external on the anterior part of the ankle with horizontal direction from one point to another, is applied with a tension of 70%, the bases adhere without tension. This bandage is sent for 3 days, twice a week.</p>
Thermotherapy	Cold with a temperature of 2 ° to 5 ° is applied, with a therapeutic time margin of approximately 15 minutes of application.

The letter of informed consent was given to the athletes to apply the different data sheet guides and a trainer interview was carried out, in this way the data will be extracted and then processed for scientific purposes. The data collection instruments were applied simultaneously in the following order: The informed consent letter was delivered to the director of the sport department and to the team coaches, later to the athletes that make up the football teams of UNAN-Managua. After the informed consent, the application of data sheet was made to each of the players and the interview to the coaches; these instruments were applied individually to each one of the athletes selected in their first visit to training, performing, at the end of the

week, the collection of data through the instruments, in order to analyze the results obtained in the study.

According to the nature of each of the variables (**quantitative or qualitative**) and guided by the commitment defined in each of the specific objectives, the descriptive analyzes corresponding to the nominal and numerical variables were carried out, including: (a) The frequency analysis, (b) descriptive statistics according to each case. In addition, graphs of the type will be made: (a) pastel or bars in a univariate way for variables of categories in the same Cartesian plane, (b) chart of boxes and whiskers for numerical, discrete or continuous variables.

Relevant Contingency Analysis was performed (Crosstab analysis) for all those parametric variables, to which the Pearson Correlation test was applied. For the specific inferential analyzes or hypothesis testing, regarding to the commitment established in the specific objective number four, the Factorial Variance Analysis was performed, using Advanced Statistical Modeling, applying the Mixed Models to examine the fixed effect of two factors and their possible interaction. In addition, the Fisher's test was applied LSD test. According to their particular characteristics, as in this research, the subjects of the study, the athletes, were not randomly assigned to the groups in a predefined way (teams), but these groups (teams) and their repetitions were already prefixed before the experiment, these are already formed independently, therefore, the data were organized according to the logic of a Quasi-experimental design with balanced data (Hernández, Fernández, & Baptista, 2014, page 151).

RESULTS

In the socio-demographic variable origin, it can be seen that of the total of the participants in the study, 56% belong to the urban area, 10% to the rural area and 34% to the suburban zone. The age of the athletes is presented, who have an average age of 18.63 years, with a confidence interval for the average of 95%, with a Lower Limit (L.I.) of 17.93 years and a Upper Limit (L.S.) of 19.32. The box and whisker plot in Figure 3, allows to interpret an interquartile range (Q3 - Q1) that accumulates 50% centered on the age of the athletes; between the ages of 17 and 20 years old, in Q1 25% of the youngest children under the age of 17 accumulate and in Q4, 25% of the older athletes accumulate over 20 years of age. At the same time, the figure shows 4 atypical data with ages from 26 to 28.

The variable schooling of the athletes studied shows that 41% attended incomplete secondary school; followed by 36% with incomplete university; 15% with full secondary; 5% with a full university and 3% with a higher technical degree. Regarding the occupation of the total of the athletes, 84% are active students and do not perform any work activity; 15% prefer to dedicate themselves to professional athletics; and 1% work privately on their own. As for the incidences of previous injuries, of the total of the athletes, 66% did not present lesions prior

to the study and 34% did present previous injuries. As for the athletes with previous injuries, 63% presented ligamentous injuries; 30% showed muscle-type lesions and only 7% previously showed bone-type lesions. The use and application of warm-ups and stretches prior to training, the graph shows that 99% of the athletes performed warm-ups and 98% did stretching prior to training.

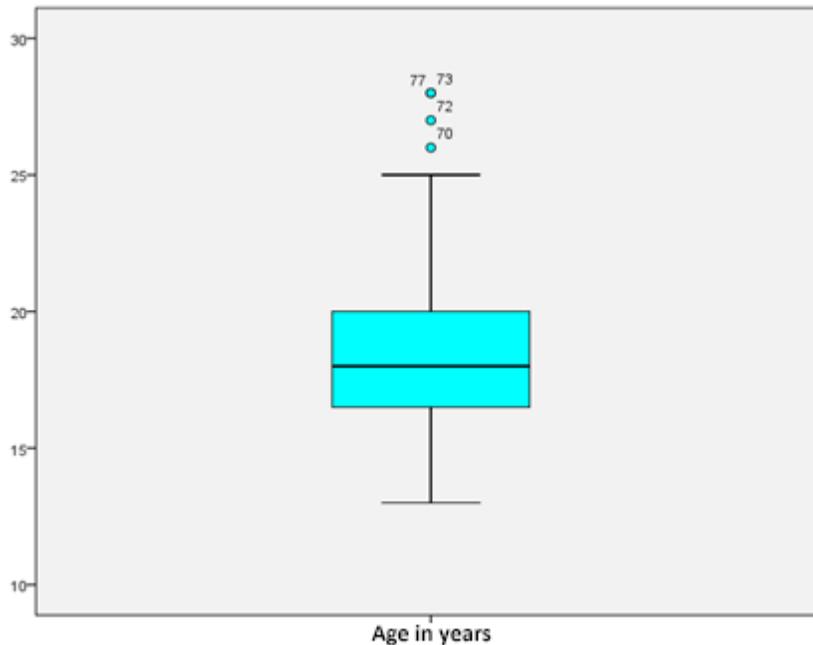


Figure: Age in years.

In this graph it is presented the weight of the athletes, who have an average of 131.05 pounds, with a confidence interval for the average of 95%, with a Lower Limit (L.I.) of 127.52 pounds and a Upper Limit (L.S.) of 134.58 pounds. The box and whisker plot allows us to interpret an interquartile range (Q3 - Q1) that accumulates 50% of the weight of the athletes, between 140 and 120 pounds approximately, in Q1 25% of the youngest accumulates below 120 pounds of weight and in Q4, 25% of the weight of athletes greater than 140 pounds is accumulated.

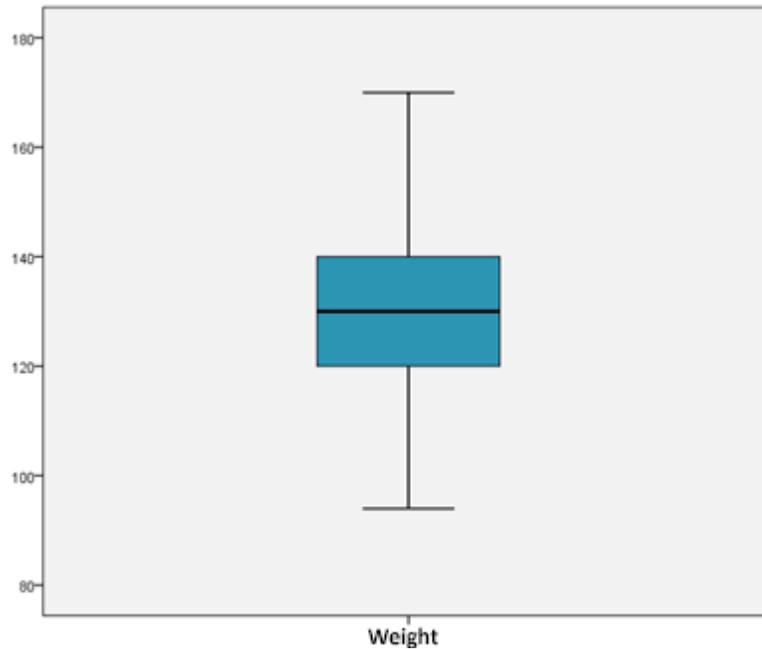


Figure: Weight.

The following graph shows the size of the athletes, who have an average of 1.65 meters in height, with a confidence interval for the average of 95%, with a Lower Limit (LI) of 1.63 meters and a Upper Limit (LS) of 1.66 meters of size. The box and whisker plot, allows us to interpret an interquartile range (Q3 - Q1) that accumulates 50% of the athletes' height, between 1.70 and 1.60 meters in height, in Q1 25% of the youngest ones accumulate by under 1.60 meters of height and in Q4, 25% of the largest athletes accumulate over 1.70 meters of height.

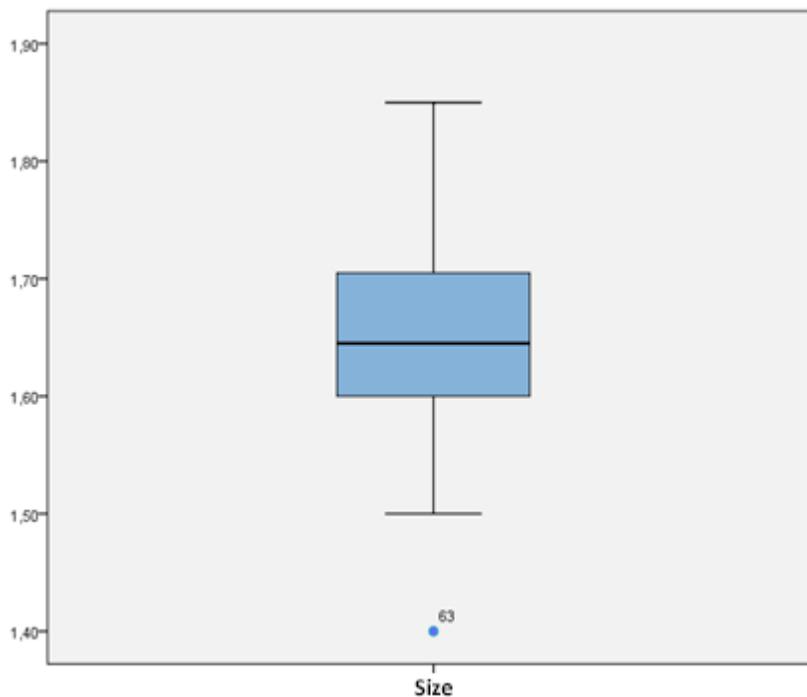


Figure: Size

In water consumption in training, the graph shows that 58% consume water before, during and after training; 31% consume water only after training; 9% consume water only during training and 3% consume water before training respectively. The degree of pain present in the pre-evaluation of athletes in which 78% of them presented zero in degree of pain, according to the BASS scale; 9% with degree of pain in three; 4% with degree of pain in four; 3% in degree of pain two and five respectively; 1% in degree of pain one, six, seven and eight, according to the BASS scale. The degree of pain after treatments indicates 84% with zero degree of pain; 5% with degree of pain two; 4% with degree of pain 1,5; and 3% with degree of pain. 4. The frequency of pain of the athletes under study, of the total of the athletes, 89% showed intermittent pain and 11% presented constant pain. The anterior drawer maneuver pretreatment shows that 99% of the athletes presented a negative behavior to the test and only 1% was positive the test. The anterior drawer maneuver post-treatment shows that 98% of the athletes in the study were negative and 3% positive. The maneuver of the anterior drawer in pretreatment knee shows that 86% of the athletes showed a negative behavior to the test and only 14% were positive the test. The maneuver of the anterior drawer in the post-treatment knee shows that 94% of the athletes in the study were negative and 6% positive. 10% of all players consume tobacco; of all the players, 14% consume alcohol and 3% of the total, consume some type of medication.

		Body Mass Index	Knee D	Knee I	Ankle D	Ankle I
Body mass index	Pearson correlation	1	.139	.144	.020	.013
	Sig. (bilateral)		.218	.202	.861	.910
	N	80	80	80	80	80
Knee D	Pearson correlation	.139	1	.970**	.559**	.551**
	Sig. (bilateral)	.218		.000	.000	.000
	N	80	80	80	80	80
Knee I	Pearson correlation	.144	.970**	1	.581**	.572**
	Sig. (bilateral)	.202	.000		.000	.000
	N	80	80	80	80	80
Ankle D	Pearson correlation	.020	.559**	.581**	1	.998**
	Sig. (bilateral)	.861	.000	.000		.000
	N	80	80	80	80	80

		Body Mass Index	Knee D	Knee I	Ankle D	Ankle I
Ankle I	Pearson correlation	.013	.551**	.572**	.998**	1
	Sig. (bilateral)	.910	.000	.000	.000	
	N	80	80	80	80	80

Interpretation of the result obtained from the ANACORR

The **Pearson Correlation analysis** performed for the **body mass index and degree of inflammation in knees (D / I) and ankles (D / I)**, provided the evidence of a $p = 0.218; 0.202; 0.861; 0.910$, respectively, which turned out to be **greater** than the critical comparison level $\alpha=0.05$. Therefore, the null hypothesis of H_0 is **accepted: $\rho = 0$** ; this means that the statistical response obtained is a non-significant correlation. The **Pearson Correlation** performed for **knee D** and **knee I** and **ankles (D / I)**, provided evidence of a $p = 0.000; 0.000; 0.000$, respectively, which turned out to be **less** than the critical comparison level $\alpha = 0.05$. Therefore, the null hypothesis of H_0 is **rejected: $\rho = 0$** ; This means that, the statistical response obtained is a significant correlation. The **Pearson Correlation** performed for **knee I** and **knee D** and **ankles (D / I)**, provided the evidence of a $p = 0.000; 0.000; 0.000$, respectively, which turned out to be **less** than the critical comparison level $\alpha = 0.05$. Therefore, the null hypothesis of H_0 is **rejected: $\rho = 0$** ; means that, the statistical response obtained is a significant correlation. The **Pearson Correlation** performed for the **ankle D** and **knees D / I** and **ankles I**, contributed the evidences of a $p = 0.000; 0.000; 0.000$, respectively, which turned out to be **less** than the critical comparison level $\alpha = 0.05$. Therefore, the null hypothesis of H_0 is **rejected: $\rho = 0$** ; therefore, the statistical response obtained is a significant correlation. The **Pearson correlation** made for the **ankles I** and **knees D / I** and **ankles D**, provided the evidence of a $p = 0.000; 0.000; 0.000$, respectively, which turned out to be **less** than the critical comparison level $\alpha = 0.05$. Therefore, the null hypothesis of H_0 is **rejected: $\rho = 0$** , this means that the statistical response obtained is a significant correlation.

Effect of the physiotherapy treatments evaluated, in relation to the degree of pain and the degree of inflammation of knees and ankles

In the **Diagnosis of the Normality of the Residues of the Model: $r = 0.926$** it is observed that in both variables, the residuals **do not** approach a normal distribution function, given that values of $r \leq 0.94$ were obtained, demonstrating the need for modeling Advanced statistics through the application of the **Mixed Models**.

Diagnosis of the Homocedasticity of the Residues of the Model

The homoscedasticity of the standardized residuals for the variables **Dif_ (ExAntes and ExPost) and Rango_Dif_ (ExAntes and ExPost)**, was diagnosed by the Levene Test. It is observed that the Levene test provided statistical evidence of > 0.9999 **ns**, which shows the homoscedasticity of the standardized residuals for both variables, *demonstrating that the treatments are comparable to each other.*

Diagnosis of the Model Waste Independence

The Independence of standardized residuals for the variables **Dif_ (ExAntes and ExPost) and Rango_Dif_ (ExAntes and ExPost)**, was verified by the Dispersion chart. The results obtained for both variables are presented in Figure 39, in which it is observed that for both variables there was no trend pattern between the values of the residuals and those predicted by the model, *which shows that there is no correlation defined in the residuals of both models.*

	Model	df	AIC	BIC	logLik	Test	L.Ratio	p-
value								
mlm.modelo.000_RANG_Dif_E..	1.00	9	663.53	684.02	-322.77	1.00		
mlm.modelo.001_RANG_Dif_E..	2.00	10	656.01	678.64	-318.01	2.00	9.52	0.0020
mlm.modelo.002_RANG_Dif_E..	3.00	12	659.01	686.16	-317.50	3.00	1.00	0.6055
mlm.modelo.003_RANG_Dif_E..	4.00	13	658.15	687.56	-316.07	4.00	2.86	0.0909
mlm.modelo.004_RANG_Dif_E..	5.00	11	656.33	681.22	-317.16	5.00	2.18	0.3361

The improvement in the quality of the statistical analysis of the fixed factors is verified by the model indicators, the Akaike Index Criteria (AIC) and the Bayesian Index Criterion (BIC), which, as they are smaller, indicate that improved the normality and homoscedasticity of the residues, thus improving the quality of the statistical analysis carried out (Di Rienzo, 2011). The most relevant results obtained in the present study (table 15) show that when comparing the five models, **000, 001, 002, 003 and 004**, it was observed that the lower value of AIC=656.01 and BIC=678.64 corresponds to them to **model 001**, which turns out to be significant with a **p value = 0.0020**, according to the **Likelihood Test** that provided the evidence of an L. Ratio = 9.52. This indicates that it is the **model 001** that best explained the results obtained in comparison with the rest of the evaluated models, being in essence a **variance analysis model in DCA, Bifactorial with Interaction effect.**

The results obtained from the hypothesis tests of **model 001** are presented, which is the reference to follow as the best model evaluated, observing **non-significant** differences of the effect of the fixed factors “Physiotherapeutic treatment” and “Gender”, with **p value = 0.5026** and **p value = 0.3278** respectively. In addition, no significant effect of physiotherapeutic

treatment interaction * gender was shown, with *p value* = 0.7697. The effect of covariance due to the covariate size, was **not** significant with *p value* = 0.3551.

Tests of marginal hypotheses of the Model 001.

Factor	Num. GL	Den. GL	Valor F	<i>p-value</i>
Treatment	3	71	0.79	0.5026 ns
Gender	1	71	0.97	0.3278 ns
Treatment: Sex	3	71	0.38	0.7697 ns
Size	1	71	0.87	0.3551 ns

The results obtained in the present study provided evidence that athletes tend to present pain previously produced injuries. 34% presented injuries that had previously occurred, which coincides and confirms the approach of Vargas (2010). It also provides evidence that physical activity, such as sports, training two hours a day, 5 days a week, reduces the appearance of tear and obesity, which coincides with the approach of Rivera (2015). Another evidence that is shown is that the main ligament affected is the patellar tendon, presenting intermittent pain in the anterior area, which coincides with the approach of Bueno (2017). The results affirm that, 14% of the sportsmen in study consume alcohol, 10% consume tobacco, which coincides and corresponds with the exposition of Mantilla, who explains that the consumption of tobacco and alcohol has effects on the physical condition of the athletes

When performing the Pearson correlation tests between the variables of **body mass index and degree of inflammation in knees (D / I) and ankles (D / I)**, shows the evidence of *p* = 0.218; 0.202; 0.861; 0.910, this means that there is no significant correlation between these study variables. This phenomenon is explained as follows, the study was aimed at healthy and active athletes, to be able to apply preventive treatments, in such a way, the players under study relatively were free of injuries which during the measurement of the inflammation was zero of inflammation, their body mass index was found to be correctly regulated, for these reasons, the response of the Pearson test was not significant.

For the analysis of **Pearson correlation** performed for **knee D with knee I and ankles (D / I)**, he provided evidence of a *p* = 0.000; 0.000; 0.000, respectively; This means that the statistical response obtained is a significant correlation. When analyzing these results, it is clearly shown that the correlation of the Pearson test in the measurements of the ankles and knee is significant due to the body’s anthropometric measurements. The modeling done by means of mixed models, allowed to better define the model finally evaluated, a Variance Analysis in DCA, Bifactorial with Interaction effect, without the random effects of Sportsman and Team. The best model, with lower AIC and BIC, was the Model 001, which allowed determining non-significant differences in the effect of the fixed factors “Physiotherapeutic treatment” and

“Gender”, with *p value* = 0.5026 and *p value* = 0.3278 respectively. In addition, no significant effect of physiotherapeutic treatment interaction * gender was shown, with *p value* = 0.7697.

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