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Changes in Technical Attempts According to Round Progression in No-Gi Jiu-Jitsu Sparring Assuming a Tournament

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Abstract. The purpose of this study was to conduct 3 rounds of 5-minute high-intensity sparring assuming an actual game to find out the degree of use and the number of attempts of the five techniques used in tournament No-Gi Jiu-Jitsu competition. The subjects of the study were 8 male high school students (17.0±1.6 years) at the blue belt level who had more than 2 years of Jiu-Jitsu training experience and participated in competitions, and were randomly assigned to participate in the experiment. The research method is divided into 5 categories: Takedown(TA), Guard pass(GA), Sweep(SW), Mount(MO) and Submission(SU) according to the rule book of the International Brazilian Jiu-Jitsu Federation. The subjects were classified, and video was taken to identify the number of attempts of the five techniques used during three rounds of 5 minutes. If the intention of surrender (tap-out) came out during the round, both fighters were trained in advance to return to the original (standing) position and continue sparring until the end of the remaining time. After the experiment was finished, the number of attempts for each technique was manually measured through the video footage taken, and recorded by a measurer qualified to judge a jiu-jitsu competition to increase reliability. Based on the measured data, descriptive statistics (frequency analysis) were used, and the techniques used between each round and the number of attempts were examined. The techniques used and the number of attempts during the three 5-minute rounds are as follows. However, since the type of technique used between rounds, the irregularity of trials, and the number of trials are different, it is judged that comparing the significant difference between rounds by the number of times can cause statistical errors. Therefore, it is judged appropriate to present the contribution (%) by converting the use of techniques and the number of attempts according to the progress of the round into a percentage(%). The technique types and contributions(%) used between each round are as follows.

First, In the contribution of technique type(%), guard pass showed the highest contribution(30%) in the 3 rounds total, and submission showed the second-highest contribution. Takedown was the third with 22%, Mount was the fourth with 15%, and Sweep was the lowest with 9%. Also, takedown in the 1st round, guard pass in the 2nd round, and contribution(%) in the submission technique in the 3rd round were the highest, and the change contribution(%) from the standing to the ground technique type was confirmed as the round progressed. Second, in the No-gi method, the takedown attempt of the stand technique type was dominant in the initial round. However, the attempts of ground technique type guard pass, submission, mount, and sweep gradually increased from 2nd to 3rd round. It would be unreasonable to infer the results of this study as the type and contribution of techniques used in the official No-gi Jiu-Jitsu tournament. However, based on the results of this study, it is judged that predicting the type and importance of techniques used in official tournament matches can be helpful in improving performance.

Keywords: No-gi Jiu-Jitsu, technique attempt, Rate of technique contribution(%).

I. INTRODUCTION

In Jiu-Jitsu official competitions, the match (IBJJF, 2021) is conducted in two ways (No-gi or Gi) depending on the clothing allowed. Among them, the No-gi method wears shorts and T-shirts made of elastic (rash guard) material instead of clothing (dobok) to play the game. The No-gi method cannot use the technique of holding the garment (gi) like the Gi method (Jones & Ledford, 2012); Yang Jae-woong, 2022), the technical characteristics of using various types of techniques using the principle of leverage after grabbing or fixing the opponent's upper limbs (wrist, elbow, shoulder, neck, etc.) or lower limb (foot, ankle, knee, pelvis, etc.) appear.

In terms of technique, both fighters start attacking and defending in a standing position (Andreato et al., 2017), and among them, takedown (2 points) knocks a standing opponent to the floor.

As a technique, no part of the body except for the two feet of both players is in contact with the floor (IBJJF, 2021), and points can be obtained if successful. If a player succeeds in the takedown technique during the match, if a part of the opponent's body (back or hip) touches the floor, the guard pass fighter(PF) and guard play fighter(GF) is divided into

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two ground positions (Báez et al., 2014), and these positions and technical attempts appear in a non-periodic form. Techniques that can be used in the ground situation include sweep (2 points), guard pass (3 points), mount (mount, back mount: 4 points), and the game ends regardless of the game time. Includes possible submissions.

In addition, the main goal of Jiu-Jitsu is to neutralize the opponent's technical attempts or block or fix body movements to obtain a tap-out (Vidal-Andreato et al., 2011; Da Silva et al., 2013).

Considering that, depending on the type of technique used during a given game time, it can affect the type of technique and attempt that the opponent will use, and as the round progresses, the learning effect preceded in the previous round can affect the type of technique and attempt in the next round. It can be expected that it may affect the number of times.

In an experimental study of a No-gi tournament simulating a real Jiu-Jitsu match similar to this study, Coswig (2018) reported that there was a difference in the number of attempts and techniques used in the second match after the first match, and the same subject It was reported that the difference in the level of technology use in the repeated rounds was a learning effect. However, no study has yet been found that presents the skills and number of trials exhibited by this precedent learning effect within and between rounds.

Therefore, in this study, it is judged that it would be meaningful to find out the five techniques and the number of attempts classified according to the International Brazilian Jiu-Jitsu Federation Rule book (IBJJF, 2021) within and between rounds. In addition, considering the match-up characteristics of jiu-jitsu competitions conducted in a tournament format (Andreato et al., 2015), studies on techniques and attempts in competitions can be used as important basic data in terms of strategies and techniques of jiu-jitsu competitions.

Therefore, in this study, assuming a tournament match for high school students (less than 18 years old) with more than 2 years of domestic jiu-jitsu experience, 3 rounds of 5 minutes no-gi sparring was conducted. Through this, we tried to analyze the trends in the number of attempts and techniques in Jiu-Jitsu Nogi competitions within and between rounds.

II. REASEARCH METHOD

1. 1 *Research Design of the Study*

Three rounds of sparring were held for each team, assuming a tournament match. Based on the rulebook of the International Brazilian Jiu-Jitsu Federation(IBJJF, 2021), sparring was conducted for five minutes, which is the duration of the blue belt competition, and the break time was also set to five minutes according to the rulebook. During sparring, subjects in each position were controlled to exert maximum effort for skill success. Additionally, In the event of a tap-out during sparring (round), both fighters were instructed in advance to return to their initial (standing) position and spar until the remaining time was over. The experimental (sparring) process is shown in Figure 1.
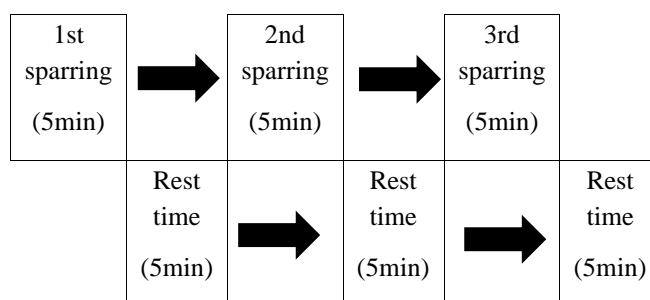

Figure 1. Experimental process

1.2 *Respondents of the Study*

The subjects of this study were 8 high school male students with blue belt level who had at least 2 years of jiu-jitsu training experience and participated in competitions at a gym in G city. Before the experiment, the guardians and subjects were properly informed of the study's goals and procedures, and only those who had signed consent forms for research participation with their guardians' approval were allowed to participate in the study. In order to increase the reliability of the measured variable values, it was controlled to refrain from the physical activity of moderate-intensity or higher 48 hours before the experiment, and the experiment was conducted in a hydrated state by inducing sufficient water intake to the subjects. The physical characteristics of the subjects are shown in <Table 1>.

Table 1. General characteristics of study subjects

	subjects
N	8
Age(years)	17.0±1.6
Career(years)	2.1±0.7
Height(cm)	173.1±4.5
Weight(kg)	73.3±7.0

2. *Research Instrument*

Video was recorded to measure the number of technical attempts during 5-minute 3-round no-gi jiu-jitsu sparring.

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3. Measuring equipment

1). Measurement method

The number of attempts of 5 techniques (takedown, guard pass, sweep, mount, submission) was written by hand using 5-minute 3-round video data, and a researcher with experience in refereeing jiu-jitsu competitions recorded them to increase reliability.

2). Data processing

The average and standard deviation of each question were calculated using the SPSS 26.0 statistical program.

Using descriptive statistics (frequency analysis), the five techniques and the number of attempts used in 5-minute 3-round high-intensity sparring were analyzed within and between rounds.

III. RESULTS

1) Analysis of technical frequency by round in No-gi Jiu-Jitsu sparring

In this study, frequency analysis was conducted on 5 types of techniques shown by attack and defense during 3 rounds of 5 minutes of 8 subjects No-gi Jiu-Jitsu sparring. The mean and standard deviation of times/ (%) are as shown in <Table 2>, <Table 3>, and <Table 4>.

Table 2. 1st round technique type frequency analysis (times)						
No-gi						
		Takedown TA1	guard pass GU1	sweep SW1	mount MO1	submission SU1
N	validity	8	8	8	8	8
	missing value	0	0	0	0	0
Average		3.12	2.87	1.00	1.25	2.25
Standard Deviation		3.563	1.552	.755	1.752	2.434

The 1st round of technical attempts(times) is a takedown average of 3.12, standard deviation 3.563, guard pass average 2.87, standard deviation 1.552, sweep average 1.00, standard deviation 0.755, mount average 1.25, standard deviation 1.752, submission average 2.25, standard deviation showed a value of 2.434.

Table 3. 2nd round technique type frequency analysis (times)						
No-gi						
		Takedown TA2	guard pass GU2	sweep SW2	mount MO2	submission SU2
N	validity	8	8	8	8	8
	missing value	0	0	0	0	0
Average		1.75	3.50	1.12	2.00	2.87
Standard Deviation		2.659	1.511	.640	2.138	1.552

2nd round of technical attempts(times) is takedown average 1.75, standard deviation 2.659, guard pass average 3.5, standard deviation 1.511, sweep average 1.12, standard deviation 0.640, mount average 2.00, standard deviation 2.138, submission average 2.87, standard deviation showed a value of 1.552.

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Table 4. 3rd round technique type frequency analysis (times)					
No-gi					
		Takedown TA3	guard pass GU3	sweep SW3	mount MO3	submission SU3
N	validity	8	8	8	8	8
	missing value	0	0	0	0	0
Average		2.25	3.12	.62	1.75	2.50
Standard Deviation		2.121	1.457	.744	2.492	2.449

3rd round of technical attempts(times) are takedown average 2.25, standard deviation 2.121, guard pass average 3.12, standard deviation 1.457, sweep average 0.62, standard deviation 0.744, mount average 1.75, standard deviation 2.492, submission average 2.50, standard deviation showed a value of 2.449.

2) Contribution of technique type between rounds in No-gi sparring(time/%)

The results of the analysis of the technical type and contribution(time/%) in the round of sparring in the 3 rounds are as follows: <Table 5>, <Table 6>, <Table 7>, <Table 8>, <Table 9>.

Table 5. Contribution between technique types in No-gi Jiu-Jitsu 1st round sparring (times/%)				
		Technique	Frequency	Ratio(%)
n=8	.00	Takedown(TA) attempts	4	50
	5		2	25
Technique type in round (times)	6		1	12.5
	9		1	12.5
	total		8	100.0
	1	Guard pass(GU) attempts	2	25
	2		1	12.5
	3		3	27.5
	5		2	25
	total		8	100
	.00	Sweep(SW) attempts	2	25
	1		4	50
	2		2	25
	total		8	100
	.00	Mount(MO) attempts	4	50
	1		1	12.5

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2			2	25
5			1	12.5
total			8	100
.00	Submission(SU) attempts		3	37.5
1			1	12.5
2			1	12.5
4			1	12.5
5			1	12.5
6			1	12.5
total			8	100

The technical type and contribution (%) in the 1st round of sparring of No-gi are shown in <Table 5>. Takedown(TA) 4 people 0 times(50%), 2 people 5 times(25%), 1 person 6 times(12.5%), 1 person 9 times(12.5%) 25 times, guard pass (GU) 2 people 1 time(12.5%), 1 person 2 times (12.5%), 3 people 3 times(37.5%), 2 people 5 times(25%) 23 times, sweep(SW) 2 people 0 times(25%), 4 people 1 time(50%), 2 people 2 times(25%), 8 times, Mount(MO) 4 people 0 times

(50%), 1 person 1 time(12.5%), 2 people 2 times(25%), 1 person 5 times(12.5%) 10times, Submission(SU) 3 people 0 times(37.5%), 1 person 1 time(12.5%), 1 person 2 times(12.5%), 1 person 4 times(12.5%), 1 person 5 times(12.5%), 1 person 6 times(12.5%) were confirmed 18 times. The technical contribution(%) in the 1st round was in the order of takedown(30%), guard pass(27%), submission(21%), mount(12%), and submission(10%).

Table 6. Contribution between technique types in No-gi Jiu-Jitsu 2nd round sparring (times/%)

		Technique	Frequency	Ratio(%)
n=8	.00	Takedown(TA) attempts	5	62.5
	3		1	12.5
Technique type	4		1	12.5
in round	7		1	12.5
(times))	total		8	100.0
	2	Guard pass(GU) attempts	3	37.5
	3		1	12.5
	4		2	25
	5		1	12.5
	6		1	12.5
	total		8	100
	.00	Sweep(SW) attempts	1	12.5
	1		5	62.5
	2		2	25
	total		8	100

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			Frequency	Ratio(%)
.00	Mount(MO) attempts		3	37.5
1			1	12.5
3			3	37.5
6			1	12.5
total			8	100
1	Submission(SU) attempts		2	25
2			2	25
4			3	37.5
5			1	12.5
total			8	100

The technical type and contribution (%) in the 2nd round of sparring of No-gi are shown in <Table 6>. Takedown(TA) 5 people 0 times(62.5%), 1 person 3 times(12.5%), 1 person 4 times(12.5%), 1 person 7 times(12.5%) 14 times, guard pass(GU) 3 people 2 times(37.5%), 1 person 3 times(12.5%), 2 people 4 times(50%), 1 person 5 times(12.5%), 1 person 6 times(12.5%), 28 times, sweep(SW) 1 person 0 times(12.5%), 5 people 1 time(62.5%), 2 people 2 times(25%) 9 times,

Mount(MO) 3 people 0 times(37.5%), 1 person 1 time(12.5%), 3 people 3 times(37.5%), 1 person 6 times(12.5%) 16 times, Submission(SU) 2 people 1 time(25%), 2 people 2 times(25%), 3 people 4 times (37.5%), and 1 people 5 times(12.5%) were confirmed 23 times. The technical contribution (%) within the 2nd round was in the order of guard pass (30%), submission (24%), mount (21%), takedown (15%), and sweep (10%).

Table 7. Contribution between technique types in No-gi Jiu-Jitsu 3rd round sparring (times/%)

		Technique	Frequency	Ratio(%)
n=8	.00	Takedown(TA) attempts	2	25
	1		2	25
Technique type in round (times)	3		2	25
	4		1	12.5
	6		1	12.5
	total		8	100.0
	1	Guard pass(GU) attempts	1	12.5
	2		2	25
	3		2	25
	4		1	12.5
	5		2	25
	total		8	100
	.00	Sweep(SW) attempts	4	50
	1		3	37.5

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2		1	12.5
total		8	100
.00	Mount(MO) attempts	4	50
1		1	12.5
3		2	25
7		1	12.5
total		8	100
.00	Submission(SU) attempts	3	37.5
1		1	12.5
4		1	12.5
5		3	37.5
total		8	100

The type of technique and contribution(%) in the 3rd round are shown in <Table 7>. Takedown(TA) 2 people 0 times(25%), 2 people 1 time(25%), 2 people 3 times(25%), 1 person 4 times(12.5%), 1 person 7 times(12.5%) 18 times, guard pass(GU) for 3 people 2 times(37.5%), 1 person 3 times(12.5%), 2 people 4 times(50%), 1 person 5 times(12.5%), 1 person 6 times(12.5%) 25 times, sweep(SW) 4 person 0 times(50%), 3 people 1 time(37.5%), 1 people 2 times(12.5%) 5 times, Mount(MO) 4 people 0 time(50%), 1 person 1 time(12.5%), 2 people 3 times(37.5%), 1 person 7 times(12.5%) 14 times, Submission(SU) 3 people 0 times(37.5%), 1 person 1 time, 1 person 4 times, 3 people 5 times were confirmed 20times. The technical contribution(%) within the 3rd round was in the order of submission(27%), takedown(22%)=guard pass(22%), mount(18%), and sweep(12%).

IV. DISCUSSION

In this study, 3 rounds (5min sparring, 5min rest) of No-gi sparring, assuming a jiu-jitsu tournament match, are conducted to discuss the change in technical type and technical contribution(%) as the round progresses.

However, it is determined that comparing the significant difference between rounds by the number of times may lead to a statistical mistake since there are differences in the types of techniques used within each round, the trials were conducted irregularly, and the overall momentum (number of attempts). Therefore, I would like to present the contribution (%) by converting the technical type and the number of technique attempts according to the round into a percentage(%). The contribution(%) between the types of technique in the round that appeared in the 5 minutes 3 rounds sparring of the No-gi method is the same as <Table. 8>. The technical attempts were confirmed 256 times (1st: 84 times, 2nd: 90 times, 3rd: 82 times) and 2nd>1st>3rd in order.

The contribution(%) among the types of technique in the 1st round was in the order of takedown(TA)(30%), guard pass(GU)(27%), submission(SU)(21%), mount(MO)(12%), and SW(10%). The stand-up technique(takedown attempt) type, was the highest at 30% of the total technical contribution (%), and the ground technique type was 70%.

	Table 8. Contribution of technique type within a round in No Gi Jiu-Jitsu sparring(times/%)															

		1R					2R					3R				
		TA	GU	SW	MO	SU	TA	GU	SW	MO	SU	TA	GU	SW	MO	SU
n=8	validity	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	missing value	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Total (times)	25 ①	23 ②	8 ⑤	10 ④	18 ③	84	14 ④	28 ①	9 ⑤	16 ③	23 ②	90	18 ②	25 ②	5 ④	14 ③	20 ①	82
Contribution within a round (%)	30	27	10	12	21	100	15	30	10	21	24	100	22	22	12	18	27	100

TA: (Takedown), GU: (Guard Pass), SW (Sweep), MO (Mount), SU (Submission)

Contribution within a round (%)

1R: TA>GU>SU>MO>SW   2R: GU>SU>MO>TA>SW   3R: SU>GU=TA>MO>SW

Since it is impossible to use a technique while holding a uniform in No-gi, it is crucial to adopt the guard pass and guard play positions. As a consequence, it is believed that a takedown (TA) had a significant technical contribution(%). In addition, in the ground technique contribution(%), guard pass(GU), submission(SU), mount(MO), sweep(SW) appear in the order, and guard pass(GU)(IGJJF, 2021) to occupy an advantageous position than the opponent (IGJJF, 2021) technique showed a high proportion, and the technical contribution(%) of submission(SU) was the third-highest.

This indicates the flow of techniques in which the submission technique is attempted after the guard pass(GU) technique, which is a characteristic of the jiu-jitsu technique in all rounds. In other words, it is considered to suggest that the number of attempts of the guard pass can directly affect the technique contribution(%) of the submission(SU).

The technical contribution(%) between the 2nd round technique types is: Guard Pass(GU)(30%), Submission(SU)(24%), Mount(MO)(21%), Takedown(TA)(15%), Sweep(SW)(10%) appeared in the order. The standing technique type, takedown(TA), seemed to be the fourth lowest at 15%, and showed the opposite technical contribution(%) from the 1st round, and the ground technique type accounted for 85%. This result is considered to be the learning effect of the 1st round technique attempt, and it is judged that the technique attempt in the ground situation, which is characteristic of jiu-jitsu, has increased.

Table 9. Contribution of technique type within a round in No-gi Jiu-Jitsu sparring(times/%)																					

Technique type		Technical Contribution(times/ (%))																			
		TA				GU				SW				MO				SU				
		1R	2R	3R	RT	1R	2R	3R	RT	1R	2R	3R	RT	1R	2R	3R	RT	1R	2R	3R	RT	Total
N = 8	Times	25	14	18	57	23	28	25	76	8	9	5	22	10	16	14	40	18	23	20	61	256
	Contribution (%)	①	③	②		③	①	②		②	①	③		②	①	③		③	①	②		
		22%				30%				9%				15%				24%				Total contribution (100%)

TA: (Takedown), GU: (Guard Pass), SW (Sweep), MO (Mount), SU (Submission)

RT: Round total

Technical Contribution Between Rounds(%)

TA: 1R>3R>2R, GU: 2R>3R>1R, SW: 1R>3R>2R, MO: 2R>1R>3R. SU: 2R>3R>1R

Therefore, in the 2nd round, the proportion of the guard pass(GU) technique to occupy an advantageous position over the opponent (IGJJF, 2021) was high, and it is thought that the technical contribution (%) of the submission(SU) also increased compared to the 1st round. Contribution (%) between technique types in 3rd round is Submission(SU) (27%), Takedown(TA) (22%)=Guard Pass(GU)(22%), Mount(MO)(18%), Sweep(SW)(12%) appeared in the order. The contribution(%) of takedown(TA) technique, which is a standing technique type, increased compared to 2nd round, but it was lower than 1st round, 22% showed. In addition, the ground technique type showed 78% of the technique contribution(%).

It is noteworthy that the technical contribution of the submission (SU), which can terminate the match regardless of the amount of time remaining, was highest in the three-round ground scenario. This is due to repeated sparring with the same opponent in the 1st and 2nd rounds. It is thought to be the learning effect of prior technical attempts.

The contribution of the total technique type during the 3rd round was <Table. 9>, and the guard pass(GU) showed the highest contribution(30%) in the 3 round total, followed by submission(SU)(24%), takedown(TA)(22%), mount(MO)(15%), and sweep(SW)(9%). These results suggest that in the No-gi method, the standing technique(Takedown) type of attempt is dominant at the beginning of the round, and also in the ground technique type, the guard pass(GU) and submission(SU) are thought to mean that the proportion of technique is high.

V. CONCLUSION

This study was conducted on eight male high school students who have more than two years of experience in Jiu-Jitsu training and participated in the competition. However, it would be difficult to generalize the results of this study due to the small number of samples to infer the types and contributions of techniques used in the official No-gi Jiu-Jitsu competition. However, based on the results of this study, it is judged that predicting the type and importance of techniques used in official tournament games can help improve performance.

REFERENCE

[1] Andreato, L. V., Julio, U. F., Gonçalves Panissa, V. L., Del Conti Esteves, J. V., Hardt, F., Franzói deMoraes, S. M., … Oliveira de Souza, E. (2015). Brazilian Jiu-Jitsu simulated competition part II. Journal of Strength and Conditioning Research, 29, 2015–2025.

[2] Andreato, L. V., Lara, F. J. D., Andrade, A., & Branco, B. H. M. (2017). Physical and physiological profiles of Brazilian jiu-jitsu athletes: a systematic review. Sports medicine-open, 3(1), 9.

[3] Báez E, Franchini E, Ramírez-Campillo R, et al(2014). Anthropometric characteristics of top-class Brazilian Jiu Jitsu athletes: role of fighting style. Int J Morphol. 32:1043–1050.

[4] Coswig, V. S., Gentil, P., Bueno, J. C., Follmer, B., Marques, V. A., & Del Vecchio, F. B. (2018). Physical fitness predicts technical-tactical and time-motion profile in simulated Judo and Brazilian Jiu-Jitsu matches. PeerJ, 6, e4851.

[5] Da Silva BVC, Marcolo Junior M, de Monteiro GGFS, Junior LOS , de Moura Simim MA, Mendes EL, et al(2013). Blood Lactate Response After Brazilian BJJ Simulated Matches. Journal of Exercise Physiology Online. 16(5):63–7. August 15.

[6] International Brazilian Jiu- Jitsu Federation. Book of Rules(2021). January. Available from: https://cbjj.com.br/books-videos. Accessed

[7] Jones, N. B., & Ledford, E. (2012). Strength and conditioning for Brazilian Jiu-Jitsu. Strength and Conditioning Journal, 34, 60–69.

[8] Nembhard, D. A., & Osothsilp, N. (2002). Task complexity effects on between-individual learning/forgetting variability. International journal of industrial ergonomics, 29(5), 297-306.

[9] Vidal-Andreato, LV, Franzo´i-de-Moraes, SM, Lopes de Moraes Gomes, T, Del-Conti-Esteves, JV, Vidal Andreato, T, and Franchini, E(2011). Estimated aerobic power, muscular strength and flexibility in elite Brazilian Jiu-Jitsu athletes. Sci Sports 26: 329–337.

[10] Yang, J. W.(2022). Comparison of skill frequency, core temperature, heart rate, lactic acid and hand grip strength during jiu-jitsu (GI) and (NO-GI) sparring (high school male student tournament assumption)