






# Ultimate Full Contact offensive efficiency analysed through styles and combat distances: a confluence of cognitive and ecological approaches

## Authors' Contribution:

-  **A** Study Design
-  **B** Data Collection
-  **C** Statistical Analysis
-  **D** Manuscript Preparation
-  **E** Funds Collection

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## Abstract

### Background & Study Aim:

Ultimate Full Contact is a hybrid combat sport where offensive efficiency takes on an important role during a fight. However, to the best of our knowledge, no study has investigated the impact of offensive efficiency based on combat style and distances. Thus, the study aimed is knowledge about the offensive efficiency related to distances, styles, skills and their interrelationships during combat.

### Materials & Methods:

One hundred seventy fight DVDs were observed, integrating (n = 340) senior male athletes who participated in the WUFC World Championships. Technical-tactical attacks made and effective, between winners and losers, with different combat styles and distances were they used to analyse the difference between winners and losers and different combat styles, through the Kalina method for the combat dynamics analysis (only offensive efficiency index), Mann-Whitney U and Spearman's bivariate correlation.

### Results:

The results indicate that winners had significant advantage in all offensive skills regarding the different combat distances and styles. Generally, striking skills were more efficient than submission grappling. Higher correlations were shown between specific distances and specific styles.

### Conclusions:

The winners attacked more and more effectively and showed greater efficiency, stability, versatility, adaptability and opportunity seizing. The biggest difference of winning or losing effect depends mainly on ground fighting (in horizontal posture), however it is supported by the efficiency of stand-up fighting (in vertical posture). It is not enough to react spontaneously according to the contextual opportunities without cognitively perceiving, interpreting and deciding on specific and certain actions at the right time, articulating styles with distances.

### Keywords:

attack • combat dynamics analysis • combat sports • technical-tactical skills

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Authors have declared that no competing interest exists

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**Technique** – *noun* a way of performing an action [52].

**Tactics** – *plural noun* the art of finding and implementing means to achieve immediate or short-term aims [52].

**Performance** – *noun* the level at which a player or athlete is carrying out their activity, either in relation to others or in relation to personal goals or standards [52].

**Skill** – *noun* an ability to do perform an action well, acquired by training [52].

**Timing** – the choice, judgement, or control of when something should be done (e.g. the moment of the attack in judo).

## INTRODUCTION

Ultimate Full Contact is a combat sport of extreme complexity, given the variety of dynamic technical-tactical actions that can be performed (offensive, counteroffensive and defensive) [1]. These actions are developed in stand-up fighting (in vertical posture) and/or ground fighting (in horizontal posture), under conditions of high tenacity, variability and unpredictability, which require high cognitive and physiological processes [1]. During the fight, the main objective is to avoid suffering blows, through dodges/slips, displacements, immobilizations, blocks, parries or reversing the opponent's dominant positions [1]. In addition, it is essential to make the greatest number of strikes (i.e. punches, knees or kicks) in the opponent's anatomical regions, in order to score, weaken, knockout or take them down and finish by submission techniques (chokes, locks) or ground and pound [1].

Previous investigations into fighting dynamics in combat sports have concluded that the winners are usually characterized by manifesting greater offensive activity and consequently carrying out more offensive actions (i.e. attack effectiveness or offensive efficiency), which is one of the main distinguishing aspects of fight winners [2-9]; their efficiency is usually characterized by the ratio of scored attacks to the total number of offensive actions, which means that the higher the ratio, the better the offensive efficiency [10, 11].

Thus, the offensive efficiency requires certain qualities to deliver a fast and accurate attack, such as good footwork and balance, distance control, strategic analysis and fluid movement around the opponent [12, 13]. The attack must be carried out at the proper time, automatically, quickly and be unpredictably [12]. In this field, the importance of giving few indicators of the following attack movements is highlighted, so that the opponent will always have more difficulty in predicting the attack, until it is impossible to stop it [14]. At the same time, integrated quick punches and the ability to close or evade with speed, spontaneously produces an infinite

number of techniques and combinations in mathematical progression, keeping the opponent always on the defensive [14]. This makes it possible to keep control of the combat, enabling the taking of the initiative without restrictions, with combined and quick attacks [14]. Also, greater skills knowledge and versatility (i.e. striking and grappling techniques) as well as the frequency of linking together technical actions and ground control are important qualities in the offensive action that the winners had shown at Full Contact and Mixed Martial Arts [13, 15].

However, distance control is very important; the proper distance is safe when a fighter overcomes the opponent, and it depends on the speed, agility and the ability to synchronize changing distances and diversified technical-tactical actions [12]. Thus, the fight distance is related to continual shifting of displacements between opponents, looking for the most appropriate defence and attack position. This requires a cognitive stability and adaptation to different contexts [1].

Furthermore, in a fight, each athlete competes according to his or her own style and to their most comfortable combat distance using a cognitive process immediately linked to different combat schemes according to the objectives [1]. Experience is a relevant factor to manage offensive actions successfully, developing a self-improvement motor skills programme and the perceptive and interpretive ability to discern possible opponent counter-attacks and defences [1, 16]. In addition, the offensive tactical-technical action requires a perfect execution at the right time (timing) considering the planned and intentionally spontaneous actions with their respective slow and fast patterns [17, 18]. In fact, the situational efficiency depends on the ability to perform several structures of motion, in different manners and from variable distances [19]. Thus, the variability (e.g. change rhythm) and transience (e.g. change complexity) limit the time to decide properly, requiring perception and anticipation skills [20]. Therefore, perception and anticipation ability appear to be important attributes for

performance in combat sports, and their development allows adaptive motor skills with maximum effectiveness for multiple and divergent competitive situations [1, 21-23]. In addition, divergent contextual perception is fundamental, allowing the fighter to act effectively in any style or combat distance using certain specific techniques, acting spontaneously and appropriately at the exact moment [24, 25]. Therefore, the decision and the action derive from an individual-context interaction. Thus, based on ecological dynamic reasoning [26], it can be said that the variability in the course of action may have its origin in the individual (e.g. choosing to fight standing when he only has a rudimentary tactical ability in ground fighting behaviour while fighting on the ground – submission / grappling) or in the context (e.g. choosing to fight standing when the opponent is known to be strong tactically in ground fighting).

Thus, it seems important that information is obtained based on the observation of the fighters' performance in a competitive context, since an analysis of the real situation reveals a representative knowledge to the contextualized practices in training [2, 8, 15, 27-38].

Therefore, considering the lack of studies that address this topic specifically in Ultimate Full Contact, more research is needed. Previous investigations have reported on offensive efficiency in modalities such as judo, taekwondo, karate or boxing [2-11], which require a limited number of techniques when compared to Ultimate Full Contact [1], and therefore make the results unrepresentative for the modality under analysis. The importance and functionality of the technique vary depending on the sports characteristics, athletes and contexts [39]. In addition, the studies presented focus only on the relationship between effective techniques and the techniques performed, disregarding the actions taken according to the environment and behaviours, such as the distances and styles adopted by the fighters.

Therefore, in the cognitive and application sense, interesting issues are: the offensive efficiency according to the winners and losers, relating their effective attacks to attacks made through the different styles, their specific offensive technical-tactical actions and different combat distances; to compare the differences in offensive efficiency according to styles and combat distances in

relation to the win or lose effect, as well as comparing the efficiencies of distance with the efficiencies of style and the fighters' specific actions in order to analyse the gestural and behavioural actions from a cognitive [40-42] and ecological dynamics perspectives [28, 43, 44].

The study aimed is knowledge about the offensive efficiency related to distances, styles, skills and their interrelationships during combat.

## MATERIAL AND METHODS

### Subjects

Three hundred and forty senior male athletes participated (master class – minimum level of national champions or high grade in their styles, aged  $\geq 18$ , and from all weight divisions), representing 38 countries, and comprised 170 (50.0%) winners and 170 (50.0%) losers who had participated in the WUFC Ultimate Full Contact World Championship, held annually in Portugal between 2008 and 2017. These athletes were chosen because they are the elite athletes in the world according to the WUFC world rankings [45].

From the 170 fights analysed in Ultimate Full Contact under professional rules, the total time was 43,120" (253.65  $\pm$  203.65), of which 84 (49.4%) ended by submission, 33 (19.4%) by decision, 33 (19.4%) by technical knockout, 18 (10.6%) by knockout and 2 (1.2%) by doctor stoppage.

### Instruments and procedures

The methodology used was based on the Kalina method for combat dynamics analysis, considering the offensive efficiency index (i.e. the ratio between effective techniques to the techniques used) [10, 11]. The descriptive statistical data from the offensive efficiency variables in relation to the winning and losing athletes was calculated. These variables were the result of the ratio between the total effective offensive actions and the offensive actions made, according to the respective distances, styles and subgroups of specific technical-tactical actions of each style.

Adaptations to the protocol were made in order to also obtain the efficiency of the tactical behaviour in the different styles and distances of fighting, as well as its impact on winning or losing. In addition, the study also sought to identify the correlation intensities between the distances, styles and

their characteristic actions, which is in accordance with the approach of specific actions according to the different perceived distances [25].

Observation grids were created in Microsoft's Excel Office 365 software, where all technical and tactical and effective actions made by the winning (W) and losing (L) athletes were recorded. Therefore, the 170 Ultimate Full Contact fights on the DVDs, provided by World Ultimate Full Contact, were observed. A total of 4602 ( $13.54 \pm 13.02$ ) attacks were made and 1835 ( $5.40 \pm 5.36$ ) effective attacks were reported, of which 1931 ( $11.36 \pm 10.87$ ) were made by losers with 455 ( $2.68 \pm 3.00$ ) effective, and 2671 ( $15.71 \pm 14.58$ ) by the winners with 1380 ( $8.12 \pm 5.80$ ) effective.

The various technical-tactical actions were grouped, according to their characteristic, by the different combat dynamics with the following WUFC terminology: styles (e.g. submission grapplers (SG)) – takedowns, locks, chokes; stand-up strikers (SUS) – kicks, knee strikes, punches; ground strikers (GS) – takedowns, Ground and Pound; and Distances (e.g. long distance (LD); short distance (SD); close distance (CD)).

### Statistical analysis

The Kolmogorov–Smirnov test was used to verify the normality of the sample and revealed no normal data distribution. Thus, offensive efficiency variables were analysed using non-parametric Mann-Whitney U statistical tests to identify the difference in the efficiency of winning or losing due to the effect of all variables. Spearman's bivariate correlation was used to correlate the total values (winners and losers) of the distance efficiency with the efficiency of the styles and their characteristic actions. The relationship intensities between the variables were interpreted according to the correlation scale: i) Very weak and insignificant correlation ( $r \leq 0.19$ ); ii) Weak correlation ( $0.2 \leq r \leq 0.39$ ); iii) Moderate correlation ( $0.4 \leq r \leq 0.69$ ); iv) Strong correlation ( $0.7 \leq r \leq 0.89$ ); v) Very strong correlation ( $0.9 \leq r \leq 1$ ) [46]. In the correlations, the significance of  $p < 0.01$  and  $p < 0.05$  were determined.

## RESULTS

The averages (Av) show that there was an advantage of the winners over the losers in all variables of offensive efficiency (Table 1). That means the winners are more versatile and adaptable to different

contextual situations. Statistically significant differences in all combat dynamics were observed between winners and losers ( $p < 0.01$ ) (Table 2). The overall Offensive Efficiency between the two groups was (60.12 and 25.58, respectively) (Table 1). This determined that the winners demonstrated significantly higher effectiveness of attack than the losers, with a statistically significant difference, with  $U = 3920.00$  and  $p = 0.000$ .

When analysing the Offensive Efficiency according to combat styles, the greatest efficiency and difference between winners and losers was recorded in the submission grappler (66.93 and 36.78;  $U = 6239.50$ ;  $p = 0.000$ ) followed by the ground striker efficiency (65.51 and 26.87;  $U = 7362.00$ ;  $p = 0.000$ ) and stand-up striker efficiency (46.36 and 21.30;  $U = 7373.50$ ;  $p = 0.000$ ) (Tables 1 and 2).

Thus, it was demonstrated that ground fighting is more efficient than stand-up fighting, and also the winning or losing effect depends more on the ground fighting styles (Submission Grapple and Ground Striker). However, the data also confirmed that the same fighters (winners) who were more efficient in the ground fighting, were also more efficient in the stand-up fighting.

Through a comparison of the offensive efficiency between winners and losers according to the technical-tactical actions specific to each style, the following were determined as the most efficient variables of specific actions, in descending order: SG takedowns efficiency, GS ground & pound efficiency; SUS kicks efficiency; SUS punches efficiency; SG chokes efficiency; SUS knees efficiency; SG joint locks efficiency (Table 1). The biggest differences in these variables of winners and losers, significantly in favour of the winners, were recorded in descending order: SG takedowns efficiency; GS ground & pound efficiency; SUS punches efficiency; SG chokes efficiency; SUS kicks efficiency; SUS knees efficiency; SG joint locks efficiency (Table 2). With regard to the fight endings by SG chokes and joint locks, these were constant (0) and were omitted by the losers, since these technical-tactical efficiency actions result in winning the fight by submission. These data seem to indicate that the winners use a great versatility of technical-tactical actions, alternating higher efficiency of ground fighting with stand-up fighting skills.

Through the analysis the offensive efficiency according to the different combat distances it was observed that the winners exceeded their opponents in all ranges. The efficiency of attack and its difference between the fighters' groups were determined in descending order: close distance, long distance and short distance (Tables 1 and 2). The winners demonstrated significantly higher effectiveness of attack over all distances.

These results seem to indicate that the winning or losing effect clearly depends on the offensive efficiency. This was a characteristic of the winners at all levels of offensive styles, skills and distances, showing higher technical-tactical versatility and situational/contextual adaptation.

### Comparison between the distance efficiencies with the style efficiencies

It was found, by total values (i.e. winners and losers), a strong and significant relation with positive direction between the long-distance efficiency and the SUS style efficiency ( $r_s = 0.898$ ;  $p < 0.01$ ), while this distance efficiency with the styles SG

and GS presented respectively very weak and weak correlations (Table 3). With regard to the short-distance efficiency, there was a moderate positive and significant correlation with SUS style ( $r_s = 0.444$ ;  $p < 0.01$ ), and positive with GS and SG styles, but both with pf very weak intensity and the first was without significance  $p = 0.018$ . In Close-Distance efficiency, there were very strong and significant positive correlations, respectively, with the styles SG ( $r_s = 0.934$ ;  $p < 0.01$ ) and GS ( $r_s = 0.877$ ;  $p < 0.01$ ), and a weak correlation with the SUS style efficiency. Thus, the efficiency level between the styles (specific skills) and distances is, in descending order: CD – SG; LD – SUS; CD – GS; SD – SUS. From these results, it is established that the fighters opted for specific styles and skills in accordance with the perceived distance for attack effectiveness. However, the choice of the appropriate distance by the fighters in order to perform effective attacks was also considered/was also taken into consideration. Therefore, it can be seen that the decision made by the fighters is the result of individual-context interaction.

**Table 1.** Descriptive data of fight distances efficiency, styles efficiency and its technical tactical actions efficiency.

Variable	Winners (n = 170)				Losers (n = 170)			
	Av	SD	Me	IQR	Av	SD	Me	IQR
Overall offensive efficiency	60.12	21.11	59.41	28.39	25.58	24.25	20.00	35.23
Long distance efficiency	44.52	31.63	48.08	44.44	20.52	25.68	13.39	33.33
Short distance efficiency	30.83	39.65	.00	66.67	9.66	24.56	0.00	0.00
Close distance efficiency	67.17	31.29	67.71	50.00	22.17	33.38	0.00	40.71
Submission grappler efficiency	66.93	35.99	75.00	50.00	23.57	36.78	0.00	44.64
Stand up striker efficiency	46.36	30.13	48.68	41.67	21.30	24.77	15.69	33.33
Ground striker efficiency	65.51	37.52	76.39	50.00	26.87	38.21	0.00	52.50
SG takedowns efficiency	64.89	43.55	100.00	100.00	29.40	42.80	0.00	70.00
SG chokes efficiency	31.23	44.42	0.00	100.00	a	a	a	a
SG joint locks efficiency	12.84	33.14	0.00	0.00	b	b	b	b
SUS punches efficiency	33.91	34.47	29.73	57.14	11.08	20.63	0.00	16.67
SUS kicks efficiency	43.18	39.97	46.61	78.93	23.29	33.11	0.00	36.65
SUS knees efficiency	21.00	37.46	0.00	29.76	6.72	22.78	0.00	0.00
GS takedowns efficiency	64.89	43.55	100.00	100.00	29.40	42.80	0.00	70.00
GS ground & pound efficiency	50.06	44.13	52.78	100.00	7.30	24.21	0.00	0.00

**A** style submission grapplers choke efficiency is constant. It was omitted; **b** style submission grapplers joint lock efficiency is constant. It was omitted; **SG** submission grappler; **SUS** stand-up striker; **GS** ground striker.

**Table 2.** Mann-Whitney test effectuated between winners and losers, in the different variables of offensive efficiency.

Variables	Winners (n=170)		Losers (n=170)		Mann-Whitney U	p-value
	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks		
Offensive efficiency	232.44	39515.00	108.56	18455.00	3920.00	.000
Long distance efficiency	208.92	35516.50	132.08	22453.50	7918.50	.000
Short distance efficiency	195.30	33201.50	145.70	24768.50	10233.50	.000
Close distance efficiency	224.67	38194.50	116.33	19775.50	5240.50	.000
Submission grappler efficiency	218.80	37195.50	122.20	20774.50	6239.50	.000
Stand up striker efficiency	212.13	36061.50	128.87	21908.50	7373.50	.000
Ground striker efficiency	212.19	36073.00	128.81	21897.00	7362.00	.000
SG takedowns efficiency	204.72	34802.50	136.28	23167.50	8632.50	.000
SG chokes efficiency	200.50	34085.00	140.50	23885.00	9350.00	.000
SG joint locks efficiency	182.00	30940.00	159.00	27030.00	12495.00	.000
SUS punches efficiency	202.12	34360.50	138.88	23609.50	9074.50	.000
SUS kicks efficiency	193.07	32822.00	147.93	25148.00	10613.00	.000
SUS knees efficiency	186.14	31644.00	154.86	26326.00	11791.00	.000
GS takedowns efficiency	204.72	34802.50	136.28	23167.50	8632.50	.000
GS ground & pound efficiency	214.39	36446.00	126.61	21524.00	6989.00	.000

**SG** submission grappler; **SUS** stand-up striker; **GS** ground striker.

**Table 3.** Spearman's correlation coefficients obtained between distance and style efficiencies.

Indicator	Submission grappler efficiency		Stand-up striker efficiency		Ground striker efficiency	
	$r_s$	P	$r_s$	p	$r_s$	P
Distances efficiency						
Long distance efficiency	<b>.161**</b>	.003	<b>.898**</b>	.000	<b>.202**</b>	.000
Short distance efficiency	<b>.128*</b>	.018	<b>.444**</b>	.000	<b>.194**</b>	.000
Close distance efficiency	<b>.934**</b>	.000	<b>.252**</b>	.000	<b>.877**</b>	.000

Significant correlations: \*\*p<0.01; \* p<0.05.

## DISCUSSION

We are investigated the offensive efficiency in relation to the different combat styles and distances of the winners and losers who participated in the WUFC World Ultimate Full Contact Championships held in Portugal between 2008 and 2017. In addition, it clarified the relationship between the efficiency of the different styles (specific skill) and distances.

Overall, the results revealed that the winners showed higher efficiency than the losers, with statistically significant difference in all combat styles, their specific offensive technical-tactical actions and combat distances.

The results show that the winning or losing effect clearly depends on the offensive efficiency. The higher efficiencies observed by the winners in all

combat styles and distances mean greater stability, versatility and adaptability. Comparing, by total values (i.e. winners and losers), the different distance efficiencies with the different style efficiencies, it was observed that specific combat styles are more highly related with specific combat distances. That is to say, the fighters select specific actions according to the perceptual contextual variation (i.e. different distances), but the contextual variation is also a purposeful approach to carry out efficient attacks.

In general, the ratio between the effective offensive actions and the offensive actions made [10, 11] showed that the winners had a significant advantage over the losers in the offensive technical-tactical action, that is, they attacked more and the attacks were more effective  $W$  ( $Av = 60.12$ , mean rank = 232.44);  $L$  ( $Av = 25.58$ , mean rank = 108.56) and ( $U = 3920.00$  and  $p = 0.000$ ). Thus, it can be said that the winners are the most offensive and efficient athletes. Therefore, the offensive action proves to be a major and determining factor for being successful in combat and achieving the victory. These data are in line with previous studies conducted in judo [6, 8]. The results suggest that the fight winners were characterized by significant higher offensive activeness ( $W$ : 0.31;  $L$ : 0.17,  $p < 0.01$ ) and attack effectiveness ( $W$ : 0.22;  $L$ : 0.01,  $p < 0.01$ ), whereby the attack effectiveness of the winners was also higher ( $W$ : 0.34;  $L$ : 0.00,  $p < 0.01$ ). In the same vein, another study [2], showed that the winners attacked more often, and 21% of those attacks were effective, while the losers' attacks were only 2% effective, with a significant difference between them ( $p < 0.01$ ). In conclusion, the same author [2], stated that offensive activity can be relevant in the both fighters' analysis and their efficiency is one of the fundamental and distinguishing winners' characteristics. The attack relevance was also mentioned in taekwondo, karate and boxing competitions, where the winning athletes attacked more [3, 4, 7, 9]. In fact, increasing the number of attacks and always putting the opponent on the defensive reduces his or her efficiency [7].

For each offensive combat style, the submission grappler was verified as the most efficient style of fighting, followed by the ground striker and stand-up striker. The statistically significant difference on the winning and losing effect was

in the same order. In accordance with the 170 matches analysed, most fight outcomes were by submission 84 (49.4%) through chokes and joint locks. The ground striker was the second most efficient style, whereby its specific skill, the ground and pound, is usually associated with the fight's outcomes by technical knockout (TKO) or knockout (KO), this being a characteristic action of the winners. According to a previous study on MMA [15], the ground and pound action was decisive for ultimate success, while in ground fighting, the athlete who limited his/her techniques to blows (striking) and achieved the most dominant on the ground obtained a clear advantage in the tactical and technical offensive. However, it should be noted that the specific skills of SUS style (i.e. kicks and punches) showed more efficiency, these actions being those that produced the best points score and fight outcomes by decision or TKO/KO. Also, the most efficient specific skills in ground fighting (i.e. submission grappler and ground striker) were the takedowns. These are the technical-tactical resources in stand-up fighting to take down the opponent and seek the end of the fight through locks and chokes or strike while fighting on the ground (i.e. ground and pound). In fact, the greater number and effectiveness of offensive actions in the stand-up fight influence the creation of tactical patterns during the fight, and a larger technical repertory increases the opportunity for attack [15, 47]. In accordance, all other skills also showed higher efficiency by the winners, namely the SUS kicks and punches were higher than chokes, knees and joint locks, respectively. But, in the significant difference of winning or losing effect, the chokes had the highest significance, followed by the kicks, knees and joint locks. The punches skills had a higher efficiency' than the chokes skills; in fact, the overall striker styles' efficiency (SUS and GS) evidenced more efficiency than the submission grappler, which is responsible for the fight outcomes by decision and technical knockout/knockout. In fact, striking had greater technical-tactical action effectiveness than submission grappling throughout combat, according to an MMA study, where striking appeared prominently [15].

The above conclusions determined that to be an efficient fighter, the competitor must be technically tactically versatile with multifaceted knowledge of how to fight both standing up and on the ground. Knowledge and the versatility are

fundamental factors in performance – that is, knowing how to combine full contact with grappling, and the hand techniques with feet techniques [13]. The best MMA fighters and winners revealed high skills both in striking and grappling, with the increase in efficiency being related to the an increase in the frequency of techniques used' [15]. Therefore, it becomes necessary to develop fundamental motor skills for greater performance in the combat dynamics of ground and stand-up fighting [32].

It is important to highlight the chokes and joint locks techniques effectiveness; they are connected to the fight outcome by submission (winners), with chokes being the most efficient action in this submission method. According to WUFC world fight reports between 2008 and 2017 [48], the rear-necked choke is the most common submission in fight outcomes (17.1%), followed by the armbar (10.0%), the guillotine shock (8.8%) and the triangle shock (5.3%), respectively.

In stand-up fighting, the highest efficiency was at the kicking level, followed by the punching and lastly the kneeling. However, there was a greater frequency of punching blows in stand-up fighting than kicking and kneeling. The greater frequency of fist blows is in line with the studies conducted in karate and in taekwondo [4, 49] where the straight punches were most used, followed by the kicks. It can be said that, although the kicking techniques are less frequent, they are more effective because, due to the risk of failure and vulnerability, they are usually performed with certainty. In fact, fighters often use fist techniques, such as straight punches (jab and cross), just to maintain a long distance and thus perform kicking techniques more safely and accurately. However, punching, which was revealed to have a higher significant difference in the winning or losing effect, is the most usual cause of TKO 33 (19.4%) and KO 18 (10.6%).

The fact that the winners showed higher efficiency in all combat distances reveals a great capacity of contextual adaptation by these athletes. It is in the close distance where the winners showed the most efficiency. In fact, the development of the fight at that distance is associated with a greater domain and control over the opponent, enabling greater effectiveness in the tactical-technical actions. The dominant ground position enabled a significant advantage to be gained in striking techniques using both hands [15].

By comparing the different styles with the different distances, higher significant correlations between specific combat styles efficiency and specific combat distances were confirmed. At long distance, the fighters opted mainly for technical-tactical actions with large amplitude (i.e. upper and lower members in full or almost complete extension at the point of impact with the target), such as kicks (i.e. low kick, round-house kick, front kick, axe kick, side kick, hook kick, spinning hook kick, spinning back kick) and straight punches (i.e. jab, cross, spinning back fist). Otherwise, at short distance the fighters opted mainly for technical-tactical actions with less amplitude (i.e. upper or lower members flexing at the impact with the target), such as short punches (i.e. hook, uppercut) and knees strikes. At close distance the fighters opted mainly for hand-to-hand fighting, where technical-tactical actions involve body control (takedowns / throws, chokes, joint locks and ground and pound). These fight dynamics are in line with a study carried out in boxing, where the fighters strike (short punches or straight punches) in accordance with the distance perceived (opportunity) [24].

It should be noted that the lower efficiency between stand-up strikers with short distance could be due to the fact that short punches are used less frequently than straight punches. This is because when the distances are shortened, many fighters instead of punching, choose grabbing, clinging or arm dragging as the way to control, immobilize or takedown the opponent. Similarly, in a boxing study [50], the straight punches (i.e. jabs) were used more, while hooks and the uppercuts (i.e. short punches) were significantly less frequently used. This could be in line with the concept that when the frequency increases so too does efficiency [15].

Finally, it was noticeable that the contextual information (i.e. different distances) implies different combat dynamics, that is, combat styles appropriate to the respective distances. Accordingly, it can be remarked that the decision-making by fighters varies according to the context (individual-context interaction), meeting a dynamic-ecological behavioural perspective, where the action emerges spontaneously according to the perceived opportunities (i.e. affordances) [25]. In this perspective, the present results go against what was previously reported in a boxing study [24], which evidenced the efficiency of



decision-making by performing the appropriate specific boxing actions, depending on the target-boxer distance variants. In addition, a Krav Maga study [51] that analysed the tasks of manipulation, creating restrictions in a situational normality, it was found that the adaptability was only achieved by experts, since the decision-making and performance were affected by the challenging situation, where the experience level contributed to explaining the behavioural differences between the participants. In fact, the decision-making and the action emerged as a situational opportunity result, in this case the different distances. However, the different distances are also a consequence of the styles and the actions used by the fighters according to their own objectives (experiences and skills), making the attack more efficient. Therefore, the right technical-tactical actions (accurate, safe, economical, fast and unpredictable), at the right time (timing), are only possible through the memorized knowledge and skills developed through experience; this is the same as in tactical reasoning [1, 12, 16, 20]. It is noteworthy that all technical-tactical action in combat must comply with its structural and functional assumptions, in order to avoid execution errors (presenting opportunity to the opponent) and meet the objectives effectively [1]. Thus, it is justified to develop training methods where analytical and integrated exercises coexist, based on technical-tactical repetitions (i.e. automation) and sparring (i.e. in a practice competition). This should be developed with a partner: a) selecting and repeating the more efficient skills (stand-up and ground fighting), focusing on offensive technical-tactical versatility and its constraints (e.g. combat styles, adaptation, balance, timing, opportunity, unpredictability and adaptability to different combat distances); b) sparring (integral or conditioned), applying the technical-tactical actions developed in the first method; or with the trainer: through plastrons/shields/punch mitts workout, which allows the trainer to make the fighter repeat the skills or create representative combat situations, stimulating cognitive and ecological dynamic processes (articulating different combat styles with different distances).

## CONCLUSIONS

The analysis of the offensive dynamic in Ultimate Full Contact related with the combat styles and distances provided very useful information for

technical-tactical training processes. These data bring new information about the fighters tactical behaviour in offensive efficiency.

Thus, this study concluded that: The winners were more efficient in all combat styles and distances, with statistically significant differences, so the effect of winning or losing considerably depends on the offensive efficiency; the higher efficiencies observed in the winners in all combat styles, their specific skills and distances, highlight greater stability, versatility, adaptability and opportunity seizing; the specific combat style efficiencies are more highly related with specific combat distance efficiencies, highlighting that the fighters select specific actions according to the perceptual contextual variation (different distances), however the distances are also a purposeful approach to attack with efficiency.

The higher offensive efficiency in styles depends, in decreasing order on submission grappler, ground striker and stand-up striker; however in their specific skills, the punches and kicks in stand-up striker showed more efficiency than the chokes and joint locks. Also, takedowns, the specific skills of ground fighters related with the way to bring down the opponent to the ground and there, try to beat him or her through submission skills or ground and pound, were the most efficient specific skill. These further reinforce the importance of technical-tactical versatility in winning fights.

Highlight the fact that offensive efficiency is related with the adjusted between the appropriate combat distances (i.e. long range, short range, and close range) and specific combat styles (i.e. stand-up strikers, ground strikers and submission grapplers). The combat distance variation provides different spaces between the opponents, forcing different dynamics with high technical-tactical diversity (i.e. adaptability and opportunity seizing). As a result, the athletes decide to choose combat styles that are most favourable to the different contextual circumstances, taking into account their individual skills, the combat strategies planned and the Ultimate Full Contact particularities. Therefore, it is necessary to enhance cognitive and situational training processes through skills repetition and sparring, which should be undertaken using analytical and integrated methods' to

promote a perfect and representative technical-tactical structural and functional development (i.e. stability, versatility, adaptability and opportunity sense).

## HIGHLIGHTS

- The offensive efficiency related with styles, its skills, and distances is a combat dynamic that is both decisive and determinant in the fighter's performance.
- Specific combat styles and their skills are significantly related with specific combat distances for higher offensive efficiency.
- Stand-up fighters must develop defence strategies (e.g. evasive displacements, balance,

sprawling, punching, kicking), keeping proper distance to avoid being taken to the ground, since the takedowns and ground fighting are shown to be very efficient.

- Technical-tactical stability, versatility, adaptability and opportunity seizing are determinant factors for higher offensive efficiency.
- Training processes based on the interaction of cognitive and dynamic ecologic models must be considerable to improve and develop the adjustable structural and functional technical-tactical actions.

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