

The indices of technical-tactical preparation of the World's Judo Champions in Tokyo 2010 as an assessment criterion for individual training

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- ☑ **A** Study Design
- ☑ **B** Data Collection
- ☑ **C** Statistical Analysis
- ☑ **D** Manuscript Preparation
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Abstract

- Background & study aim:** Individualization of the training process is important as it determines an athlete's competitive performance. The purpose of our research was the individual indices of the technical-tactical preparation (PTT) for judo champions gold medal winners from the World Judo Championships in Tokyo in 2010.
- Material and methods:** Fifty men's contests from the World Judo Championships was the research material (men's judo). The contests were recorded by means of the standard audio-video equipment. Technical-tactical preparation of the winner from eight weight categories was determined by the indices of the winner. Our analysis allowed us to determine the range and frequency of the techniques used. Additionally, to find preparations between attempts and effective attacks, as well as to determine scored points and points lost by referee penalties.
- Results:** The competitors under analysis performed in 6 or 7 contests on their ways to gold medals. The individual (PTT) indices of the winners were different in terms of techniques, frequency and effectiveness of attacks. The competitors had the high value of effectiveness and defence efficiency indices and small loss of points resulted from referee penalties.
- Conclusions:** The PTT indices allowed to determine the features of individual special preparation in judo competitors who won gold medals at the World Championships in Tokyo, 2010. The value of the indices is the base for controlling and conditions of best possible way of training.
- Key words:** judo • individual indices • technique and tactics
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INTRODUCTION

The main competitions in judo are the Olympic Games and World Championship for each age category. Each weight division implies marked differences among competitors in technical and tactical aspects as well as in physiology, body performance and composition. Thus, it directly influences some key aspects of athletes' preparation including the

management of body weight and body composition [1,2]. To be effective judo techniques should be executed with accuracy, within a good time of opportunity', with strength, velocity and power. This short burst of energy is supplied mainly by anaerobic metabolism. In contrast, the maintenance of the intermittent work performed during a match, as well as the recovery process during the short intervals, are mainly

supported by aerobic metabolism. Additionally, aerobic metabolism is particularly important for an effective recovery between matches [3].

Individualization of the training process, during physical and technical training is important since it determines sport performance [4,5]. Some important changes in judo sport regulations which were introduced in 2009 and 2010 also affect tactical and technical preparation. Koka – the lowest score was cancelled, and some throws that involve direct grasping opponent's legs such as morote gari, kuchiki taoshi, kibisu gaeshi, kata guruma, sukui nage, kata otoshi were prohibited.

Since 2010 those throws have been performed only in counterattacks and combinations forms. Judo competitions have also been changed by decreasing the number of repechage contests to two competitors from one country in each weight category, and location of competitors according to ranking lists. Those changes are also aimed at reducing the techniques which are not judo originated, and may also result in more attractive judo contests and better organization of judo competitions <http://www.ijf.org/> and <http://www.eju.net/>.

In this research we have attempted at determining individual technical-tactical preparation (PTT) in 2010 world judo champions.

MATERIAL AND METHODS

Fifty contests played by 8 gold medal winners was our research material. The contests were recorded by means of the standard audio-video equipment. 531 attacks (including 47 efficient ones) were recorded during the analysed competitions, the total time of 50 contests was 183 minutes and 9 seconds. The audio-video material was graphically processed, then the indices were determined. The analysis allowed us to determine a range of techniques used (versatility), frequency of attacks (activity), proportions between attempted attacks and effective attacks (effectiveness) and to determine scored points and points scored or lost due to the referee's penalties (efficiency).

Determining the indices of versatility

To assess an individual PTT, in sport competitions, a range of techniques used (volume) was described by the indices of general, effective and simulate (attacks which were not judged) versatility. According to the Kodokan Judo [6,7] there are 94 judo techniques (67 throws, and 27 grappling techniques). Competitive judo, however, limits the range of techniques used in practice, e.g.

– techniques prohibited: kani basami, kawazu gake, dakiage, dojime; techniques performed in some forms: morote gari, kuchiki taoshi, kibisu gaeshi, kata guruma, sukui nage; and techniques scarcely seen: yama arashi, obi otoshi, tawara gaeshi and others. In this paper we have limited the range of techniques being analysed to 50 ones, and that value is a constant denominator of the versatility indices. The value of versatility indices was calculated according to the following formulas:

$$W_o = X_o / X \text{ (x100\%)} \\ \text{and} \\ W_e = X_e / X \text{ (x100\%)} \\ W_p = W_o - W_e$$

W_o – general versatility index
 W_e – efficiency versatility index
 W_p – simulate versatility index
 X_o – number of techniques performed
 X_e – number of efficiently performed techniques
 X – number of techniques which can be executed – they were analysed in our paper – 50 techniques

Determining the activity indices

Activity allowed to determine differences in frequency of between the examined competitor and his opponents. The activity index was calculated in accordance with the formulas:

$$A_a = A \text{ sum} / n \\ A_o = a \text{ sum} / n \\ AA = A_a - A_o$$

A_a – activity attack index
 $A \text{ sum}$ – number of the recorded attacks of the judoka
 n – number of the analysed contests
 A_o – defence activity index (opponents' activities)
 $a \text{ sum}$ – the number of the recorded attacks of the opponents
 AA – activity index

Determining the effectiveness indices

We can determine the frequency of efficiently performed throws by using the PTT indices. Effectiveness of attacks and defence was determined as the proportion of attempted attack to successful attacks (attacks judged by referees). The value of those parameters shall be determined, analysing attack and defence, using the following formulas:

$$E_a = AS \text{ sum} / AP \text{ sum} \text{ (x 100\%)} \\ \text{and} \\ E_o = 1 \text{ (100\%)} - AS \text{ sum} / AP \text{ sum} \text{ (x 100\%)} \\ \text{and} \\ E_o = 1 \text{ (100\%)} - AS \text{ sum} / AP \text{ sum} \text{ (x 100\%)}$$

E_a – effectiveness of the attack index
 $AS \text{ sum}$ – the number of efficient attacks of the analysed judoka
 $AP \text{ sum}$ – the number of attacks performed by the analysed judoka
 E_o – effectiveness of defence index
 1 (100\%) – value of defence prior to contests

As sum – the number of efficient attacks performed by the opponents of the observed judoka

Ap sum – the total number of the attacks performed by the opponents of the observed judokas.

Determining the efficiency indices

Efficiency index (Sa) and points lost due to referee penalties (Po) were determined by analysing points scored per one contest. Calculation was done in the following way:

$$Sa (Po) = 5xM + 7xM + 10xM / n [8]$$

RESULTS

Four Japanese competitors were the winners of the World Championships in 2010, and one competitor for each of the following countries: France, Greece, Korea and Uzbekistan. The winners of under 60, 73, 81, 90, 100, +100, weight categories and the open category had 6 contests each, and the winner of under 66 weight category had 7 contests. Total time of the contests ranged from 18 min and 28 sec to 25 min and 34 sec. The World's champions had the shortest contests during preliminary round, all their contests were won prior to the time limit for a contest. The longest contests were those of semi-finals where in two tree-minute

contests with the winners were decided by the referee's announcement, and the other two contests were won in the extra-time (Table1).

Among the winners from 2010, competitors from the 60, 81, 90 and +100 kg weight division used the widest range of judo techniques – and they obtained the highest values of the general versatility indices as well as apparent and efficient versatility indices. The Japanese judokas used the least range of judo techniques winners from the 73 kg, 66 kg open and 100 kg judokas (Figure 1).

The winners from the 60, 73, 90, 100, +100 kg weight divisions dominated their opponents in terms of attacks frequency, obtaining positive value of the activity index, while the winners of 66 kg, 90 kg and open category yielded to their opponents in the frequency of attempted attacks, and they had negative value of the activity index (Figure 2).

The winners of 60, 90 and +100 kg weight division most often attacked effectively – their techniques were often judged in relation to all attempted attacks, they gained the highest value of the effectiveness attack indices. The winners from the 81 kg and 100 kg weight categories seldom effectively

Table 1. Efficient time of a contest (minutes, seconds) duration of effective contests, number of attacks and points scored by the winners at the World Championships in Tokyo 2010

Champions at the World Champ 2010	60kg	66kg	73kg	81kg	90kg	100kg	+100kg	OPEN	Total
Extra contest	X	0'46"	X	X	X	X	X	X	0'46"
1 st preliminary contest	4'50"	1'01"	1'50"	0'45"	1'24"	3'05"	1'07"	0'15"	14'17"
2 nd preliminary contest	3'30"	1'49"	5'0"	5'0"	5'0"	0'04"	1'48"	4'54"	27'05"
3 rd preliminary contest	5'0"	2'59"	3'21"	2'40"	5'0"	5'0"	4'30"	3'57"	32'37"
One-quarter contest	5'0"	5'0"	1'51"	5'+1'12"*	3'50"	4'48"	1'55"	5'0"	32'46"
Semi-final contest	2'37"	5'+3'0"*	5'+3'0"*	5'0"	2'01"	5'+0'24"*	5'+0'20"*	2'18"	38'39"
Final contest	4'37"	2'59"	3'26"	5'+0'16"*	1'14"	5'0"	5'+0'48"*	5'+3'0"*	36'20"
Total contest time	25'34"	22'34"	23'28"	24'53"	18'28"	23'21"	20'28"	24'24"	183'09"
Number of attacks performed	60	87	63	78	35	74	69	65	531
Amount of points scored	71	72	45	54	52	68	82	52	496

* Efficient time of a contest (5 minutes), and extra time of „play-off“ in case of a draw.

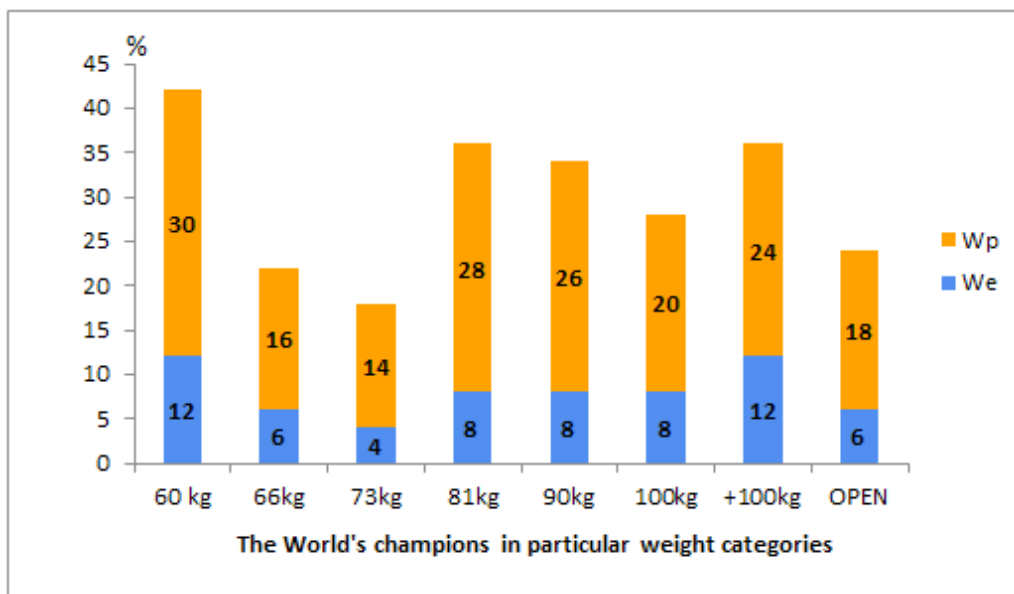


Figure 1. The value of versatility indices

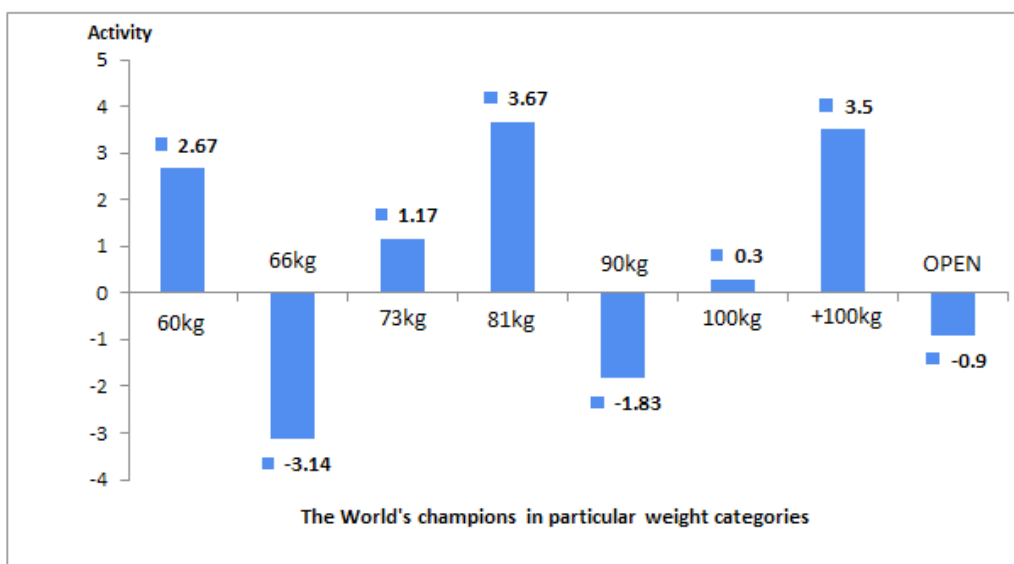


Figure 2. The value of activity indices

attacked, and they gained the lowest value of the effectiveness of the attack indices. The winners from 60, 73, 81, +100kg weight divisions and open category judokas secured 100% of defence effectiveness, their opponents were not able to perform any successful attacks (Figure 3).

The winners of +100 kg and 60 kg weight category obtained most referee points for efficiently executed attacks, they obtained the highest value of the efficiency indices. The winner of 81 kg weight

category obtained the least points for successful attacks. The opponents of the winner 100 kg and 81 kg weight categories lost much due to penalties. 6 out of 8 winners lost no points due to penalties. Only one judoka, the winner in the 73 weight category neither lost nor gained points due to the referee penalties (figure 4).

The value of the analysed indices allowed to determine the individual PTT of the judokas, who won at World Championships in Tokyo, 2010.

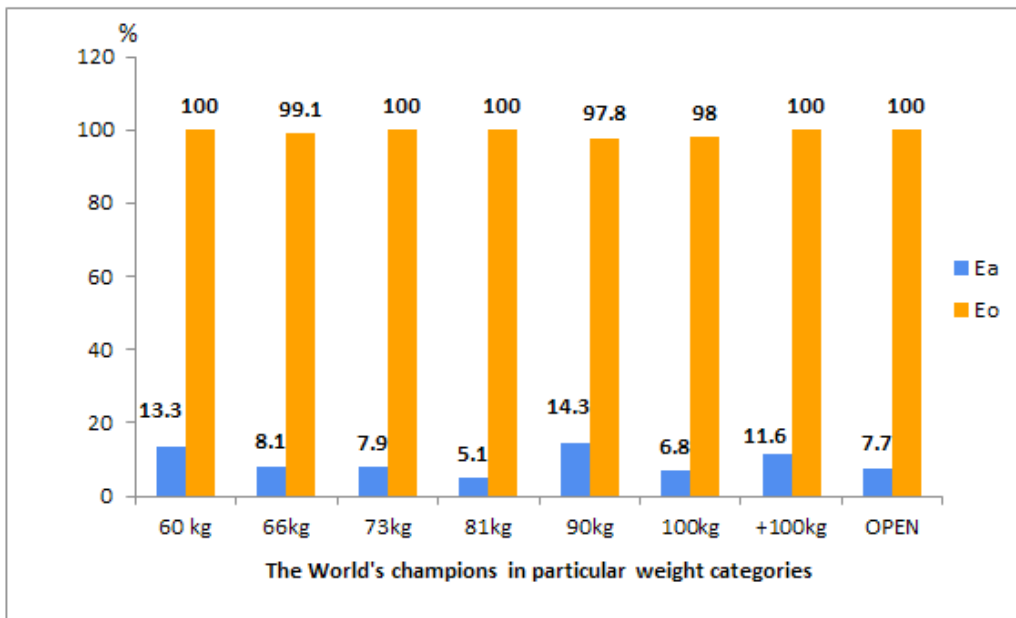


Figure 3 The value of the indices of attack and defense effectiveness

The winner from the 60 kg weight category won 6 contests of total time of 25 min 34 sec. He attacked 60 times and scored 71 pts. The judoka obtained high value of the analysed indices and the widest range of techniques used ($W_o = 42\%$, $W_e = 12\%$ and $W_p = 30\%$). He dominated over his opponents in frequency of attacks ($AA = +2.67$) and high effectiveness of attacks ($E_a = 13.3\%$) and defence ($E_o = 100\%$). He obtained high value of the efficiency attack ($S_a = 9.83$ pts.), his opponents lost points due to referee penalties ($P_o = +2$ pts.).

The winner from the 66 weight category won 7 contests of total time 22 min 34 sec. He attacked 87 times and scored 72 pts. The judoka had small range of techniques performed ($W_o = 22\%$, $W_e = 6\%$ and $W_p = 16\%$). His opponents more often attempted to attack $AA = -3.14$ (he gained the lowest value of that index). He had low value of effectiveness of attacks and defence ($E_a 8.1\%$ and $E_o 99.1\%$). He obtained high value of, efficiency attacks $S_a = 8.86$ pts., and his opponents lost points referee penalties $P_o = +1.43$ pts.

The winner from the 73 weight category won 6 contests of total time 23 min 28 sec. He attacked 63 times and scored 45 pts. Judoka had the lowest range of techniques performed ($W_o = 185$, $W_e = 6\%$ and $W_p = 14\%$). He was more active than his opponents ($AA = +1.17$). He got $E_a = 7.9\%$ while his effectiveness defence (E_o) was 100% - none of his opponents performed successful

attacks. Judoka and his opponents did not lose points due to referee penalties.

The winner from the 81 kg category had 6 contests of total time 25 min 53 sec, he attacked 78 times and scored 54 pts. Judoka obtained high value of general and apparent versatility indices $W_o = 36\%$ and $W_p = 28\%$. He was very active, he attempted to attack more often than his opponents ($AA = +3.67$). He obtained the lowest value of effectiveness of attack ($E_a = 5.1\%$) and efficiency of attacks (4.83 points), whereas his effectiveness of defence was 100% , and his opponents were often penalized by referees.

The winner from the 90 kg category had 6 contests, of total time 18 min, 28 sec. He attacked 35 times and scored 52 pts. Judoka many times attempted to execute, various techniques but with little success $W_p = 26\%$, $W_e = 8\%$. His opponents often performed attacks which were shown by the negative value of the activity index ($AA = -1.83$). That judoka had the highest index of effectiveness of attack ($E_a = 14.3\%$) which means that attempted attacks were most often judged.

The winner of the 100 kg category had 6 contests of total time 23 min, and 21 sec. He attacked 74 times and scored 68 pts. His opponents lost their points ($P_o = 4.0$). He gained low value of the effectiveness of attack (E_a index = 6.8%). The value of the other indices did not distinguish that judoka from among others.

The winner of the +100 kg category had 6 contests of total time of 20 min and 28 sec. He attacked 68 times and scored 82 pts. Judoka had high value of the indices. He applied a wide range of techniques (Wo = 36% and We = 12%); and he dominated over his opponents in frequency of performed attacks (AA = +3.5). Effectiveness of those attacks was also high (Ea = 11.6%). That judoka had the highest value of the efficiency of attacks (Sa = 11.2 pts.), and his opponents were not able to attempt any successful attacks (Eo = 100%).

The winner from the open category had 6 contests of total time 24 min and 24 sec. He attacked 65 times and scored 52 pts. The judoka had a small range of techniques (Wo = 24%, We = 6% and Wp = 18%). He secured 100% of defence effectiveness (Eo) despite his opponents' frequent attacks (AA = - 0.9).

DISCUSSION

In our research we aimed the value of individual indices of the technical and tactical preparation (PTT) in World's Judo Champions in 2010. The PTT indices of the judokas who won the World Championships in Tokyo allow to determine the features of their individual training. The Wp index described the range of those techniques executed by the champions. It has been stated that they attempted their attacks by using from nine to twenty-one techniques (the Wo index), and from two to six efficiently executed techniques of those twenty-one (the We index) (Figure 1). The activity index (AA) allowed to determine judokas who gained or lost in frequency of the performed techniques. The value of that index was not influenced by contest time. The repeated occurrence of the negative value of that index may indicate either some deficiencies in physical efficiency, or some training features of their opponents. Five judokas from among the champions had positive value of total index and negative value were observed in three judokas (Figure 2). The judokas who manifested the highest value of the effectiveness of attacks indices, scored points every 7th, 8th or 9th attempts of efficient techniques whereas the judokas with low value of that index, attacked efficiently every 15th or 20th attempts (Figure 3). According to Franchini et al [4] a greater number of throwing techniques and the use of directions for attack seem to be important in increasing unpredictability during judo matches.

The value of those indices plays an important role especially after changes in judo sport rules which were introduced in 2009 and 2010 (<http://www.eju.net/>). The range of techniques used by judokas depends on their individual training and proper preparation. The range of their technical training, as a part of their tokui waza, can be determined with the use of the versatility indices [9-11]. The best judokas executed the techniques in their individual ways. They used various simulated attacks ("opening" techniques) which allowed to execute their techniques effectively [12-16]. Low value of the index may result from the new judo sport rules, comparing to the previous research [17-19] – cancelling koka for effectiveness attack, might have decreased the number of the assessed techniques. Further observations and analysis are required in order to verify the hypothesis.

The efficiency of the attacks performed allowed to determine the point value of the executed techniques – their accuracy and quality. The value of the efficiency index depended on the points scored and judged by referees. The final contest results were also affected by referee penalties imposed for a violation of the rules. The point value of the penalties was significant part of the PTT of the observed judokas (Figure 4).

The individual PTT assessment show that the winners from the 60 kg and +100 kg category, had high value of the analysed indices in comparison to the other investigated judokas. It may indicate they had better technical-tactical preparation for the World Championships in 2010. The observations of the top sport levels judokas during competitions and the analysis of their training allow to gather information about current tendencies in development of special preparation. It gives possibility to search for some defined value of the PTT [20-22], which is the basis for planning and efficient implementation of the training process based on the individual criteria of assessment.

The value of indices obtained by judokas who took part at World Championships in 2010 was not the only base for determining their PTT levels; but it also allowed to describe the individual features of special preparation.

CONCLUSIONS

The judokas who became winners at to 2010 World Championships have just completed their stages of

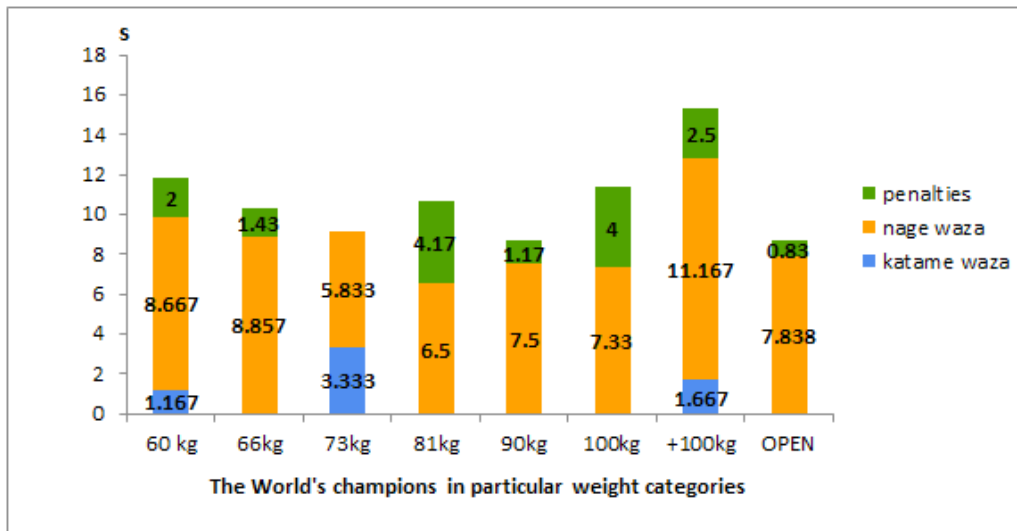


Figure 4. The value of efficiency indices

preparations. They face another challenge to repeat their success next year or get the chance to win medals at the Olympics in London. The technical-tactical preparation indices allow to assess the effectiveness of individual training. Entering another stage of sport

preparations we have to analyse the previous contests and to search for means which will lead to sport success. The analysis of the PTT indices allows to plan and effectively implement the special preparation process.

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