High School Badminton Seen from the Analysis of the World's Best Player Momota

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Current status

Cannot win in a team battle

motive

What is necessary to win a team battle?

Team battle… 2 doubles + 3 singles

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What are the elements needed to win in singles?

Badminton singles world champion was analyzed

Momota Kento

How to convert Momota's match to data

Data①
Flight time of shuttle

Smash・Clear・Hairpin

Drop・Cut・Lobing

Drive・Push　　etc.

Shot has no definition

Data②
From where did player hit shuttle

Right handed

1	2	3
4	5	6
7	8	9

Left handed

3	2	1
6	5	4
9	8	7

Opponent（Right handed）

9	8	7
6	5	4
3	2	1
3	2	1
6	5	4
9	8	7

Net

Momota（Left handed）

1
GRUNDFOS
HSBC
VICTOR

1
GRUNDFOS
HSBC
VICTOR

How to convert Momota's match to data

movie

How to organize data

Player name	Place number	Flight time(s)
Chou	2	0.68
Momota	1	0.83
Chou	9	1.06
Momota	3	0.83
Chou	4	0.63
Momota	1	0.63
Chou	1	0.81
Momota	9	1.24
Chou	4	0.43

Amount of data sampling

All these data were measured with a stopwatch

	Momota	Opponent	Total
Get point by shot	34	31	65
Get point by miss	25	25	50
The number of rallies they won	59	56	115
The number of shots	674	683	1357

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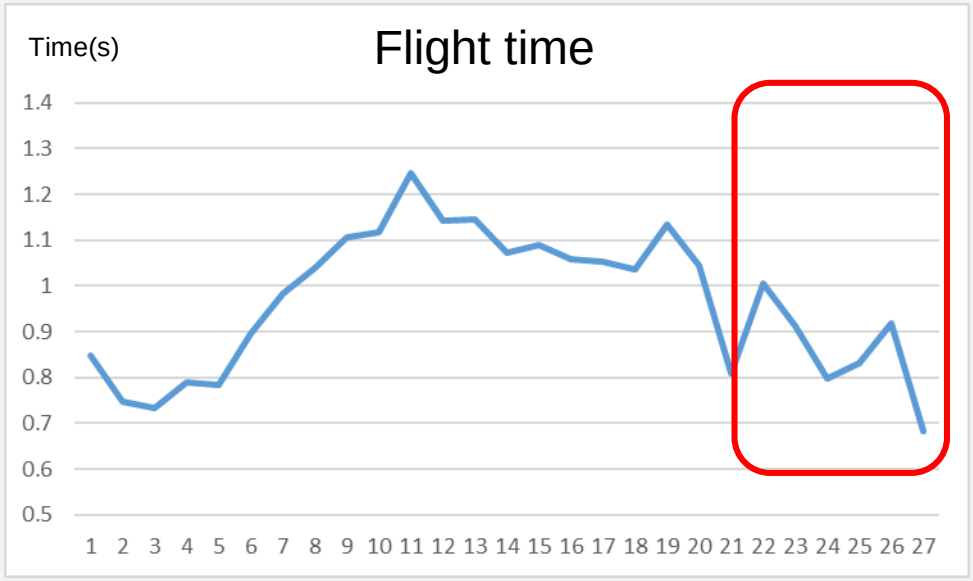
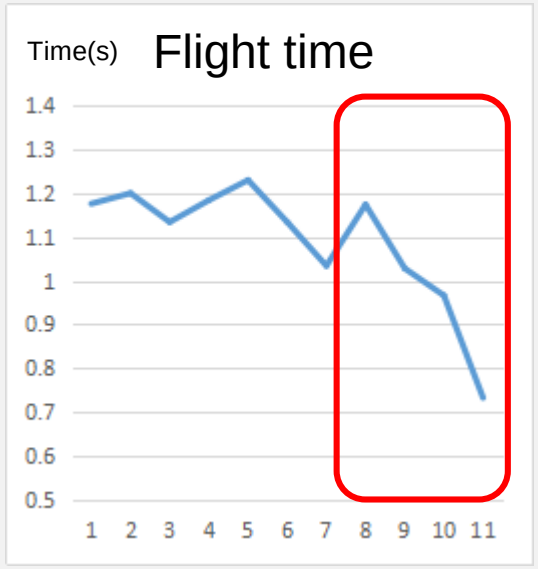
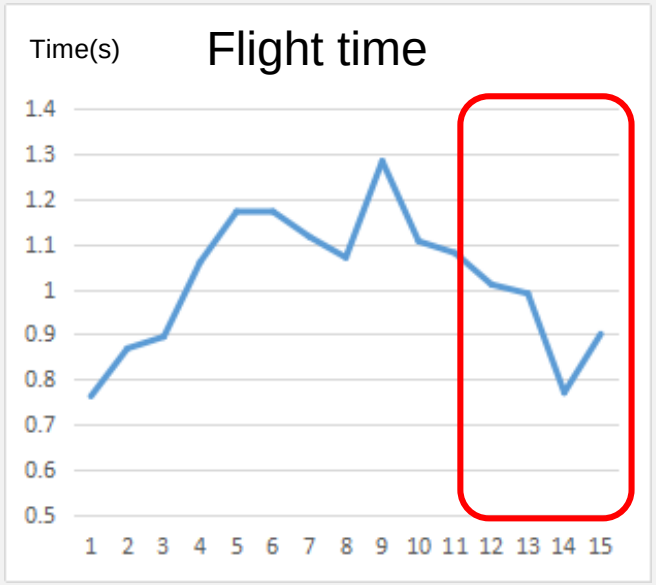
If the flight time data were shown on the graph …

Are the last few shots faster?







Hypothesis

The pace of the last few shots are faster than normal pace

（Comparison between effective shots and ineffective shots）

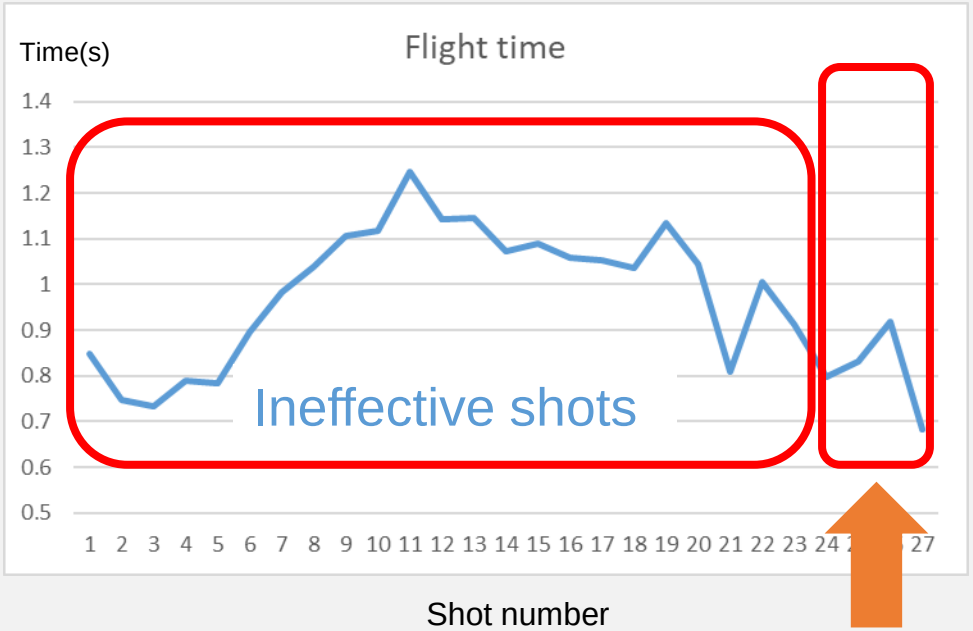
Hypothesis　How to analyze data

- Use the collected data
- Compare the winner’s pace of the last few shots (effective shots) with other shots (ineffective shots)

※Rally that ended with a mistake is excluded from the data

Rally that ended in less than 10 shots is excluded

Hypothesis analysis result



Ineffective shots (s)	Effective shots (s)	Rate of flight time
1.0775	0.78	0.723897912
0.923846	0.81	0.876769505
1.128	1.25	1.108156028
0.968571	0.535	0.552360126
0.916	1.045	1.140829694
0.711818	0.685	0.962324639

Hypothesis　All data

Ineffective shots (s)	Effective shots (s)	Rate of flight time
1.0775	0.78	0.723897912
0.923846	0.81	0.876769505
1.128	1.25	1.108156028
0.968571	0.535	0.552360126
0.916	1.045	1.140829694
0.711818	0.685	0.962324639
0.8575	0.735	0.857142857
1.05375	1.01	0.958481613
0.93	0.7	0.752688172
1.093333	0.47	0.42987818
1.201429	0.595	0.495243581
0.873333	0.625	0.715649128

0.78	0.63	0.807692308
1.03	0.875	0.849514563
0.865	0.855	0.988439306
1.116	0.67	0.600358423
1.048333	0.955	0.910970083
0.76	0.595	0.782894737
1.04	0.705	0.677884615
1.053	1.035	0.982905983
0.886667	0.605	0.682330571
1.042	1.225	1.1756238
0.9975	0.87	0.872180451
0.64	0.65	1.015625

Hypothesis　Analysis result

Take the average of the rate of flight time

0.83

The flight time of effective shots are short

Hypothesis　Consideration

Doing a rally at 1s/1shot pace

0.83 second

Can score by changing the pace to 0.83s/1shot

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Verification

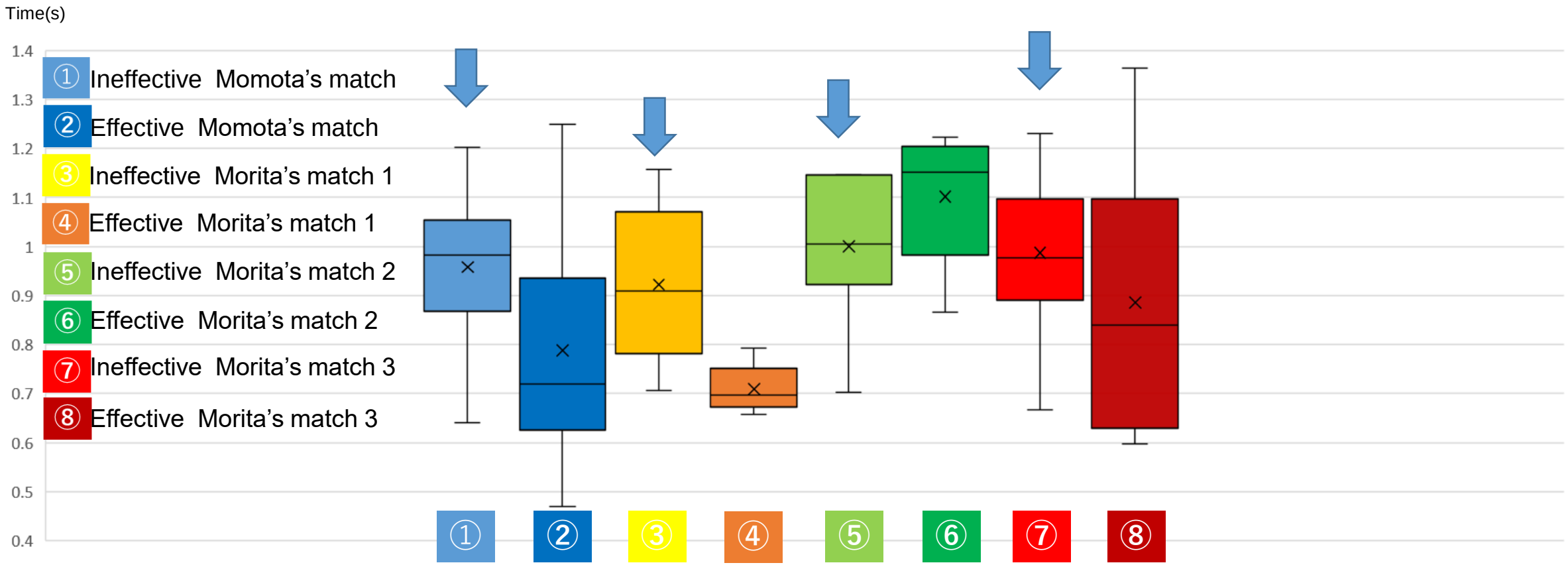
The result were applied
to high school students

Verification

How to analyze data

- Obtain data from Morita’s (high school student) match
- Compare Momota’s data with Morita’s data (use t-test)

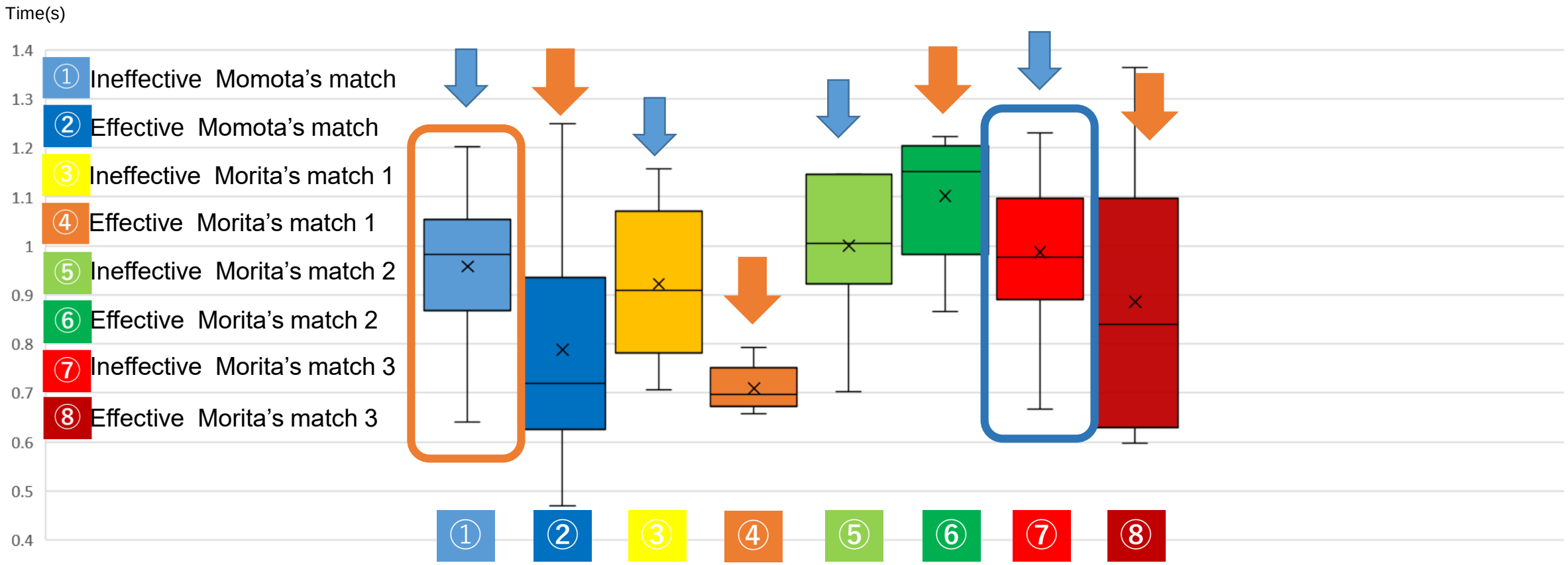
Compare match data（Box plot）



Make a boxplot of the data of effective and ineffective shots

Discover match data with similar ineffective shot paces

Compare match data（Box plot）

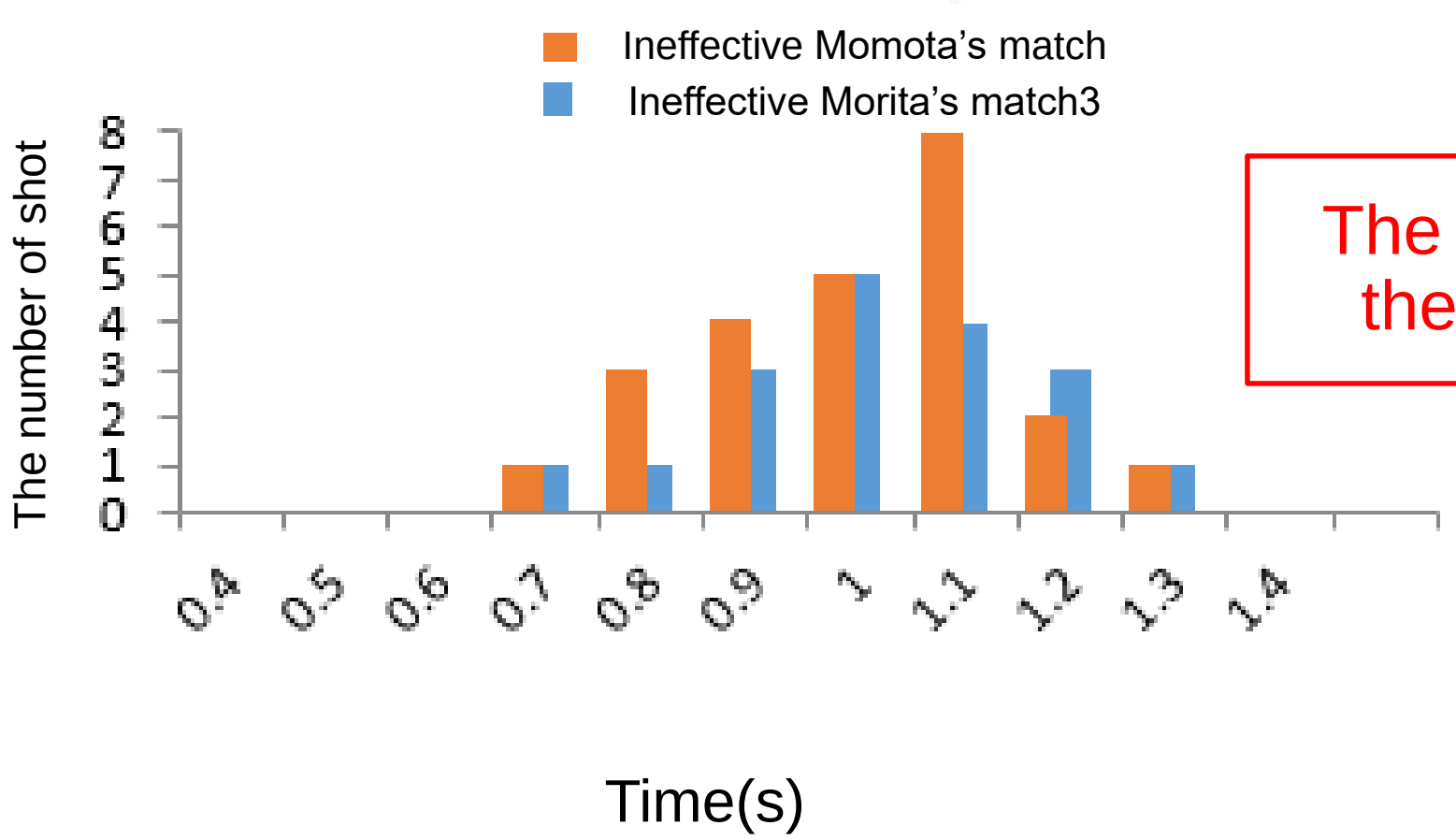


Make a boxplot of the data of effective and ineffective shots

Discover match data with similar ineffective shot paces

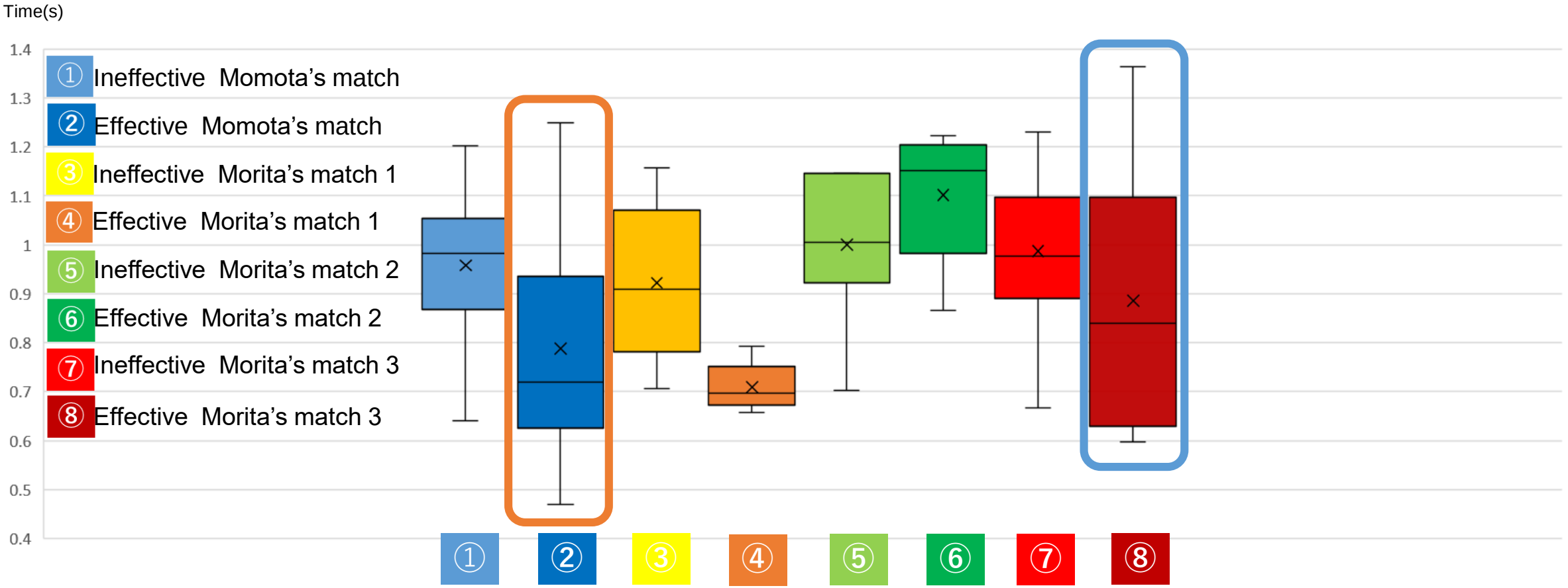
Compare ineffective shots data （Histogram)

Momota's ineffective shots・Morita's ineffective shots



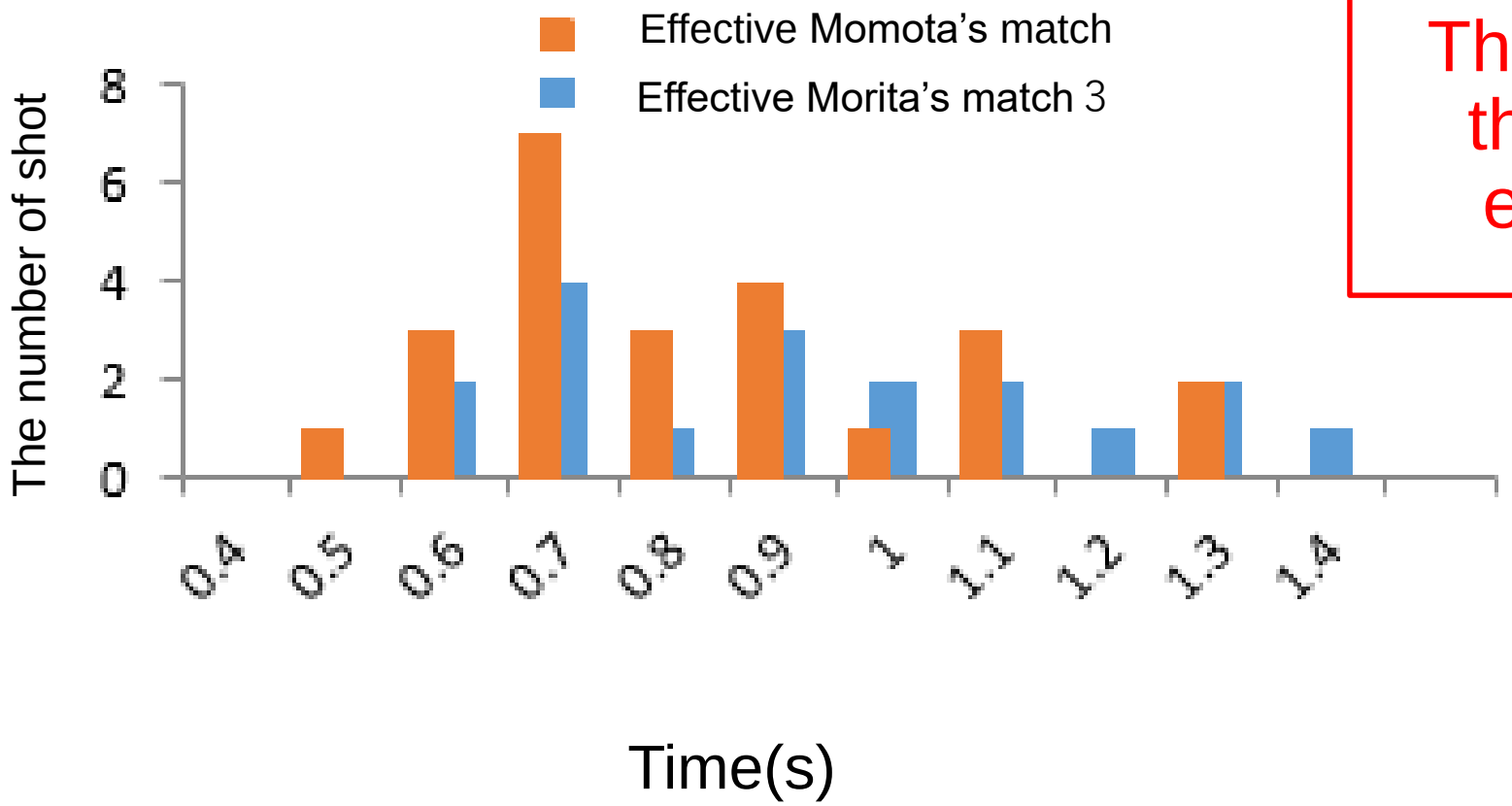
The histogram shows that the two data are similar

How was the comparison of effective shots data in the same match?



Compare effective shots data（Histogram）

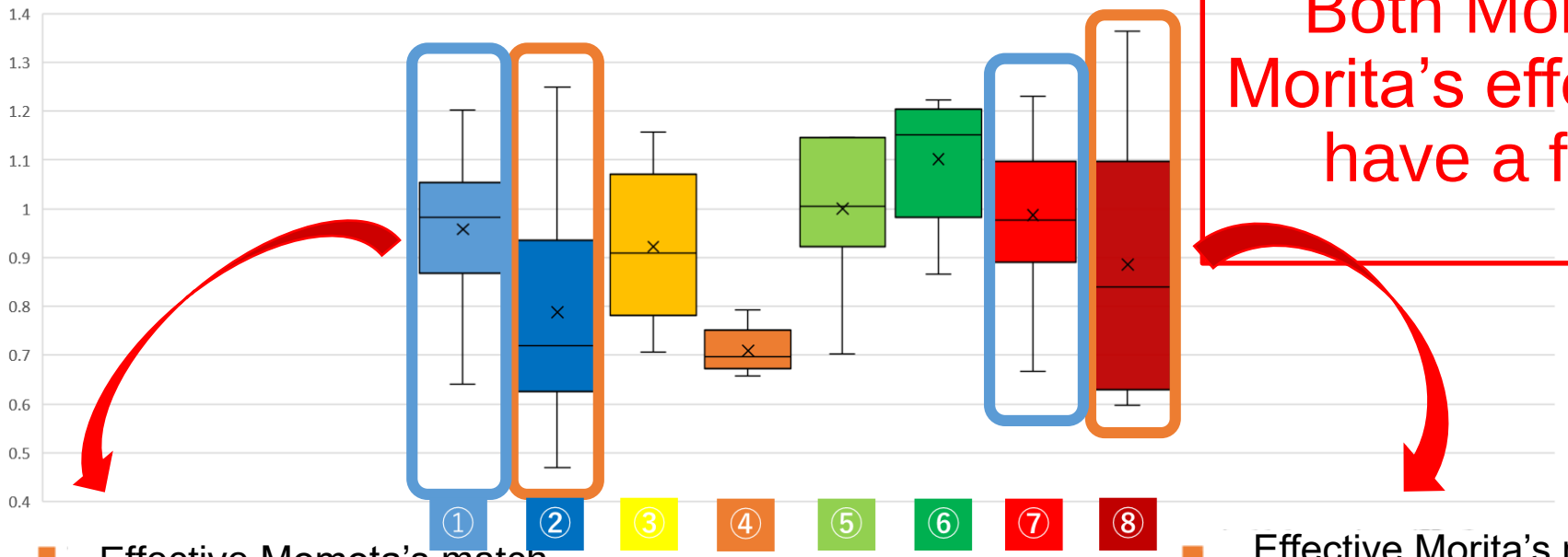
Momota's effective shots ▪ Morita's effective shots



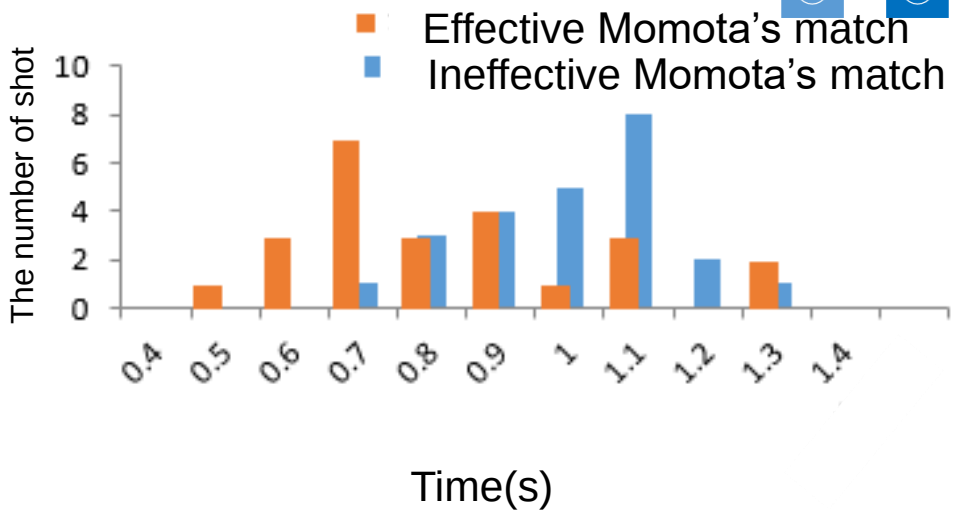
The histogram shows that the two data are similar even to effective shots

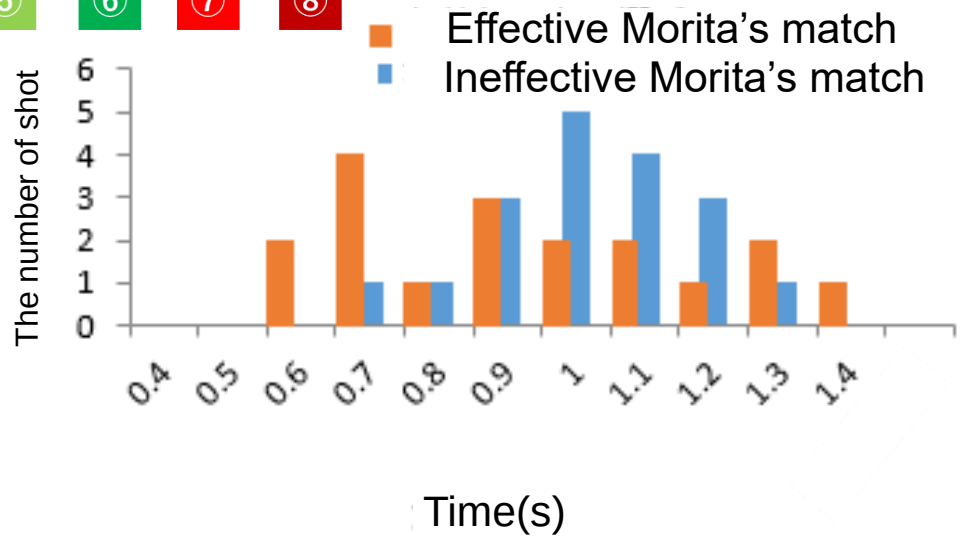
Visualize each player's effective shots data

① Ineffective Momota's match
② Effective Momota's match
③ Ineffective Morita's match 1
④ Effective Morita's match 1
⑤ Ineffective Morita's match 2
⑥ Effective Morita's match 2
⑦ Ineffective Morita's match 3
⑧ Effective Morita's match 3

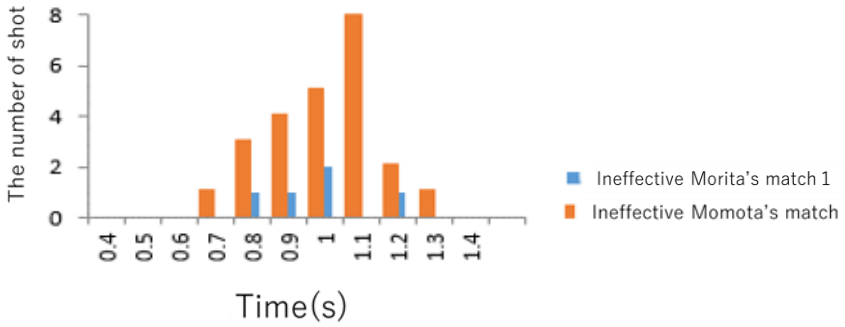


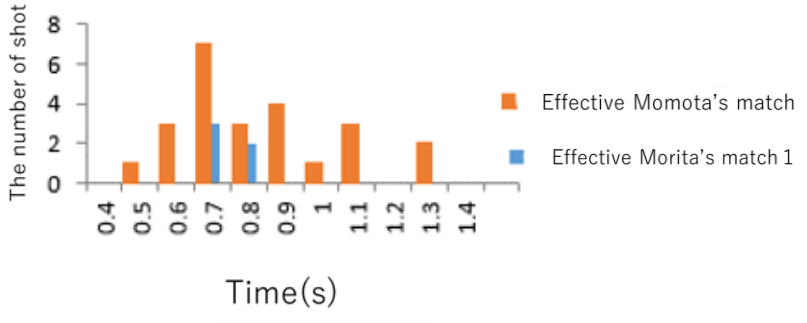
Both Momota and Morita's effective shots have a fast pace

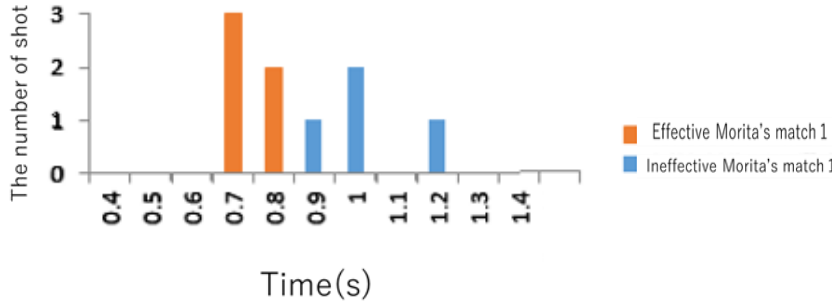


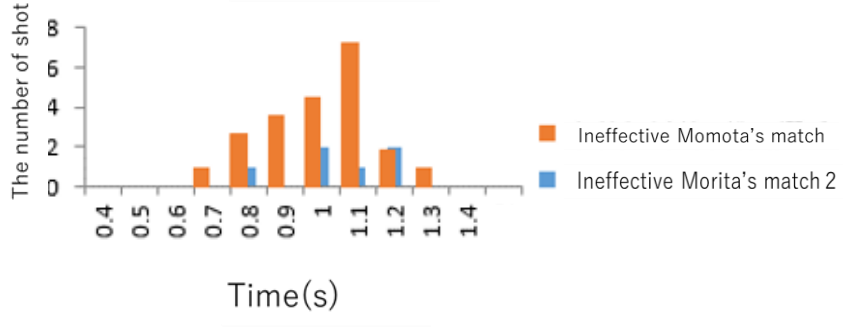


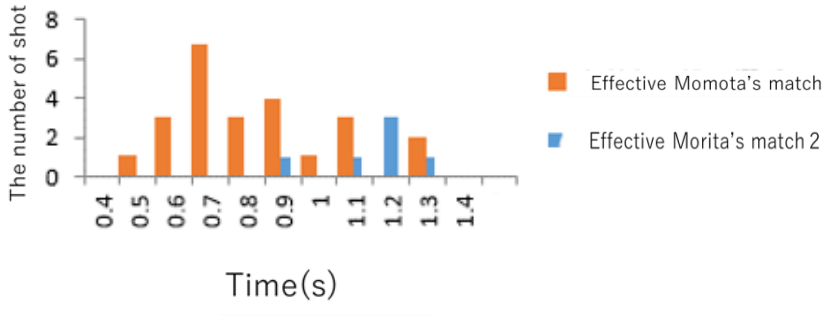
Visualize the pace of various matches

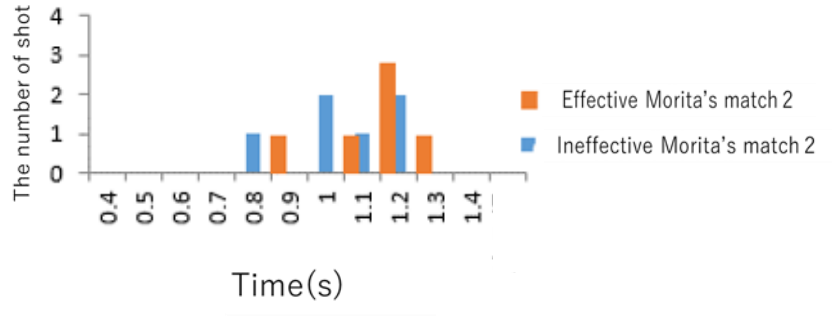


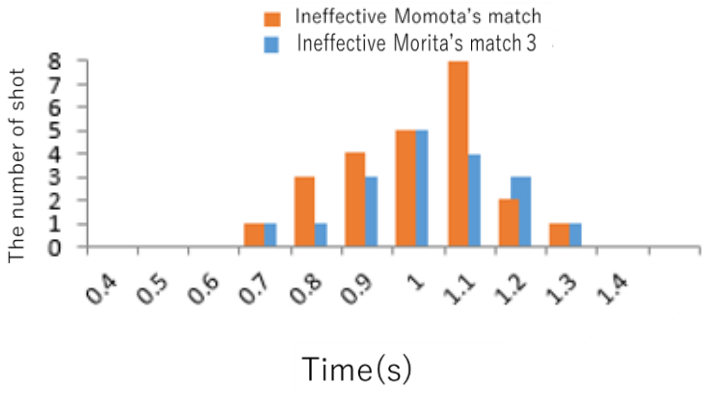


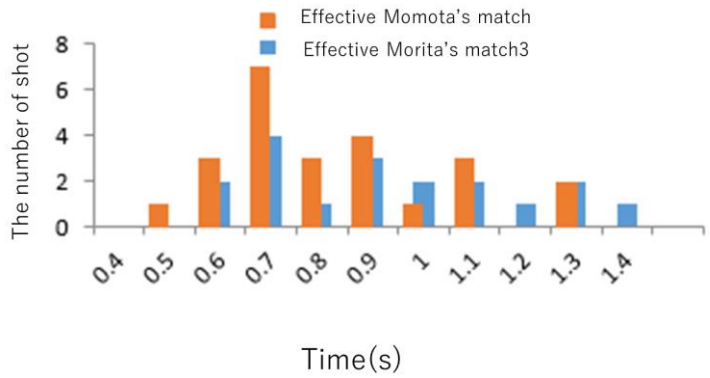


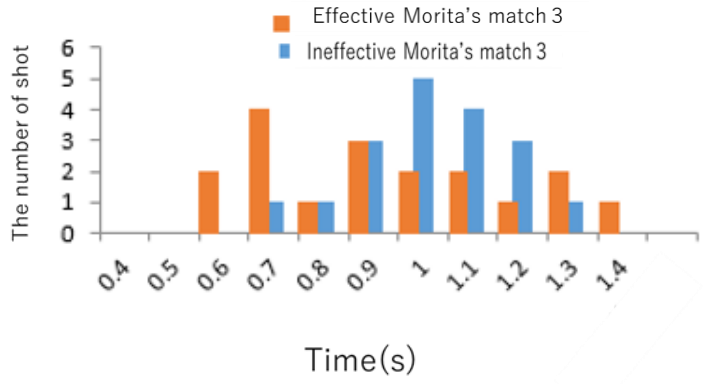








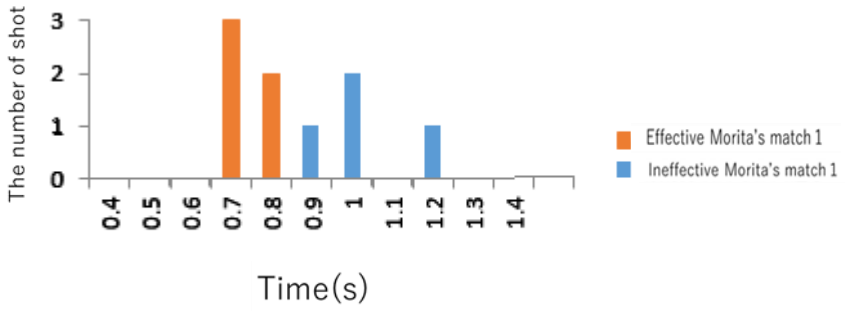


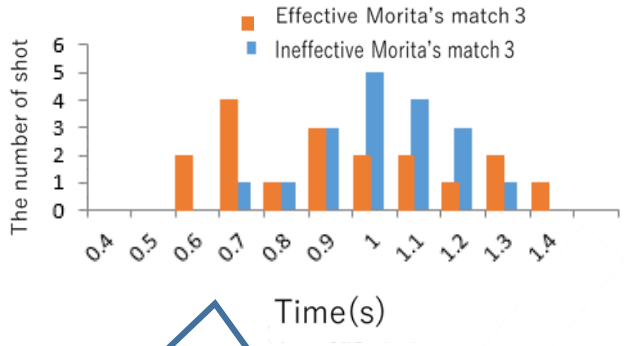


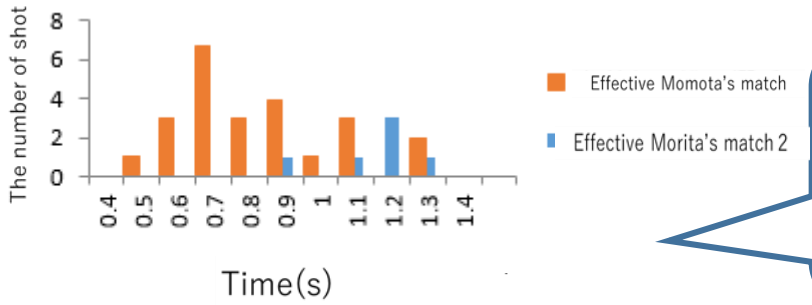
Verification by t-test

Average A	Average B
Standard deviation A	Standard devieton B
Significant difference	

0.92	0.96	0.71	0.79	0.92	0.71
0.15	0.14	0.05	0.21	0.15	0.05
Insignificant		Insignificant		Significant	
1.00	0.96	1.10	0.79	1.00	1.10
0.15	0.14	0.13	0.21	0.15	0.13
Insignificant		Significant		Insignificant	
0.99	0.96	0.89	0.79	0.99	0.89
0.14	0.14	0.24	0.21	0.14	0.24
Insignificant		Insignificant		Significant	







Momota's shots are faster than Morita's ones

Effective shots are faster than ineffective ones

Result of verification

There is no difference in pace
between Momota and high school students

Use what we discover from the research

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Hypothesis

Comparison of effective shots and ineffective shots

The effective pace is 0.83 times as fast as the normal pace

Practice

Verify the hypothesis by high school students

The results could be applied to high school students

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Prospect

・We practice to increase the pace only in the last set
of the all 5 sets on the knock training

Inventing a new badminton practice based on this study

Bibliography

The movie used for data sampling

https://www.youtube.com/watch?v=sZAAmtQ4VBY
https://www.youtube.com/watch?v=WICT4vXAerM