EVALUATION OF SELECTED PERFORMANCE-RELATED FITNESS STATUS OF MALE SOCCER PLAYERS AT THE 2024 TERTIARY SOCCER COMPETITION IN KANO STATE

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Abstract

In everyday life, fitness is a prerequisite for healthy living, while in sports, it is an important determinant of successful performance and an antidote to sports-related injuries. Physical fitness characteristics such as strength, flexibility and endurance have implications for health and performance; and are vital in successful attainment in all aerobic and anaerobic sporting events, including soccer-playing ability and in prevention of stress injuries. In order to ascertain the significance of these variables; using standard procedures, the 2024 KAHIGA-bound male soccer players (N=16) were exposed to several tests to ascertain their fitness levels and preparedness for the tournament. Results showed that they faired above average in all the tests, and when compared with results from other studies, they presented superior values in strength (N=16; $P > 0.05$) and endurance (N=16; $P > 0.05$), but poorly in flexibility (N=16; $P < 0.05$). Matched against standard norms, the subjects scored 70^{th} and 75^{th} percentile in strength and endurance (VO_2max) respectively but average (50^{th} percentile) in flexibility tests. It was concluded that despite the age, gender and body type factors that inhibit fitness status among young adults, a consistent year-round training would be necessary for healthy living and successful soccer-playing ability. It is, therefore, recommended that a health and performance physical fitness training should be included in the daily exercise routine of sportsmen and women in tertiary institutions.

Key words: Flexibility, Male soccer players, Performance-related fitness status, Strength, VO_2max

INTRODUCTION

The prize does not always go to the strongest as the saying goes, but many times, it does. Discussions on physical fitness and health have focused on exercise**,** as well as on the more broadly defined concept of physical activity. Physical activity, as defined by Boone, et al. (2012) is any bodily movement produced by skeletal muscles that requires energy expenditure, while exercise is a form of physical activity that is planned, structured, repetitive, and performed with the goal of improving health or fitness (Heyward, 1998). The ultimate focus is the health-related components of physical fitness because it provides a framework for components that are necessary for good health and improved work performance. Thus, the cardiorespiratory endurance (CRE) (called aerobic endurance), flexibility, muscular strength, muscular endurance, and body composition fall

into this category (American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD, 1980). Excellence in sports outing require an above average scoring in the aforementioned fitness variables, and soccer playing inclusive.

Soccer is a sport that is very popular and favoured globally irrespective of age, sex and race. It is a team game that is played using the feet with 11 vs 11 players (including a goal keeper each) fighting for possession of the ball in order to score goals (Bush et al., 2015). The players can play the game with all parts of the body including the hands (during a throw-in) and the goal keeper actually tends the goal with his hands. It behoves on every soccer player to maintain ball possession and defend their goal (Bahtra, Asmawi & Widiastuti, 2021) using the complex skills of walking, running, jumping and diving activities. According to Paskalis, Wati and Rubiyatno (2022), soccer players do walk (slow walk), then jog (light running), followed by running at high speed, then sprinting depending on the positional play and situational demands. All these movements are combined with football skills of kicking, trapping, heading, dribbling, throw-ins and tackling to mention a few while still retaining the ball within their strides. All of these are unified into fluid soccer play that ensure success in the game in which health-related fitness characteristics of strength, flexibility and endurance have been found to play vital roles (Kirankumar, Rajaram & Kulothungan, 2023).

It has been learned from research and experience that a high level of strength is essential to good performance in all athletic events, and in some others, it is of utmost importance in the selection process in some sports (Benfica, et al. 2018). Its relative significance, however, varies depending on the nature of the particular activity being engaged in (Heyward, 1998). Strength, as the ability of the body or its segments to apply force (Adeyanju & Dikko, 2015) in any given physical activity is an important element in human's day-to-day activities. Maximum strength efficiency is a factor affecting performance, and the maximum increase in strength is usually in direct proportion with the development of strength. For this reason, maximum strength efficiency is an important factor potentially affecting football. It is important to maintain the strength achieved during preparation period throughout the competitive season (Nobari et al. 2021). Therefore, when preparing training programs, strength and power-enhancing trainings are included in sports which require strength. The trainings being in line with the characteristics of the sports will play important roles in increasing the performance (Bahtra, Asmawi & Widiastuti, 2021).

Of equal importance is the range of motion (ROM) in a joint or a combination of joints, this is flexibility as it scientifically called. It allows players to move freely and execute a wide range of movements, such as shooting, dribbling, passing, and tackling. Flexibility allows players avoid sudden movements that could strain or damage their muscles, enhance posture and balance and improve joint mobility. This fitness characteristic is influenced by quality bone structure of the joint, the amount of bulk surrounding the joint and extensibility of the ligaments, tendons and muscles which traverse the joint (Stølen et al. 2005).

As flexibility is an important, yet often neglected component of physical fitness, so the cardiorespiratory endurance status of sportsmen and women. Cardiorespiratory endurance (CRE), as measured by the capacity of the heart and lungs to uptake and use oxygen, therefore, is one of the single determinants of fitness necessary for health, wellness and work performance (Nieman, 1998). It is developed through endurance training generally refers to training the aerobic system, as opposed to the anaerobic system. In soccer, it is the ability to maintain physical and mental effort for a prolonged period and keep up active while playing against agile opponents.

The aforementioned physical fitness characteristics (strength, flexibility and endurance) jointly contribute to players' ability to execute the numerous soccer skills without negative physiological implications which may result in injuries. Soccer, an aerobic game that involves running at top, high and low speeds depending on game situation, kicking and stopping the ball, dribbling while keeping the ball within the players' strides, jumping to head the ball and applying different other skills while playing the game (Adeyanju & Dikko, 2015), require strength, flexibility and CRE to successfully complete a playing duration of between 90 - 120 minutes. CRE provides the mechanical force that supplies the needed oxygen for prolonged exertion. This is because oxygen increases the body's capacity for energy production during physical activity (Venkateswarlu, 2015) during the kicks, fast runs, abrupt stoppages, changes in direction and the characteristic meanderings during dribbles that are necessary for success in the game, hence, require high level of flexibility, strength and endurance for sustained participation (Adeyanju & Dikko, 2015).

This study has become necessary because quality of soccer playing has often been marred by debilitating injuries that could result in permanent disability (Nieman, 1998), which on the one hand, is attributable to low fitness status of players and on the other, to poor conditioning.

Therefore, fitness training needed for exercise performance is primarily building resistance to fatigue following guidelines for exercise prescription in terms of gradualness, intensity and conditioning procedures (Shidon & Haichun, 2022). Recognizing the importance of sports as a uniting force that can bring youths of different cultures and climes together in a metropolitan state, the Kano state Higher Institutions Games Association (KASHIGA) organized the 2024 Governors' Cup in which soccer played a prominent role. It is in the light of the above, this study evaluated selected fitness characteristics of male soccer players to the 2024 KASHIGA competition in Kano state

METHODOLOGY

This study evaluated selected performance-related fitness status of male soccer players to the 2024 KASHIGA competition in Kano state. Using the quasi-experimental design of one-shot case study; which was deemed appropriate because subjects' fitness characteristics would not be manipulated, but rather measured in their readiness state for the competition ahead. All the Federal University of Education, Kano soccer players (N=16) volunteered to partake in the study and signed informed consent forms, have been in training camp for upward of four (4) weeks. Answers to the four research questions raised and corresponding hypotheses proffered are in respect of players' physical characteristics, physical characteristics by fitness status; physical fitness status by positional play and percentile score of fitness status by positional play in soccer.

Data collection followed standard procedure in which one measurement result does not interfere with the result of another. Therefore, standing height and weight were measured with Holtain stadiometer (Health-o-meter) while dressed in light training kits and without shoes; and recorded to the nearest cm and 0.1 kg respectively. Strength of the arms and legs were measured by handgrip dynamometer (Harpenden model) calibrated from 0 -100kg, while the back and leg dynamometer (Takei, Japan) calibrated from 0 – 300kg was used to determine trunk strength of subjects.

Flexibility was measured using the modified sit and reach trunk flexion test and recorded to the nearest cm (Nieman, 1998) while cardiorespiratory endurance (CRE) was measured by the modified Cooper's 12-minute run/walk test. Total distance covered was converted to VO2max using the AAHPERD (1980) nomogram. The descriptive statistics of mean and standard deviation were employed to describe the athletes' status, and inferential statistics of one-way repeated

measures ANOVA for significance when compared against standard norms. All hypotheses were tested at 0.05 alpha level.

RESULTS

Data collected for this study were analysed in line with three research questions raised and corresponding hypotheses using the descriptive statistics of means and standard deviation to provide answers to the research questions raised in respect of players' physical characteristics, positional play by fitness status and physical fitness status by percentile ranking; and inferential statistics of one-way repeated measures ANOVA to test for significance of the hypotheses proffered. All hypotheses are deemed significant at $P \leq 0.05$ alpha level as shown in Tables below:

Table 1: Summary of Physical characteristics of soccer players in the study

Variable	X ± SD	R
Age	22.5 ± 2.39	19 – 26
Height	153.44 ± 4.21	146 – 160
Weight	59.77 ± 6.36	48.7 – 70.4

Source: Field Survey (2024)

A careful study of Table 1 showed the summary of physical characteristics of age, height and weight of the subjects. The mean age of soccer players in this study was 22.5 ± 2.39 years with an age ranging from 19years to 26years for the youngest and oldest respectively. The study further revealed mean height of players (153.44 ± 4.21 meters) with a range height of 146 – 160 meters while their mean weight and standard deviation was 59.77 ± 6.36kg with the weight of players ranging from 48.7 – 70.4kg. From the result, it can be deduced that the soccer players are in early adulthood stage of life and had variable height and weight capable of athletic ability. In order to find out whether their age, height and weight are significant by positional play of attack, midfield and defense, the data collected were analyzed by using the repeated measures (multiple classification) ANOVA as shown in Table 2.

Table 2: Summary of repeated measures (multiple classification) ANOVA for physical characteristics by positional play in soccer.

Source of variance	Variable					
	Age		Height		Weight	
	F-ratio	Prob	F-ratio	Prob	F-ratio	Prob
Main Effects	110.246	.000*	17.452	.000*	2.446	.563
Attack	17.292	.010*	0.422	0.231	3.242	.067
Midfield	10.212	.000*	1.364	0.438	12.581	.000*
Defense	3.642	.000*	12.239	.000*	1.224	.330
Explained	25.344	.000*	8.322	.000*	9.361	.000*

$F_{(2,16)} = 3.63 < 0.05$, *Significant

A careful study of Table 2 showed age was a factor in players' positional play of attack, midfield and defense hence the significant main effects by age ($F_{(2,16)} = 3.63 < 0.05$) recorded; however, this could not be said of height and weight which presented variable results as explained only in defense (F=12.239) by height and weight in the midfield (F=12.581) positions. Therefore, the results do not support the null hypothesis raised in respect of age across all positional plays, height by defense and weight by midfield and therefore, not accepted at $P \leq 0.05$. Thus, physical characteristics of age, height and weight have variable relevance in soccer playing positions.

Table 3: Summary of effects of fitness status on positional play in soccer

Variable	Positional Play					
	Attack		Midfield		Defense	
	X ± SD	R	X ± SD	R	X ± SD	R
Strength (kg)						
Trunk	61.06 ± 6.83	48 – 70	65.1±4.22	33 – 77	66.8±4.52	43 – 69
Leg	49.00 ± 3.22	43 – 64	52.0±3.84	35 – 69	64.4±6.34	40 – 70
Arm	46.56 ± 7.32	35 – 60	39.6±3.56	33 – 54	52.1±2.54	42 – 65
Flexibility (cm)						
Trunk	19.39 ± 3.35	13.4-21	23.0±4.66	19– 26.4	22.3±2.45	18 - 25
Knee	12.52 ± 1.20	10.1- 14	14.4±3.21	11.2- 16	15.8±4.11	13 – 22.
Arm	10.34 ± 2.25	9.4 - 12	11.6±4.53	9.0 – 13	17.3±2.26	14 - 24
Distance (km)-Endurance	1.80±0.43	0.9 -1.1	1.85±0.21	1.0 – 2.2	1.44±0.33	0.5 – 1.6
$\dot{V}O_2$ max (ml/kg/min)	47.68 ± 6.27	46 - 72	48.45±1.2	44 - 69	41.5±3.56	37 - 48

An examination of the above table shows the variability of the listed variables by the different positional in the game of soccer. Trunk strength recorded highest values of 66.8±4.52kg for defensive players and the attackers had 61.06 ± 6.83kg, while the midfield players were more flexible (23.0 ± 4.66) and mobile having recorded a 1.85±0.21km distance in the Cooper's 12min

run-walk test with an equivalent 48.45±1.2ml/kg/min volume in oxygen consumption. The defensive and attacking team players recorded lowest values in endurance and flexibility tests (1.44±0.33kg = 41.5±3.56 ml/kg/min; 10.34 ± 2.25cm) respectively. These results imply there is no cut off point for values recorded for each variable for success in soccer. It is training that separate ability and performance. In order to find out whether these values are significant, the inferential statistics of repeated measures (multiple classification) ANOVA was employed, results of which are presented in Table 4

Table 4: Summary of repeated measures (multiple classification) ANOVA for effect of fitness status on positional play in soccer

Variable	Positional Play					
	Attack		Midfield		Defense	
	F-ratio	Prob	F-ratio	Prob	F-ratio	Prob
Strength (kg): Main Effects	119.214	.000*	29.652	.000*	2.446	.663
Trunk	0.112	.010*	0.529	.231	3.274	.088
Leg	2.536	.000*	10.084	.000*	19.981	.000*
Arm	0.341	.000*	12.239	.000*	1.620	.364
Explained	25.363	.000*	8.820	.000*	9.385	.000*
Flexibility: Main effects	87.426	.000*	69.524	.000*	1.432	..000*
Trunk	4.522	.079	2.326	.356	3.145	.434
Knee	0.425	.004*	6.245	.000*	3.758	.000*
Arm	11.222	.026*	1.434	.535	2.223	.475
Explained	2.243	.093	4.163	.016*	12.213	.000*
Endurance: Main Effects	122.951	.000*	26.223	.019*	36.745	.000*
$\dot{V}O_2$ max (ml/kg/min)	32.674	.000*	13.142	.020*	22.116	.000*
Explained	23.131	.000*	15.412	.006*	18.221	.000*

Note: $F_{(2,16)} = 3.63 > 0.05$ * Significant

A cursory look at Table 4 shows the effects of fitness variables under study on positional play in soccer. The main effects of strength is explained for the attacking players, leg and arm for midfielders and for legs of defenders which were significant ($F_{(2,16)} = 3.63 > 0.05$). A further study of the same table showed flexibility is significant for attackers' knee and arm (F=0.25>0.05), (F=11.222>0.03) and knee of midfielders (F=6.245>0.05) respectively. Finally, that the main effects of endurance were significant and explained for the three playing positions show how oxygen uptake and utilization play vital role in successful performance in soccer. Thus, the null hypotheses raised in respect of these variables against the playing positions are not retained.

Table 5: Summary of Percentile score of fitness status by positional play in soccer

Variable	Positional Play					
	Attack		Midfield		Defense	
	Score	% 'tile	Score	% 'tile	Score	% 'tile
Strength (kg): Trunk	61.06	70th	65.1	75th	66.8	75th
Leg	49.00	50th	52.0	75th	64.4	90th
Arm	46.56	60th	39.6	40th	52.1	75th
Flexibility: Trunk	19.39	30th	23.0	50th	22.3	40th
Knee	12.52	10th	14.4	15th	15.8	20th
Arm	10.34	10th	11.6	12th	17.3	25th
Endurance: $\dot{V}O_2$ max in (ml/kg/min)	47.68	60th	48.45	60th	41.5	55th

Source: Alpha Fitness Battery Norms (2023)

As revealed in Table 5, results of each fitness test conducted was juxtaposed with normative values from similar climes by age, gender and activity levels in percentile ratings. Results show that attack, midfield and defensive players scored high in trunk strength having ranked between 70th and 75th percentile, with the lowest percentile of 50th and 40th ranking was obtained in leg and arm strength among attackers and midfielders respectively. Furthermore, the table revealed very low percentile score across all positional plays in flexibility except the midfield that recorded an average 50th ranking in arm flexibility. Also, result of endurance test shows the attack and midfield players had 60th percentile while the defense recorded 55th percentile ranking. These results could be explained by the quantity of energy requirements during game situation in which the defenders moved less compared to attackers and midfielders.

DISCUSSION

Physical fitness, as a state of health and well-being, play important roles in our activities of daily living (ADL) and sports performance; this can probably be attributed to its health-related components of cardiorespiratory endurance (CRE), flexibility, muscular strength, muscular endurance, and body composition. These components, even though affect sports performance, can also be modified by several factors that include, but not limited to age, sex, height, weight, the type and requirement of the sport in question etc. Good soccer players possess endurance, speed, strength, agility, balance, and coordination and can run for at least 90 minutes in their playing positions while moving with the ball. Consequent upon the above, this study evaluated fitness status of male soccer players who participated at the 2024 KASHIGA competition in Kano state.

Physical characteristics of age, height and weight were evaluated by positional play. The mean age of soccer players in this study was 22.5 ± 2.39 years with an age ranging from 19years

to 26years for the youngest and oldest player respectively. The study further revealed mean height of players (153.44 ± 4.21 meters) with a range height of 146 – 160 meters while their mean weight and standard deviation was 59.77 ± 6.36kg with the weight of players ranging from 48.7 – 70.4kg. The age and height values are superior to those obtained in other studies (Ozer & Kilinc, 2011) but inferior to weight values in volleyball. This is probably because weight is inversely related to success in volleyball playing ability than height is (Benfica, 2018). These values are, however, inferior (< 164.6 ± 6.13m) to values recorded for younger players in other studies (Shidon & Haichun, 2022); although older and more mature soccer players have been reported to gain advantages in the selection process by coaches. This probably explains the significance of age in different playing positions; and height by midfield and weight by defense positions only ($P > 0.05$).

So far, numerous studies have investigated differences in various fitness profiles between soccer players of different playing positions. For instance, soccer involves highly violent actions and also the violence is intense and intermittent (Stolen, et al., 2005; Fraser, et al. 2017). Players travel up to 10 km for 90 minutes in repetitive speeds, jumps and direction changes (Stolen et al., 2005). Also, strength is an important factor and quite necessary during training and tournaments. Results from this study showed trunk, leg and arm strength values ranged from 61.06 ± 6.83kg, 49.00 ± 3.22kg, 46.56 ± 7.32kg in attack; 65.1±4.22kg, 52.0±3.84kg, 39.6±3.56kg at the midfield and 66.8±4.52kg, 64.4±6.34kg and 52.1±2.54kg at the defense respectively. These results are significant ($P>0.05$) for all strength variables in attack, leg and arm in the midfield ($P>0.05$) and only leg in the defense ($P>0.05$).

These results support Nobari, et al. (2021) who found significant strength parameters among athletes ($P > 0.05$) in the trunk, leg, and arm across all playing positions in different sports. Same pattern was recorded by Ozer & Kilinc (2011) who reported high strength values among team sports players with significance in shoulder, leg and arm ($P > 0.05$). However, Boone et al. (2012) found that there were no significant differences among positions in their study conducted on English Premier League soccer players ($P < 0.05$). These results indicate why strength is an important biomotor property and quite necessary for success in soccer tournaments.

Flexibility is a main component of health-related fitness and one of the basic components of fitness for the performance in some sports like soccer. Although there is no consistent scientific evidence about the relationship between flexibility and injury risk, it seems lower range of motion values in soccer players could also increase the risk of some muscle injuries. Results of leg

flexibility test from this study was significant (P>0.05) but not at trunk level (P<0.05) across all playing positions. These values are superior to the ones obtained by (Girouard & Hurley, 1995) which can be age and sex related (Bahtra, Asmawi & Widiastuti, 2021). As flexibility seems to decline with age (Castagna, et al. (2013), research evidence suggests that biological changes such as tendon stiffening, joint capsule changes, or muscle changes could be responsible factors for the age-related decrease (Boone, et al. (2012). In this sense, data from this study supports this statement showing a slight tendency for lowered ROM prior to soccer tournament. This implies that flexibility needs to be considered as important by trainers in order to reduce injury risk in the field of play.

Soccer is a team sport characterized by intermittent bouts of intense activity. Moreover, research has shown that the running demands differ between playing positions. More specifically midfielders cover both the greatest total and high-intensity distance, followed by attackers and central defenders (Di-Salvo et al., 2007; Bush et al., 2015). Thus, position-specific endurance performance of soccer player revealed significant mean estimated $\dot{V}O_2$ max across the attack, midfield and defensive playing positions as 47.68 ± 6.27 ml/kg/min, 48.45±1.2 ml/kg/min and 41.5±3.56 ml/kg/min respectively. Although this value is inferior to that obtained for female soccer players (57.77 ± 7.45ml/kg/min) it is rated average in the fitness norm designed by Getchel (1976). Since the game is characteristically an intermittent sport with bursts and pauses which in the long run, makes it a highly-rated aerobic sport, the value obtained can be regarded as average for a soccer tournament team.

When results were compared with established norms, leg and arm flexibility scored the lowest on the percentile rating (10^{th}) among attackers while the midfielders and defenders were ranked between 12^{th} and 25^{th} percentile on the two parameters respectively. The defensive players scored 70^{th}, 90^{th} and 75^{th} percentile on strength tests, while midfielders had a 40th percentile score which was rated below average. Results of $\dot{V}O_2$ max test score was good for the attack and midfielders (60^{th} percentile) but average for defenders. This is probably as a result of less need for long distance running on the field of play. On the variable $\dot{V}O_2$ max recorded by the positional play, there might be additional reasons which might further explain the similarities of outfield players' endurance capacities compared to the defense. Along with previous findings by Altmann et al. (2018) that endurance capacity is related to total and high-intensity distance covered during matches, while the question of the existence of player-specific match-running performance arises and needed to be considered for further research.

CONCLUSION

The purpose of this study was to evaluate performance-related fitness status of FUE Kano male soccer team to the 2024 KASHIGA competition in Kano state. Soccer, being very popular among the Nigerian population; and favoured globally irrespective of age, sex and race, is a team game played on a rectangular surface where players fight for ball possession in order to score goals (Shidon & Haichun, 2022). With its numerous combined skills of running, kicking, trapping, heading, dribbling, throw-ins and tackling etc, while moving and still retaining the ball within the strides, the baseline fitness requirements of strength, flexibility and endurance, among others, ensure the soccer player excels in whichever position the coach entrusts upon him to play

From the results presented, it was concluded that physical performance either decreases or increases with age, height and weight depending on the sport (Paskalis, Wati & Rubiyatno, 2022); and performance-related fitness characteristics are the bases for excellence in sports performance. Furthermore, soccer is an interesting but strenuous game characterized by good display of strength, flexibility and cardiorespiratory endurance; and as a highly mobile game, which calls to play a high level of physical fitness, strength is required for all the various skills with the leg, head, chest and even hands during the throw-in, ball placement in free kicks or goalkeeping.

Flexibility comes into play during sliding tackles and recovery from falls, throw-in, heading and the characteristic meandering while dribbling, while cardiorespiratory endurance is activated from the overall aerobic metabolism required for sustained energy production throughout the duration of activity. The level of oxygen consumption, however, depicts the overall fitness status of the soccer player. Thus, the various aspects of fitness assessed in this study showed that the players were not in top fitness form for the KASHIGA tournament. It was, therefore, not surprising that they failed to qualify for the quarter finals of the tournament; even though participation and not winning at all cost was the emphasis.

Research outcomes have reported that some conditions like age, gender and body type factor might interfere with training schedule and even influence result obtained. In spite of this, it is believed that when training is taken as normal routine, the players strength, flexibility and endurance characteristics would improve considerably. This assertion is in agreement with the suggestion that disuse due to lack of physical activity or immobilization produces contracture and shortening of the connective tissue (Heyward, 1998) and consequently reversal of the gains of

fitness (Nieman, 1998). To prevent this, training programmes should be aimed at developing all aspects of fitness and should be maintained for early attainment and retention of peak performance.

RECOMMENDATIONS

i. To evaluate the real risk of injury associated with soccer tournaments, there is need for improved trainings for flexibility and range of motions as corrective and preventive action.

ii. Strength training needs to be considered as important by trainers in order to improve confidence of players and also prevent stress

iii. Practical applications of this study results could be the implementation of specific warming up and training protocols to prevent and improve reduction of flexibility

iv. It is believed that when training is taken as normal routine, the players strength, flexibility and endurance characteristics would improve considerably

v. Endurance training of players should be specific to their running demands during matches. This will go a long way to prevent burn out and exhaustion.

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