Characterization of Beginner Crossfit athletes in the city of Bucaramanga – Colombia

Caracterização de atletas iniciais de Crossfit na cidade de Bucaramanga - Colômbia

Maria Alejandra Camacho Villa
Magister en Fisioterapia
Instituição: Unidades Tecnológicas de Santander
Endereço: Av. Los Estudiantes #9-82, Bucaramanga, CEP: 680011 - Santander - Colombia
E-mail: mcamacho@correo.uts.edu.co

Juan Pablo Florez Vera
Graduado Profesional Actividad Física y Deporte
Instituição: Unidades tecnológicas de Santander
Endereço: Av. Los Estudiantes #9-82, Bucaramanga, CEP: 680011 - Santander - Colombia
E-mail: juanpflorez06@outlook.com

Giovanny Diaz Quintero
Graduado Profesional Actividad Física y Deporte
Instituição: Unidades tecnológicas de Santander
Endereço: Av. Los Estudiantes #9-82, Bucaramanga, CEP: 680011 - Santander - Colombia
E-mail: nani-3247@hotmail.com

Guillermo Andrés Rodriguez Gomez
Doctor en educación deportiva y ciencias aplicadas al deporte
Instituição: Unidades tecnológicas de Santander
Endereço: Av. Los Estudiantes #9-82, Bucaramanga, CEP: 680011 - Santander - Colombia
E-mail: guillermoarg0701@hotmail.con

José Luis Jaime Gil
Maestría en Pedagogía de la Cultura física- Entrenamiento Deportivo.
Instituição: Unidades Tecnológicas de Santander
Endereço: Av. Los Estudiantes #9-82, Bucaramanga, CEP: 680011 - Santander - Colombia
E-mail: jljaime@correo.uts.edu.co

Ingrid Johanna Díaz Marín
Magister en Fisioterapia
Instituição: Unidades tecnológicas de Santander
Endereço: Av. Los Estudiantes #9-82, Bucaramanga, CEP: 680011 - Santander - Colombia
E-mail: ingridd@correo.uts.edu.co

ABSTRACT
Introduction: In the last decade, the practice of CrossFit has become a training alternative that involves high intensity functional movements, which is why it has been increasing its practice

exponentially, to this is added the commercial and marketing component in Colombia to through television programs. However, due to the complexity and demand in its performance, it has resulted in a discipline where certain indications and precautions must be followed, which raises concerns in health and training professionals, related to those people who start their practice. **Objective:** The purpose of the study was to characterize the most frequent injuries in beginning CrossFit athletes. **Methodology:** This cross-sectional study had a sample of 43 athletes, from gyms dedicated to training in this discipline, including the only two BOX centers Certified by the CrossFit company in the city of Bucaramanga. The information gathering technique was a closed interview. This study was approved by the ethics committee of Unidades Tecnológicas de Santander. **Results:**The mean age was 29 years, 54% female. 41% of the population reported 1 to 2 years of experience, followed by 3 to 4 years with 25.5%. The body mass index (BMI) was 24.97 ± 2.6 Kg / m2. 53.5% of the athletes trained an average of 4 to 5 times per week. 65% reported a day off in the training week, the majority (95%) reported supervision and advice from a professional. The regions of the body with the highest reported number of injuries are: shoulder (26%), knee (16.2%) and spine in the lumbar area (14.5%). The most recurrent type of injury was tendonitis (55%) and muscle tear (15%). **Conclusion:** The professionals who supervise the beginner athlete (1-3 years) should focus the adequate execution of the movements that involve the regions identified in the study, in the realization of the Work of the Day (WOD). Therefore, these injuries are the product of the high repetitions (volume) and loads (intensity) that involve these joints, characteristic of the discipline.

Keywords: athletes, high-intensity interval training, injuries.

RESUMO
Introdução: Na última década, a prática de CrossFit tornou-se uma alternativa de formação que envolve movimentos funcionais de alta intensidade, razão pela qual tem vindo a aumentar exponencialmente a sua prática, a que se junta a componente comercial e de marketing na Colômbia, através de programas de televisão. No entanto, devido à complexidade e exigência no seu desempenho, resultou numa disciplina onde certas indicações e precauções devem ser seguidas, o que levanta preocupações na saúde e na formação de profissionais, relacionadas com as pessoas que iniciam a sua prática. Objectivo: O objectivo do estudo foi o de caracterizar as lesões mais frequentes no início da prática de CrossFit por atletas. Metodologia: Este estudo transversal teve uma amostra de 43 atletas, de ginásios dedicados ao treino nesta disciplina, incluindo os dois únicos centros BOX certificados pela empresa CrossFit na cidade de Bucaramanga. A técnica de recolha de informação foi uma entrevista fechada. Este estudo foi aprovado pela comissão de ética das Unidades Tecnológicas de Santander. Resultados:A idade média foi de 29 anos, 54% do sexo feminino. 41% da população relatou 1 a 2 anos de experiência, seguida de 3 a 4 anos com 25,5%. O índice de massa corporal (IMC) foi de $24,97 \pm 2,6$ Kg / m2. 53,5% dos atletas treinaram uma média de 4 a 5 vezes por semana. 65% reportaram um dia de folga na semana de treino, a maioria (95%) reportou supervisão e aconselhamento de um profissional. As regiões do corpo com o maior número de lesões relatadas são: ombro (26%), joelho (16,2%) e coluna vertebral na zona lombar (14,5%). O tipo de lesão mais recorrente foi a tendinite (55%) e a laceração muscular (15%). Conclusão: Os profissionais que supervisionam o atleta principiante (1-3 anos) devem focar a execução adequada dos movimentos que envolvem as regiões identificadas no estudo, na realização do Trabalho do Dia (WOD). Portanto, estas lesões são o produto das elevadas repetições (volume) e cargas (intensidade) que envolvem estas articulações, características da disciplina.

Palavras-chave: atletas, treino em intervalos de alta intensidade, lesões.

1 INTRODUCTION

New trends are presented in the sports field on a daily basis, observing adaptations in the modalities of some sports, rules and form of competition. In the field of Fitness, since 1995 a new sports discipline was established that would eventually take on great importance in the preference of people when choosing a sport, such as CrossFit (1).

CrossFit today has become a training alternative in different parts of the world, which is why it has been increasing its practice exponentially, however, due to the complexity and demand in its performance, it has turned out to be a discipline that requires indications. and precautions, while concerns arise in health professionals for those who start their practice (2). However, over time the risk of injury and the high physical-mental demand that this discipline requires has become very evident (3).

These training programs present a combination of weightlifting and power techniques (deadlift squats, bench presses and presses), exercises from the fitness field, techniques with allusions of sprinter and runners, aerobic exercise and metabolic conditioning that make your physical demand be complex (4,5).

As in all sports, you must have a base in all physical, coordinative and conditional capacities, which allow the body to be brought to its maximum demand and effectiveness according to the discipline. However, the same versatility factor of CrossFit causes people to speed up the time to achieve performances of highly demanding techniques that can lead to injuries. This is mainly presented by the inadequate execution of the technique and by not respecting the principles of progression when trying to perform complex gestures with high loads (6-8).

Previous studies report injury prevalences similar to those of other sports disciplines, although the methodological designs and the way of collecting information are questioned (2, 9-11). Specifically in Bucaramanga, Colombia there are no studies to date that report this type of information necessary for professionals in the area of sports and physical exercise to make decisions based on evidence in aspects related to planning, execution of training and development of the athlete's rehabilitation process. Taking the above into account, the objective of this study was to characterize the most frequent injuries in beginning CrossFit athletes in the city of Bucaramanga, Colombia.

2 MATERIALS AND METHODS

2.1 DESIGN

2.1.1 Descriptive cross-sectional study

2.1.2 Study population

Men and women CrossFit athletes from the city of Bucaramanga belonging to the Boxes certified for the training of this discipline.

2.1.3 Inclusion criteria

Athletes over 18 years of age, signing the informed consent. Participation in at least one certified competition, minimum one year of training (10).

2.1.4 Exclusion criteria

People with alterations in their cognitive, neurological, genetic, visual and / or auditory capacity to whom the questionnaire cannot be applied.

2.1.5 Sample size and sampling

A non-probabilistic convenience sampling was applied in four of the eight BOXs with Crossfit training in the city of Bucaramanga. In this way, 43 athletes who met the inclusion and exclusion criteria were included.

3 STUDY VARIABLES

3.1 SOCIODEMOGRAPHIC VARIABLES

They were recorded in the questionnaire designed for this study. The variables of gender, age, weight, height, BMI, marital status, education, municipality of residence and address, were investigated in order to characterize the athletes.

3.1.1 Variables related to training characteristics

Training supervision variables, time of experience in the discipline, frequency and duration of training, warm-up options, rest days, strength training and other components, practice of another discipline were measured. from the questionnaire (10).

3.1.2 Variables related to injuries

It was investigated by the number of injuries in the last year or some time ago, region of the body injured, type of injury, medical diagnosis, symptoms before the injury, possible cause of injury, attention to the injury, abstention from training due to the injury and perception of the most injured region of the body during CrossFit practice (10).

4 PROCESS /MEASUREMENTS

4.1 PHASE 1

4.1.1 training

It began with the training aimed at students in the tenth semester of the professional cycle in Physical Activity and Sport of the UTS (main researchers) with the previous application of the questionnaire, to clarify doubts and review the form and substance of the questions and facilitate their application in a clear and efficient way.

The questionnaire used was based on the study carried out by Mehrab et al, in the year 2017 in the Netherlands entitled: "Injury incidence and Patterns among Dutch CrossFit Athletes". This was modified by the principal investigators adjusting it to the population context and the objective of the study. This questionnaire does not have data on psychometric properties and a pilot test was not carried out for its evaluation.

4.2 PHASE 2

4.2.1 Information gathering

The collection of the information required the definition of a checklist to define the material and the conditions that would guarantee the quality of the procedure, for which the following elements were included: cockade with the student card, printed survey, table, printed formats of informed consent. This process took place during October and November 2019.

4.2.2 Application of the surveys

The main researchers applied the surveys to the athletes of the 4 BOX CrossFit of Bucaramanga certified for having participated in competitions of this discipline. The initial contact was made with the owner informing the objective of the investigation to be carried out with the athletes; It was established with a personal identification of the interviewer and the cover letter. Subsequently, the reason for the survey of the athletes was explained to the coach, with a duration of approximately 15 minutes; Upon acceptance of participation, the informed consent was read and signed. At the end of the interview, the participation on behalf of the institution was thanked. Once the survey was carried out, it was checked that all the fields were correctly filled out.

5 STATISTICAL ANALYSIS

Central tendency and dispersion measures were applied to describe the sociodemographic characteristics of the study population and graphics to present the results of each of the survey questions. The database was prepared in Microsoft Excel® and later exported to STATA IC 13®.

6 ETHICAL CONSIDERATIONS

According to resolution 8430 of 1993 of the Ministry of Health of the Republic of Colombia, this research was classified in the category No Risk, because the method and the measurement techniques and the questionnaire used in the interview did not modify the biological variables, physiological, psychological or social of the individuals who will participate in the study (Resolution No. 008430 of 1993. Ministry of Health Republic of Colombia). This project was endorsed by the Ethics Committee of the Unidades Tecnológicas de Santander

7 RESULTS

7.1 SOCIODEMOGRAPHIC DESCRIPTION OF THE STUDY POPULATION

In total, 43 surveys were applied to CrossFit athletes from the City of Bucaramanga, registering a female predominance (54%), with an average age close to 30 years (Table 1).

7.2 CHARACTERISTICS RELATED TO CROSSFIT TRAINING.

The athletes registered mostly (95%) supervision and advice by a coach, 41% reported 1 to 2 years of experience, followed by 3 to 4 years with 25.5% of the participants (Figure 1, 2).

Table 1. Sociodemographic characteristics of CrossFit athletes in the city of Bucaramanga

Variable		n (43)
Age (years) *Average ± SD*		$29{,}11 \pm 6{,}43$
Gender *N° (%)*	*Male*	20 (46%)
	Female	23 (54%)
BMI (Kg/m^2) *Average ± SD*		$24{,}97 \pm 2{,}6$
Civil status *N° (%)*	*Unmarried*	29 (67%)
	Married	9 (22%)
	Union in free marriage	5 (11%)
Educational level *N° (%)*	*Primary school*	4 (9%)
	High school	5 (11%)
	Technical education.	4 (9%)
	Technologic education.	23 (54%)
	University academic level	7 (17%)

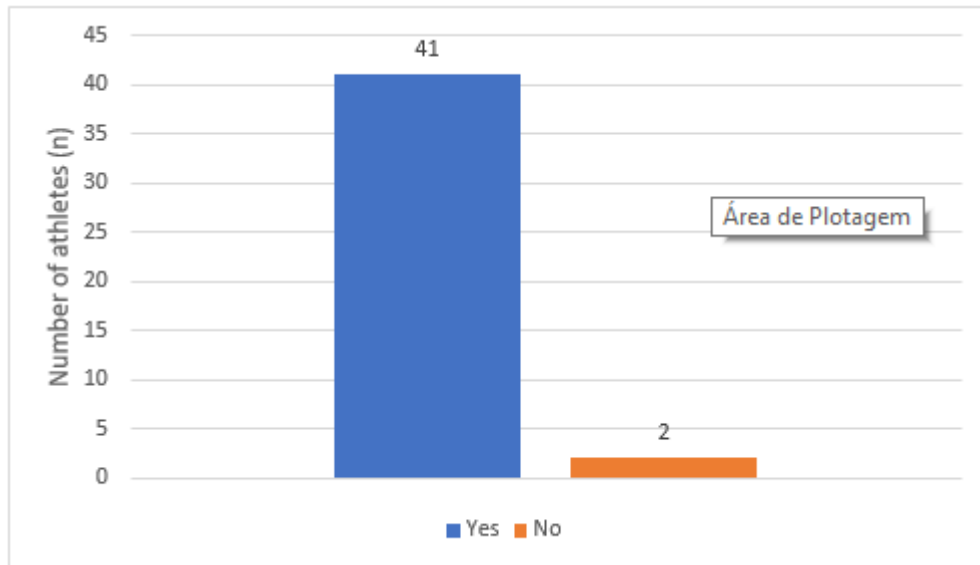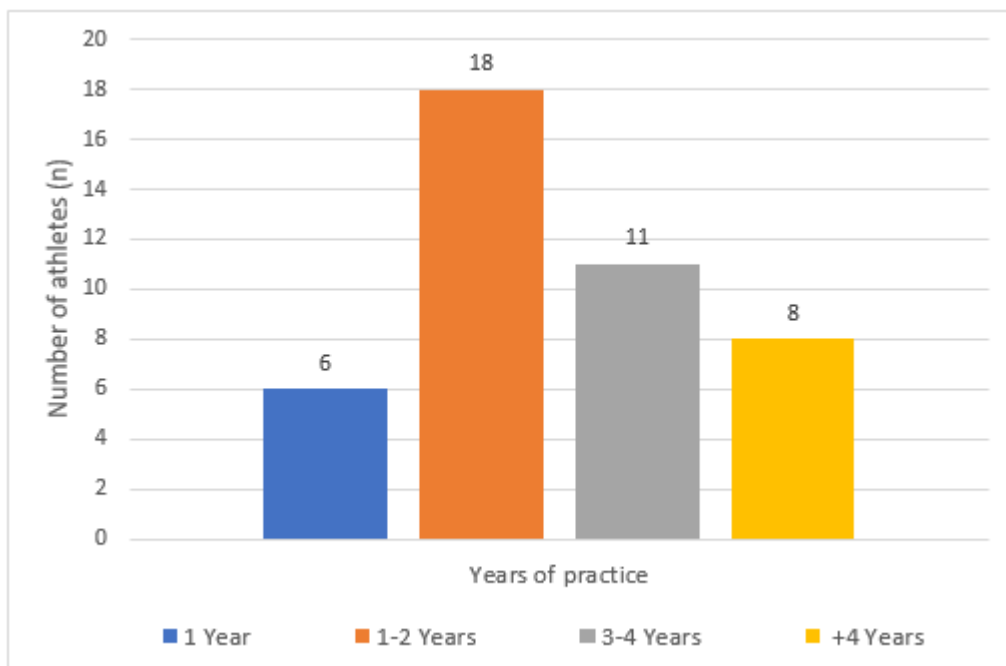Figure 1. Training under the supervision and /or advice of a coach

Figure 2. Years of experience practicing CrossFit

53.5% of athletes train with a frequency of 4 to 5 days a week, followed by 42% between 6 to 7 days. 63% of the participants reported a training session between 1 to 2 hours, with only 25.6% of multiple training in the day (Figure 3, 4, 5).

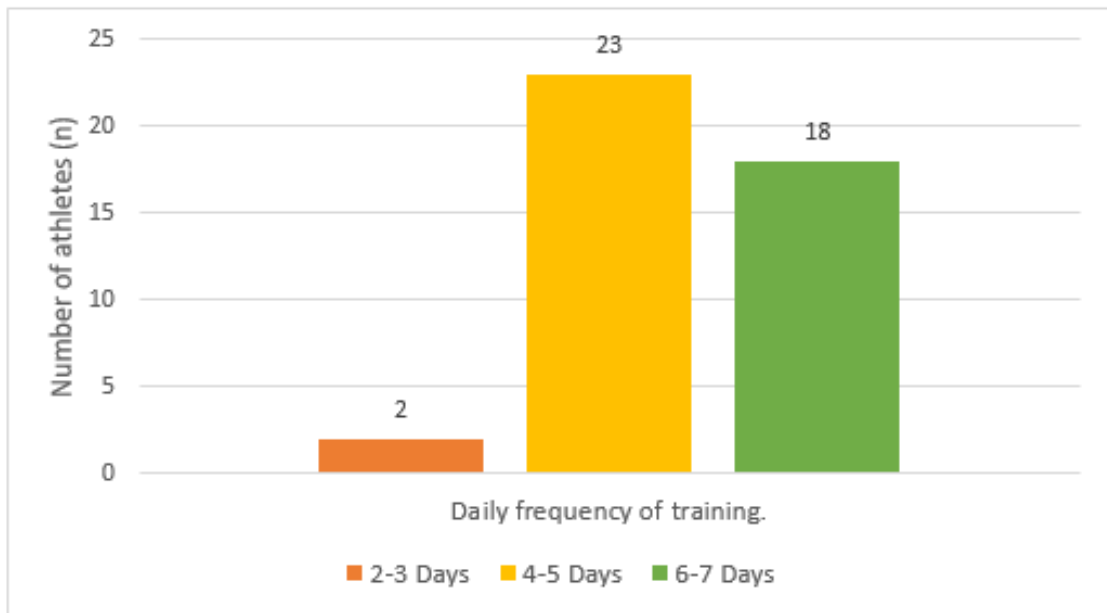Figure 3. Daily frequency of training per week (days)

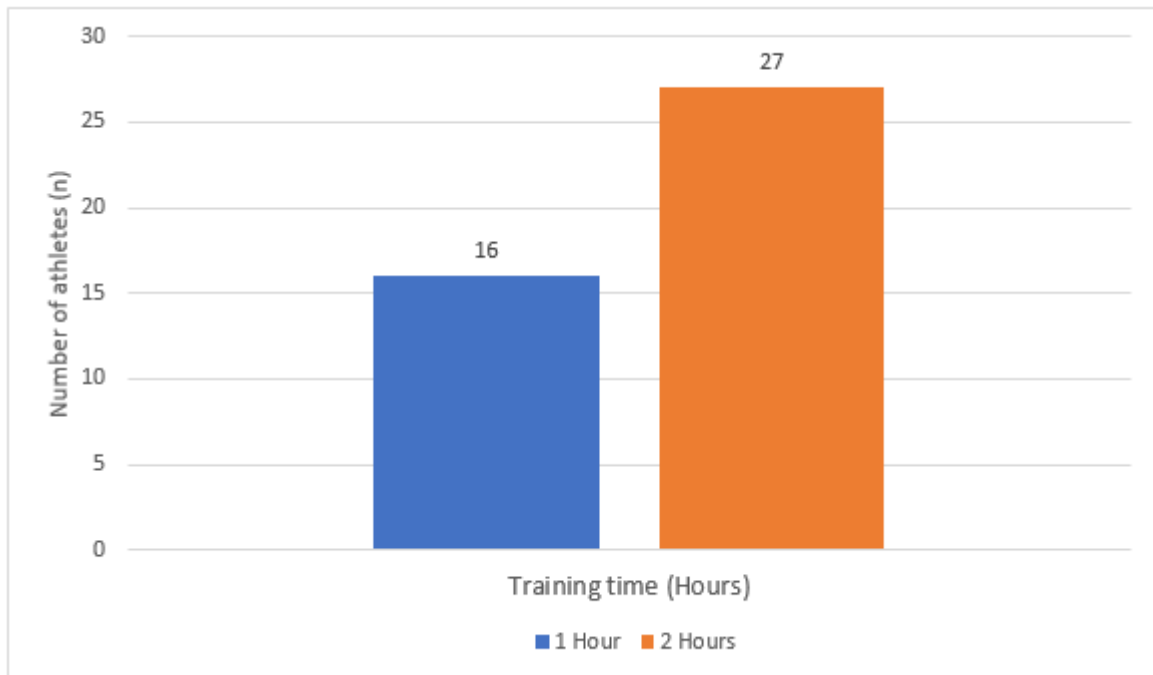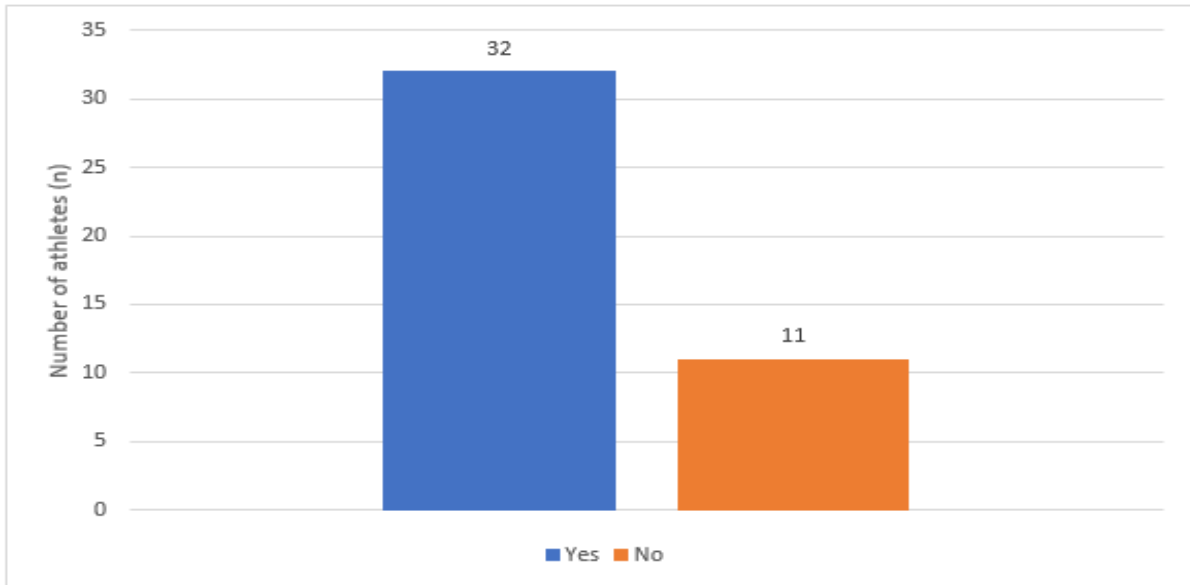Figure 4. Duration of the training session (hours)

Figure 5. Multiple training per day

Among the options used during the warm-up, all the athletes who participated in the survey stated that they used at least one of the warm-up methods mentioned below: stretching, joint mobility, cardiovascular activation, multi-joint exercises and progression in loads. It is important to note that 23 (53%) athletes argued that they use all these pre-training warm-up methods and 16 athletes (37.2%) use 4 of the mentioned methods. 65% of the athletes rest weekly between 0 and 1 day, followed by 28% with 2 days and 7% 3 days (figure 6).

Figure 6. Days of total rest per week
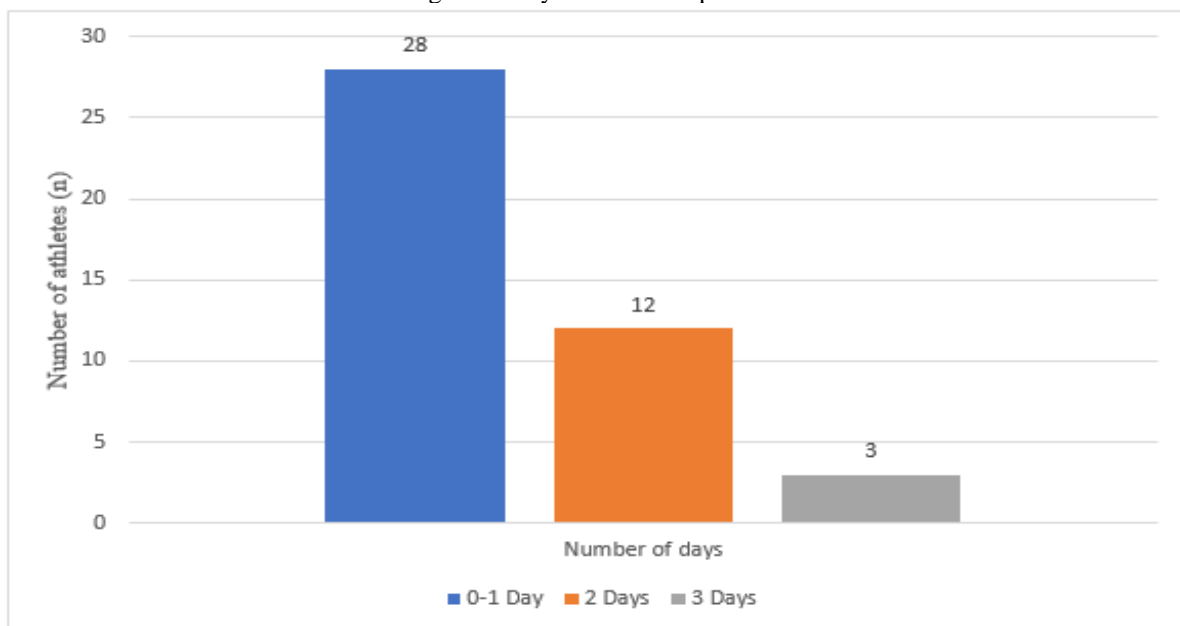
47% of athletes strength train for 2 to 3 days, followed by 44% for 4 to 5 days, and lastly 9% for 0 to 1 days. Regarding the training of skills, the majority of the athletes (48%) registered training between 5 and 6 days a week, 1-2 days and 3-4 days reported the same number of athletes (26%) each one.

60% of the athletes recorded training joint mobility weekly between 1 and 2 days, followed by 26% between 5 and 6 days, and finally with 14% 3 and 4 days (Figure 7, 8, 9).

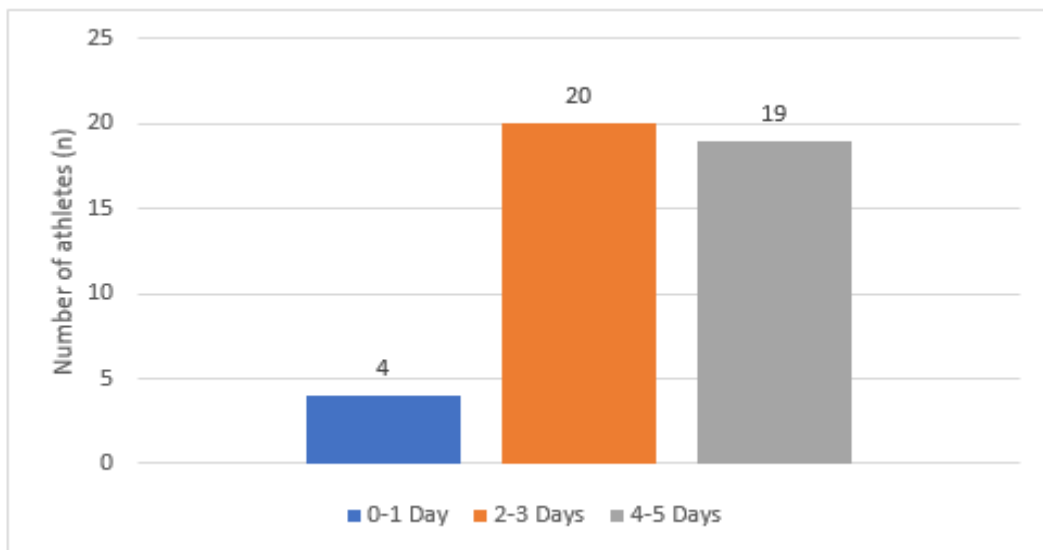Figure 7. Number of days of muscle strength training in the week

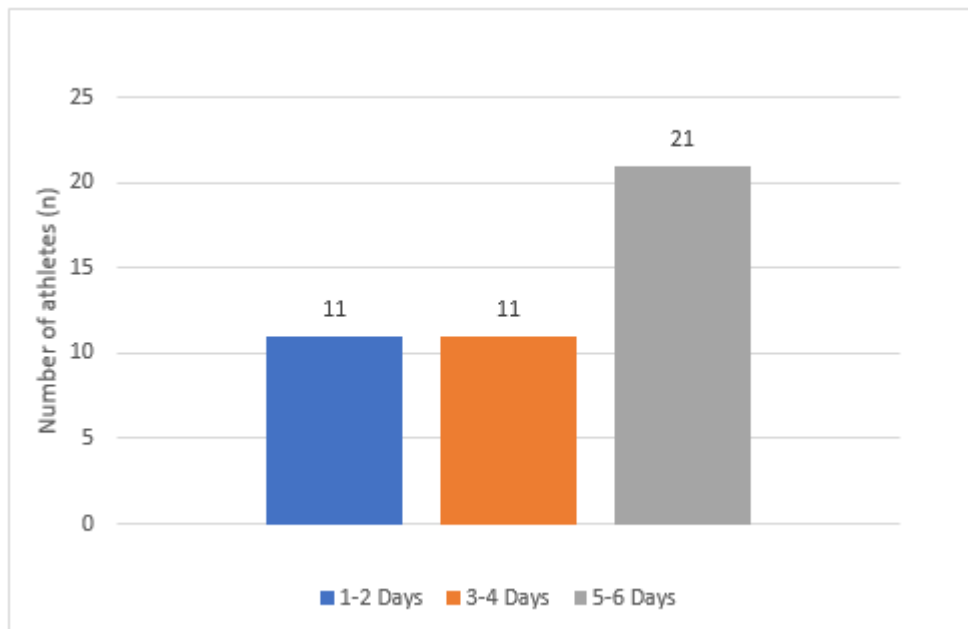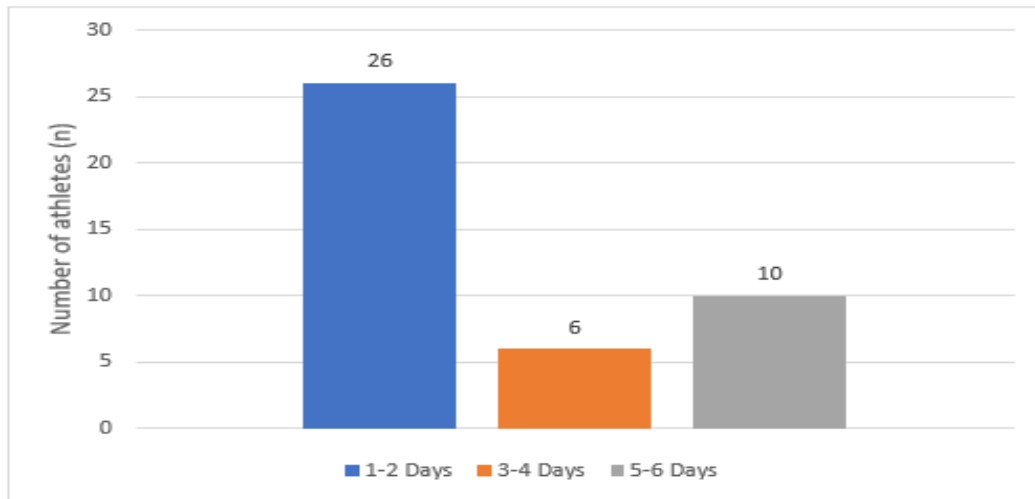Figure 8. Days of skill training in the week

Figure 9. Days of joint mobility and /or flexibility training in the week

In relation to the practice and frequency of doing other sports, 20 of the athletes (46.5%) practice another on a regular basis. Among the most mentioned are cycling (n = 4), volleyball (n = 4), swimming (n = 3), soccer (n = 3), and disciplines such as rugby, weightlifting and dance. However, none of these sports is practiced more than twice a week by the participants and most only do it as a hobby on the weekend for recreation.

8 INJURY-RELATED FEATURES IN CROSSFIT

It is essential to highlight that certain criteria were had in each question in order to qualify the situation of "injury" by the athletes. These criteria were:

1. Total rest from Crossfit training or any other physical exercise routine for more than a week.

2. Modifications of training activities in terms of duration, intensity or mode for more than two weeks.

3. Any physical complaint serious enough to warrant a visit to a healthcare professional.

Taking into account the number of injuries presented in Crossfit during the last 12 months, a total of 16 athletes (37%) stated that they did not have any injuries in this period of time; 19 athletes (44%) suffered an injury in this same time , being the majority of participants. A total of 7 athletes (16%) had two injuries in the last year, and, finally, only 1 (2%) athlete managed to suffer 3 injuries in this time.

Regarding the presence of Crossfit injuries beyond the last 12 months. 10 athletes (23%) had some type of injury. The remaining 33 (77%) stated that they had not been injured before the last year. The body regions with the highest number of injuries reported by athletes were shoulder (25.5%), knee (16.2) and lumbar spine (14%).

Figure 10. Region of the body where injuries were recorded in the last year
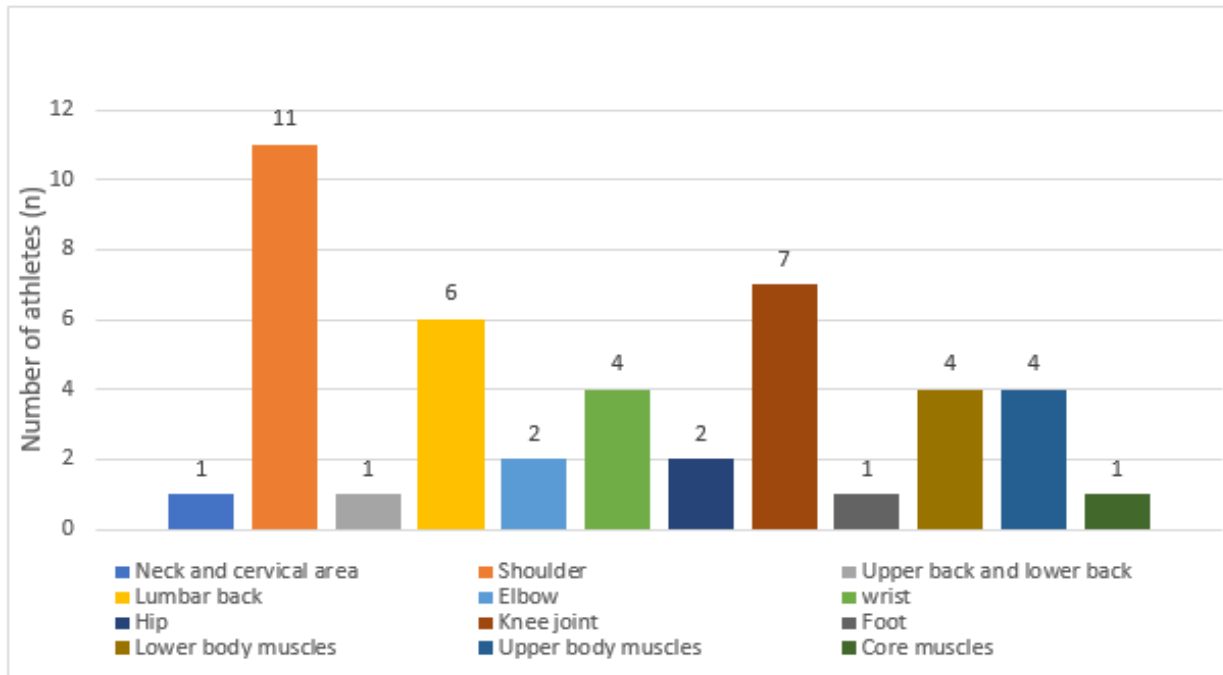
Of the injuries mentioned by the athletes, 27 participants (62.8%) had at least one injury, of which 24 (55.8%) attended the diagnosis and review by a health professional; and the remaining 3 (7%) did not. Of the injuries reported by the athletes, it was evidenced that tendinitis was the most concurrent injury with 15 cases (55%), followed by muscle tear with a report of 4 athletes (15%) and sprain only with 1 report (4%). It should be clarified that among the testimonies of the injured NOT diagnosed there were 7 types of injuries (26%) not specified in the survey (discomfort or pain that prevented the normal development of training).

Regarding abstention from training, 21 athletes (78% of the injured) stated that they had to pause their training session, while the remaining 6 (22%) did not stop their training; even so, they had to modify some aspects (intensity, volume, etc.) in their training routine. A total of 8 athletes (30%) witnessed some discomfort in the area, prior to suffering the injury, and most of the people who suffered an injury, being 19 (70%) did not feel any discomfort.

According to what was reported in the perception of the possible cause of injury, 26.8% mentioned the incorrect execution of the technique followed by 25% fatigue and others. In the other option (25%), the athletes stated the following reasons why they were injured:

• 1 training accident (contusion with the bar).

• 6 occasional accident (unrelated to training).

• 5 accidents in competition.

• 5 absence of heating.

Figure 11. Perception of possible causes of injury
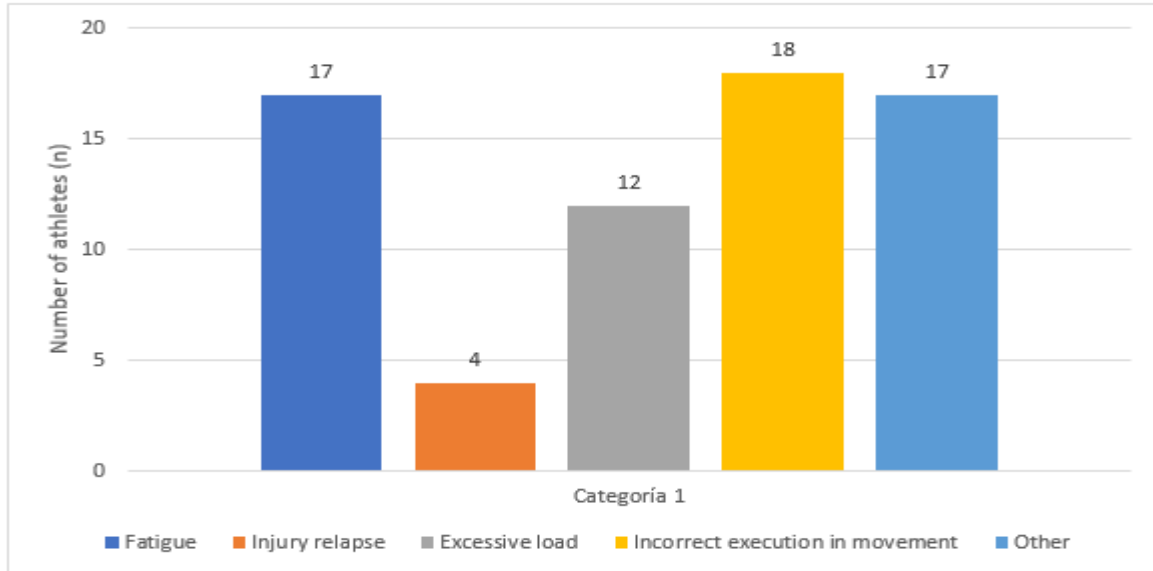
Among the measures taken by the athletes for the treatment of their respective injuries, it was recorded that 41% attended Physiotherapy. 32% strengthened the affected area or its synergistic areas. 10% and 7% attended the training of the technique, to the practice of cycling, jogging and / or swimming respectively, while 4% do not remember.

Cryotherapy (physical modality that uses cold to recover and reduce pain and inflammation) was used by 1 athlete, while 2 preferred to rest their training sessions; they represented 6% of the injured population.

Figure 12. Measures taken to treat the injury
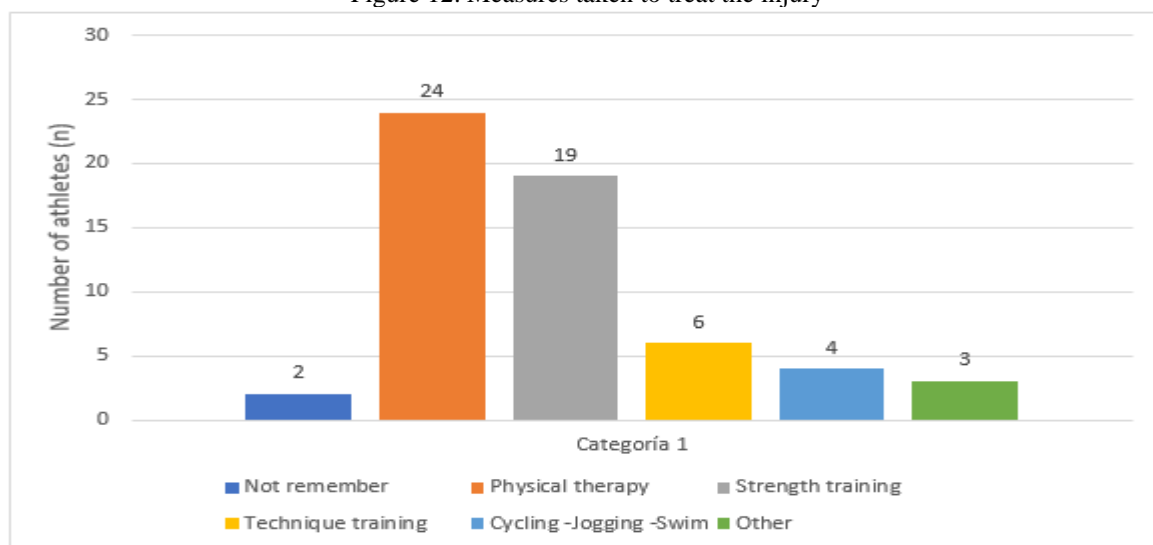
Finally, taking into account the perception of the most injured region in CrossFit by athletes due to their experience, 30% was reported to be the shoulder. 25% say that the knee is the next segment with the highest risk of injury followed by the lumbar spine with 20% while the wrist appears with 15%.

For the elbow, high spine and hip there was a 1.6% risk of injury respectively. And for areas such as the hand, the neck (cervical area) and the muscles of the upper body, there was no more than 0.8% of the vote. Fingers, ankles and lower body muscles were not reported in any case of injuries.

Figure 13. Perception of the regions with the highest prevalence of injuries in CrossFit athletes
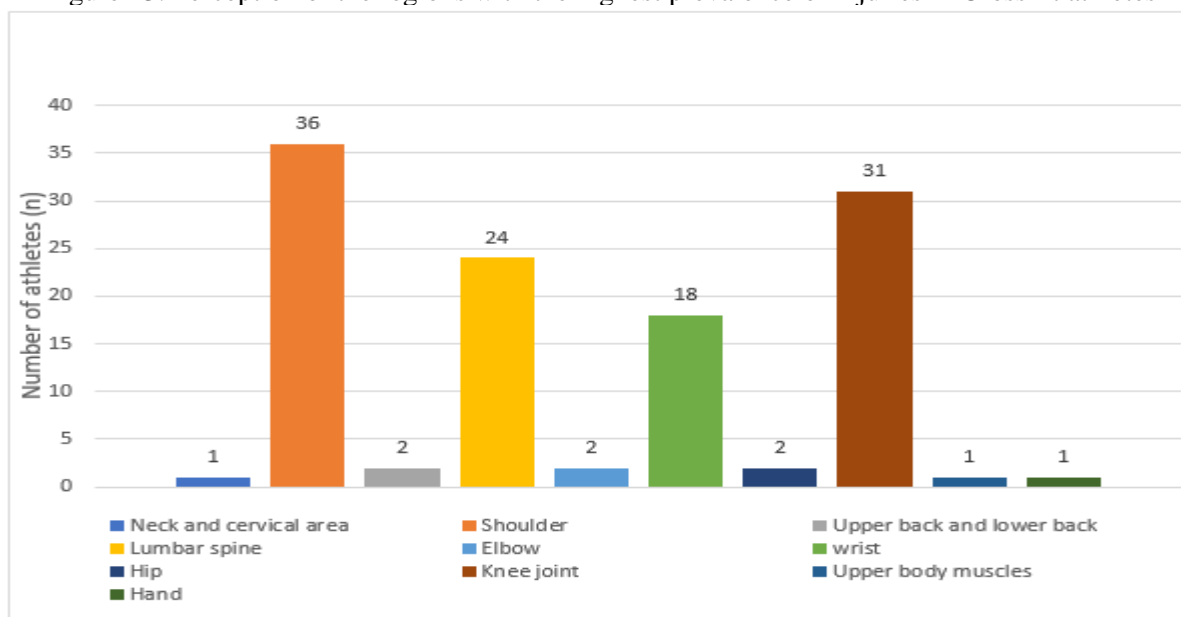
9 DISCUSSION

Through the methodology used, the objective of this study was established, which was to characterize the most frequent injuries in beginning CrossFit athletes in the city of Bucaramanga, Colombia. Taking into account the sociodemographic characteristics of the population, mainly in the variables of age, gender and BMI, similar results were observed to those reported by Sprey et al in 2016. According to the authors, the physiological and morphological aspects such as sex, and the BMI did not find significant differences in the injury incidence rate. (12).

According to the characteristics of the training, a greater number of injuries was observed versus the years of training in this sport. It was evidenced that athletes with a longer time of CrossFit training (more than three years) presented a lower or equal number of injuries compared to athletes who have between one and two years of practice. Feito et al conclude in their study

that the injury rate registered the highest number of affected in participants with less than six months of CrossFit training, followed by those who had between 6 months and a year of training. "Based on these data, the injury rate was inversely proportional to the number of years of experience." (3).

According to Sprey et al in 2016, within their conclusions, they mention that those who practiced CrossFit for more than 6 months (35.1%) showed significantly higher injury rates than those who practiced for less than 6 months (22.9%). "Among the participants with more than two years of practice, an injury rate of 44.9% of the 622 respondents was shown" (Sprey et al 2016). The results of the study developed by Sprey et al are contradictory to the data of this investigation, which is why the evidence is not clear and it is recommended in future investigations to continue investigating these variables.

The region with the highest prevalence of injury was the shoulder, with a quarter of the athletes reporting having an injury in this area, followed by the knee and the lumbar spine area. Mehrab et al in 2017 also found in the study population that the shoulder is the area of greatest injury with 28.7%, in second place is the lower back area with 15.8% and followed by the knee with 8.3% (1130). Likewise, part of the hypothesis raised in the study carried out in Santiago de Cali - Colombia by Flórez et al in 2017 is corroborated (13).

At the same time, according to the athletes' perception, on the areas most prone to suffering an injury in the practice of CrossFit, the shoulder and the knee are reported, first, followed by the lumbar spine and the wrist (14). Feito et al, also named these first 3 segments as the ones with the highest prevalence of injuries (first the shoulder followed by the lumbar spine and the knee), although afterwards they recorded the elbow and later the wrist (3,14).

The incorrect execution of the technique turns out to be the main cause by which the athlete perceives that he is injured with 41.8% followed by fatigue with 39%. Feito et al, asked the athletes what they thought might have caused their injury; "Wrong way / (n = 75, 20.5%), fatigue (n = 74, 20.2%), too heavy (n = 59, 16.1%), unknown (n = 37, 10.1%), relapse of a previous injury (n = 34, 9.3%) and very little or bad training (n = 6, 1.6%) (3).

As treatment for injuries, the methods most used by athletes were physical therapy and strength training in synergistic body segments to the affected area. Drum et al in 2016 et al, suggest that athletes should intersperse their training with planned rest cycles to avoid excess and prevent injuries (15,16).

It was evidenced that 53% (n = 23) of the athletes had 1 or no injuries, who train 4 or more times a week. Additionally, athletes who were injured 2 or 3 times coincided with training 4 to 6 days a week. Feito et al suggest "that those within their first year of training, as well as

those who participate in this modality of training less than 3 days per week have a higher risk of injury" (3). Taking into account the above, it is important to determine an adequate number of training sessions per week, which allows optimal recovery and undulation of the load (17,18).

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