ANALYSIS OF CURLING TEAM STRATEGY/TACTICS USING CURLING INFORMATICS

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INTRODUCTION

- Japan national curling team won Second place at the Woman's World Championship 2016
  →**Still need to continue working in order to aim for the top**

- Curling is an Olympic game
  →Fifth place at the Sochi Winter Olympics
  →**Japan needs to work its way to get the medal**

Information Science Approach

Physical factor

- Temperature of ice sheet
- Changes in ice sheet
- Characteristics of stone
- Behavior of stone

Human factor

- Player's skills
- Player's physical abilities
- Player's state of health
- Player's state of mind

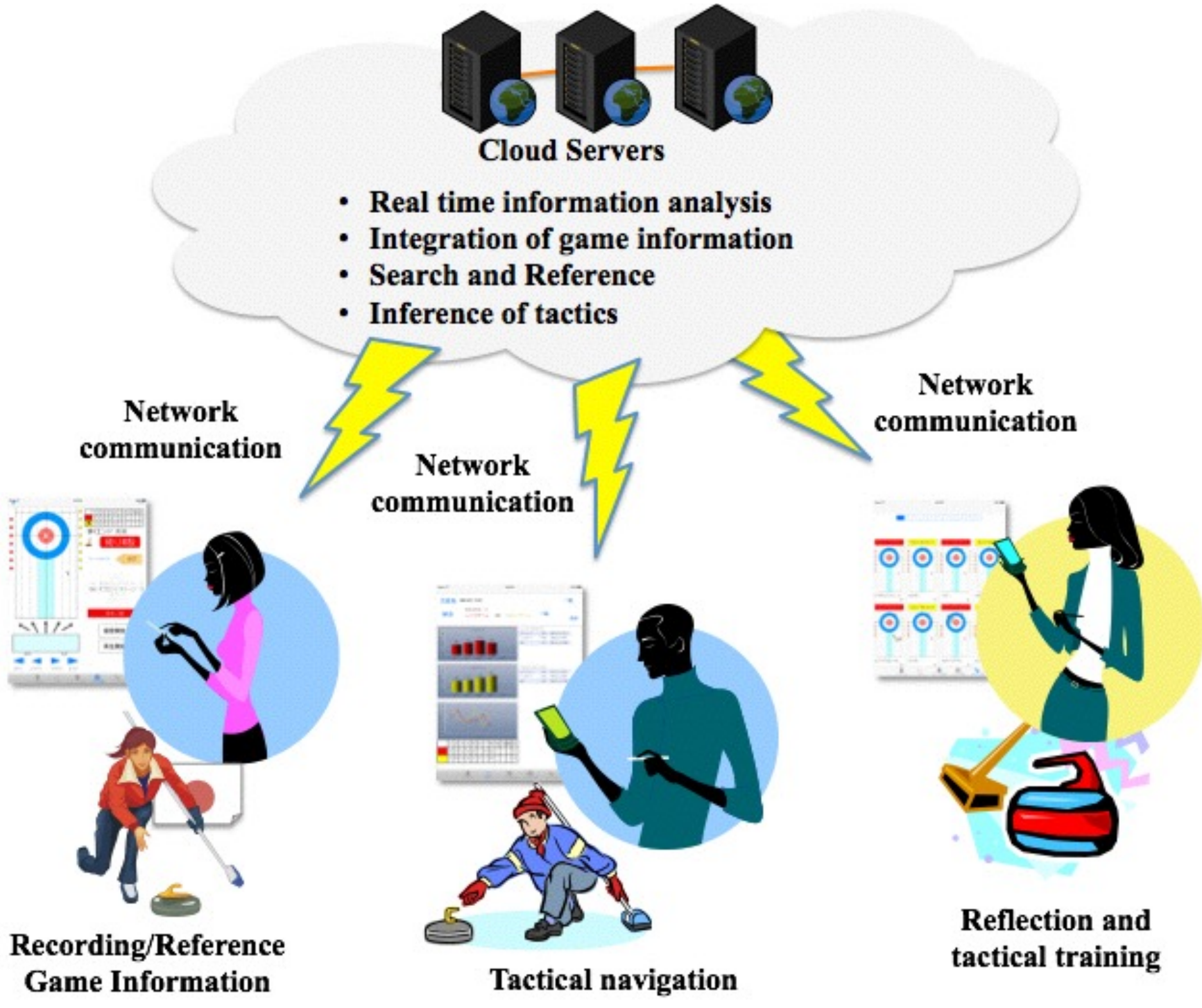
Strategic/Tactical factor

- Shot type
- Shot accuracy
- Game plan
- Team strategy/tactics

"The tactical aspects of curling play are still very, very important.

– John R. Bradley

CURLING INFORMATICS



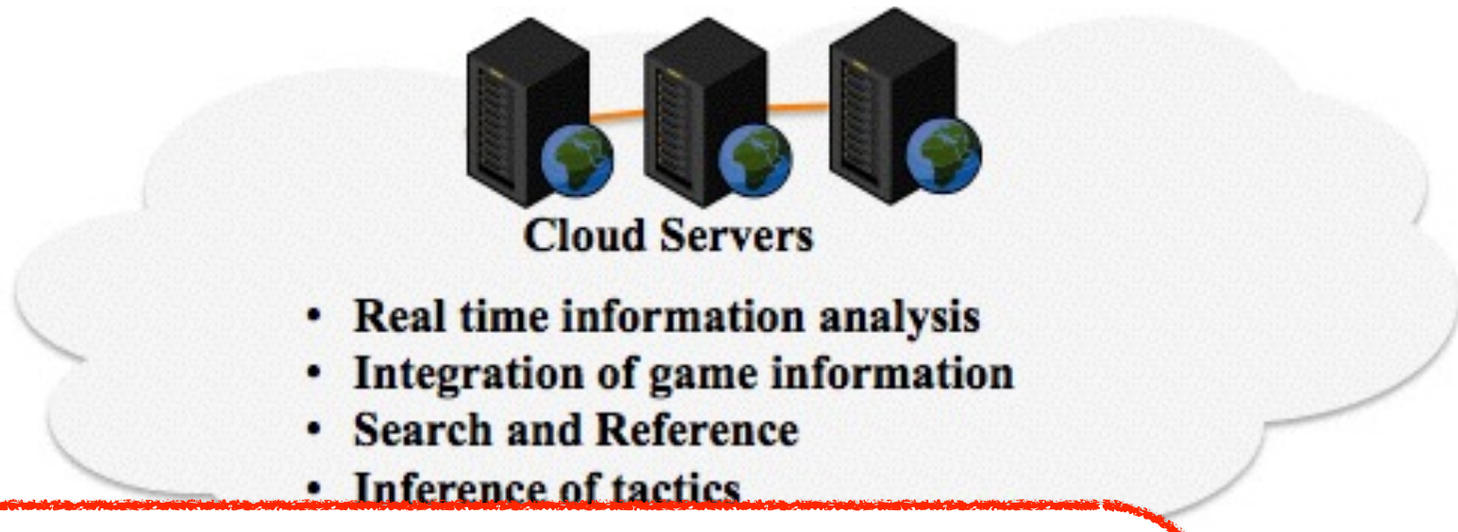
PORTABLE DIGITAL SCORE BOOK

iCE (intelligent Curling Elicitator)

- Recording a game information in real time
- Showing shot accuracies for each team

F. Masui, K. Hirata, H. Otani, H. Yanagi, and M. Ptaszynski:
Informatics to Support Tactics and Strategies in Curling,
International Journal of Automation Technology, Vol.10, No.2, pp.244-252 (2016.03)

CURLING INFORMATICS



Goal of this research

To support tactical factors of top curling teams and **improve the strategic and tactical skills of curling players**

Aim to **specify the team's characteristics** and **establish the appropriate analytical method**

This paper

Discuss **the influence of shot accuracy on the game result**

BACKGROUND

CURLING?

CHESS ON ICE

produced by Curling Canada

We have gotten consent to use this video from Curling Canada.

SHOT SCORE

- Shot score is rating how accurate the delivered shot was according to the team skip from **0** to **4** points

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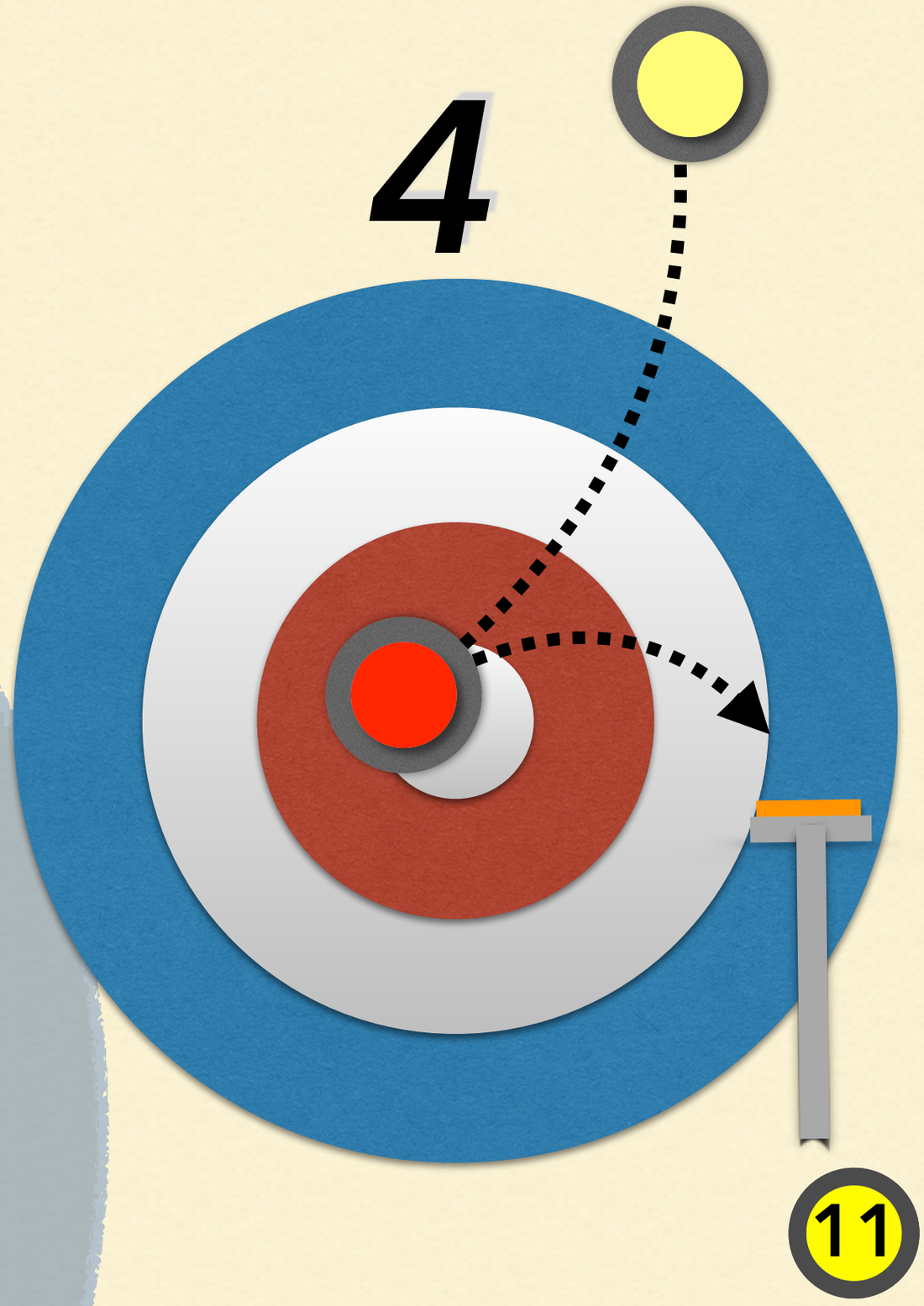

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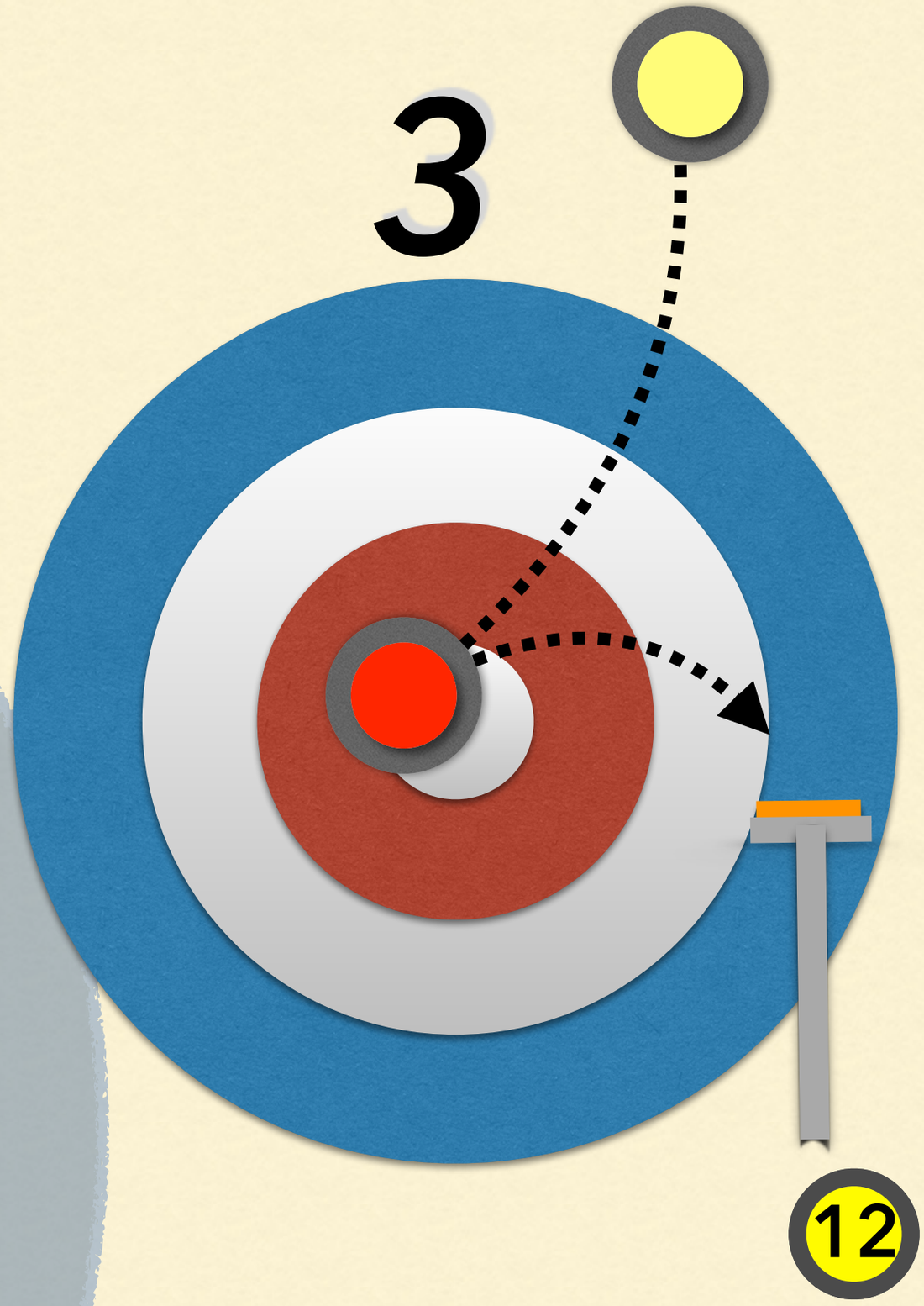

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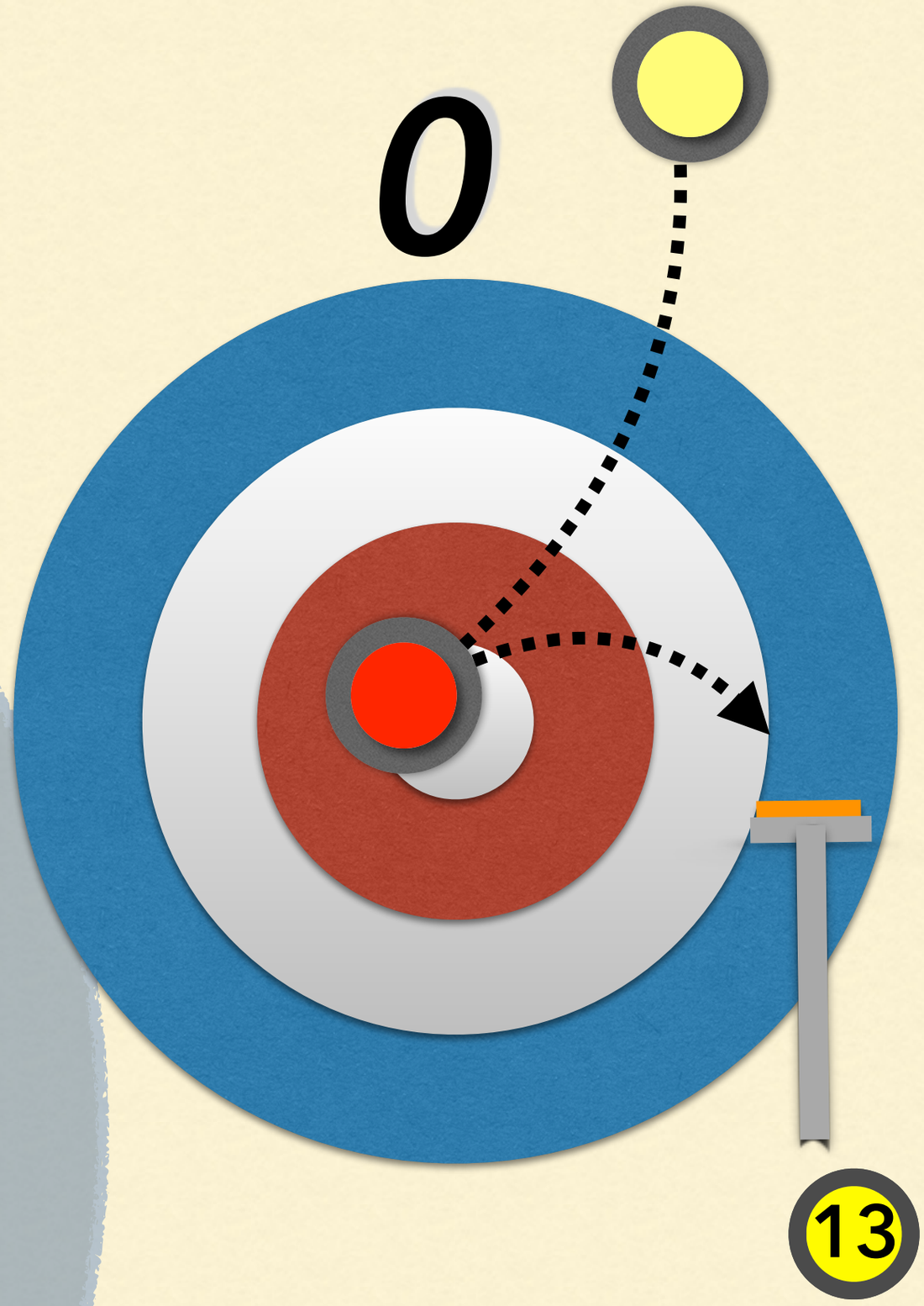
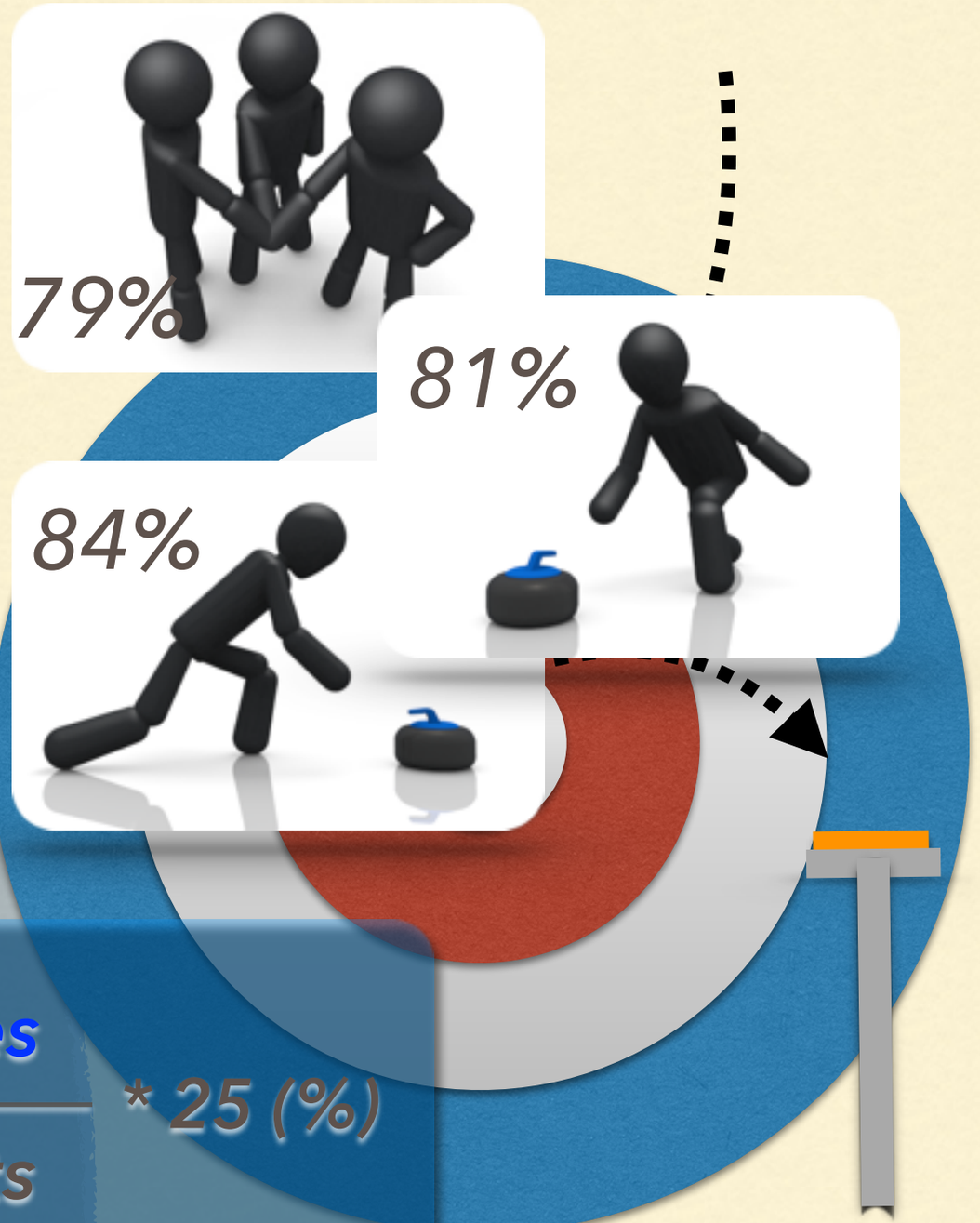


SHOT ACCURACY

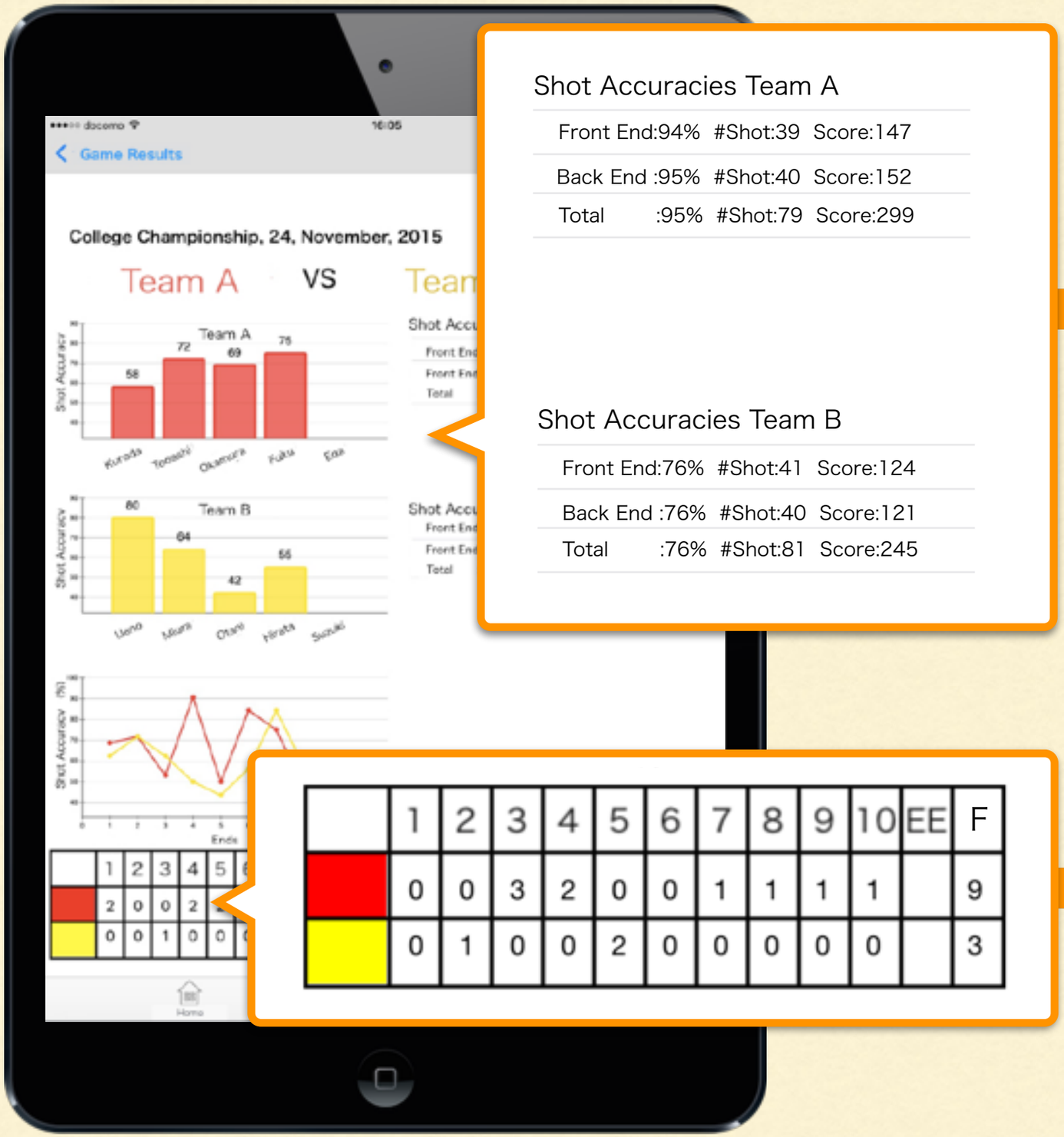
- Shot score is rating how accurate the delivered shot was according to the team skip from **0** to **4** points



$$\text{Shot Accuracy} = \frac{\text{Total Shot-Scores}}{\text{Number of Shots}} * 25\ (\%)$$

METHOD AND TARGET DATA

METHOD



Difference in shot accuracy

95-76=19Point

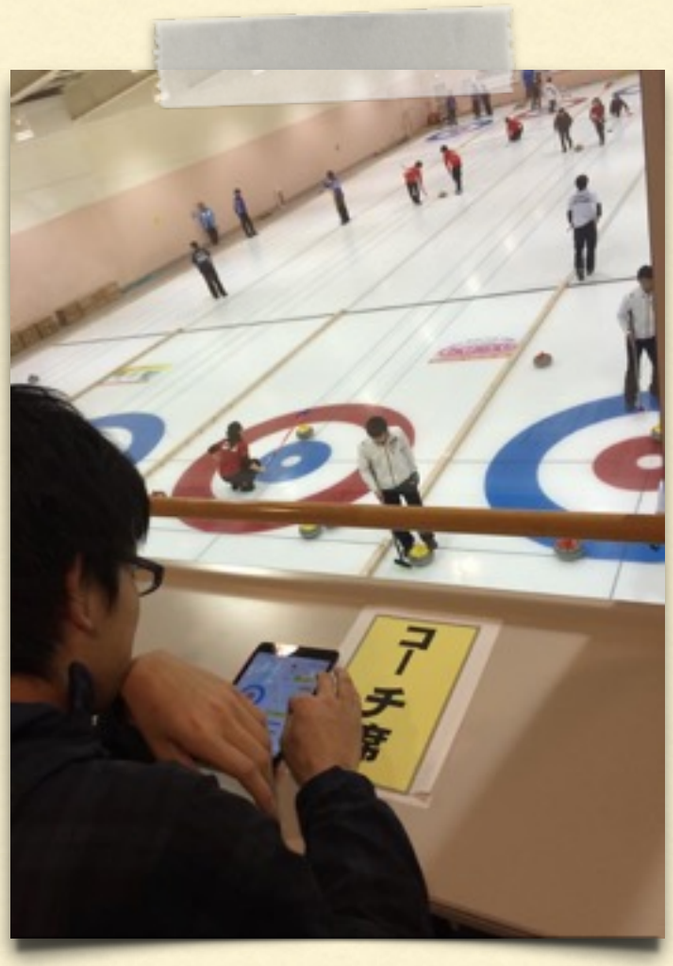
Calculate correlation

Difference in game score

9-3=6

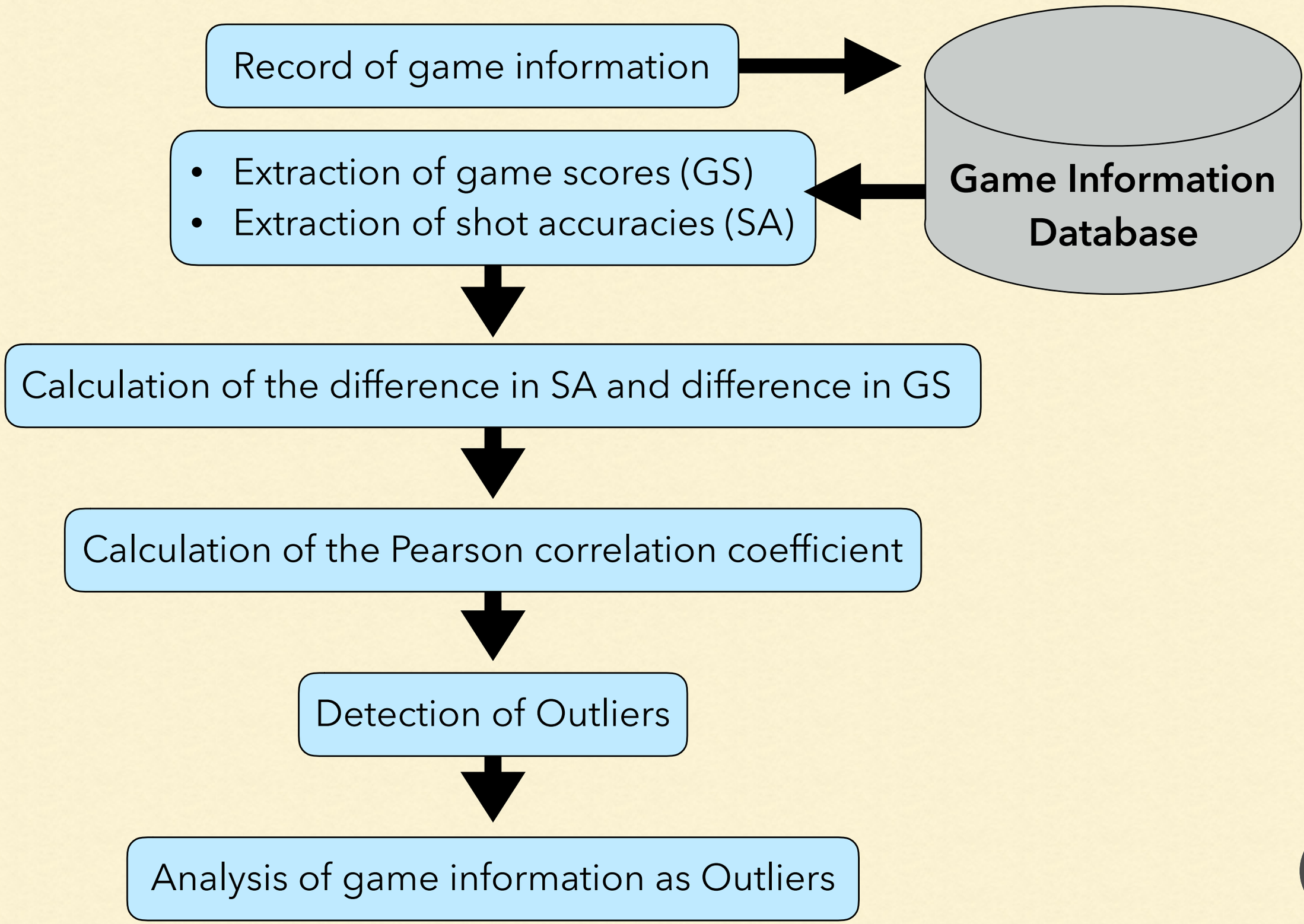
TARGET DATA

Total of **378 games**, covering around **sixty thousand shots**



Year	Championships	Number of games
2012	30th Japan Championship	26
	PACC Japan Playoff	16
	Pacific Asia Junior Championship	20
	World Junior Championship	11
	3th College Championship	10
	Universiade 2013 of Japan Playoff	7
2013	Japan Junior Championship	24
	31th Japan Championship	11
	Olympic Winter Game of Japan Playoff	21
	4th College Championship	11
2014	4th College Championship	13
	Universiade 2015 of Japan Playoff	30
	Advics Cup	13
	Sochi Olympic Winter Game	93
2015	World Woman's Championship	72

ANALYSIS PROCEDURE



ANALYSIS BY MASUI 2016

- Difference in shot accuracies is related to the difference in the game scores

- Japanese national class has stronger correlation than Japanese Jr class

- In World class the correlation becomes weaker than for Japanese national class

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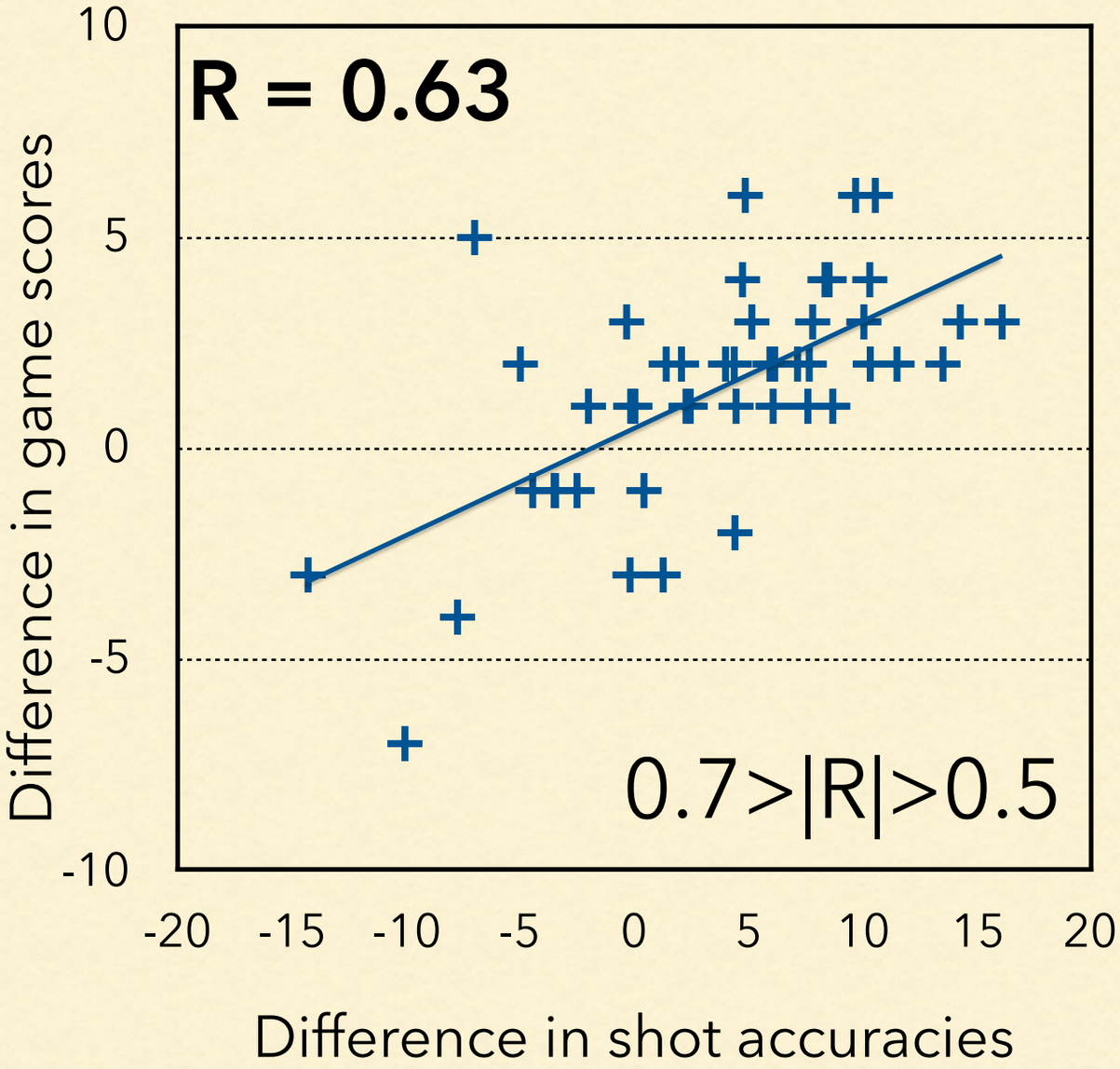
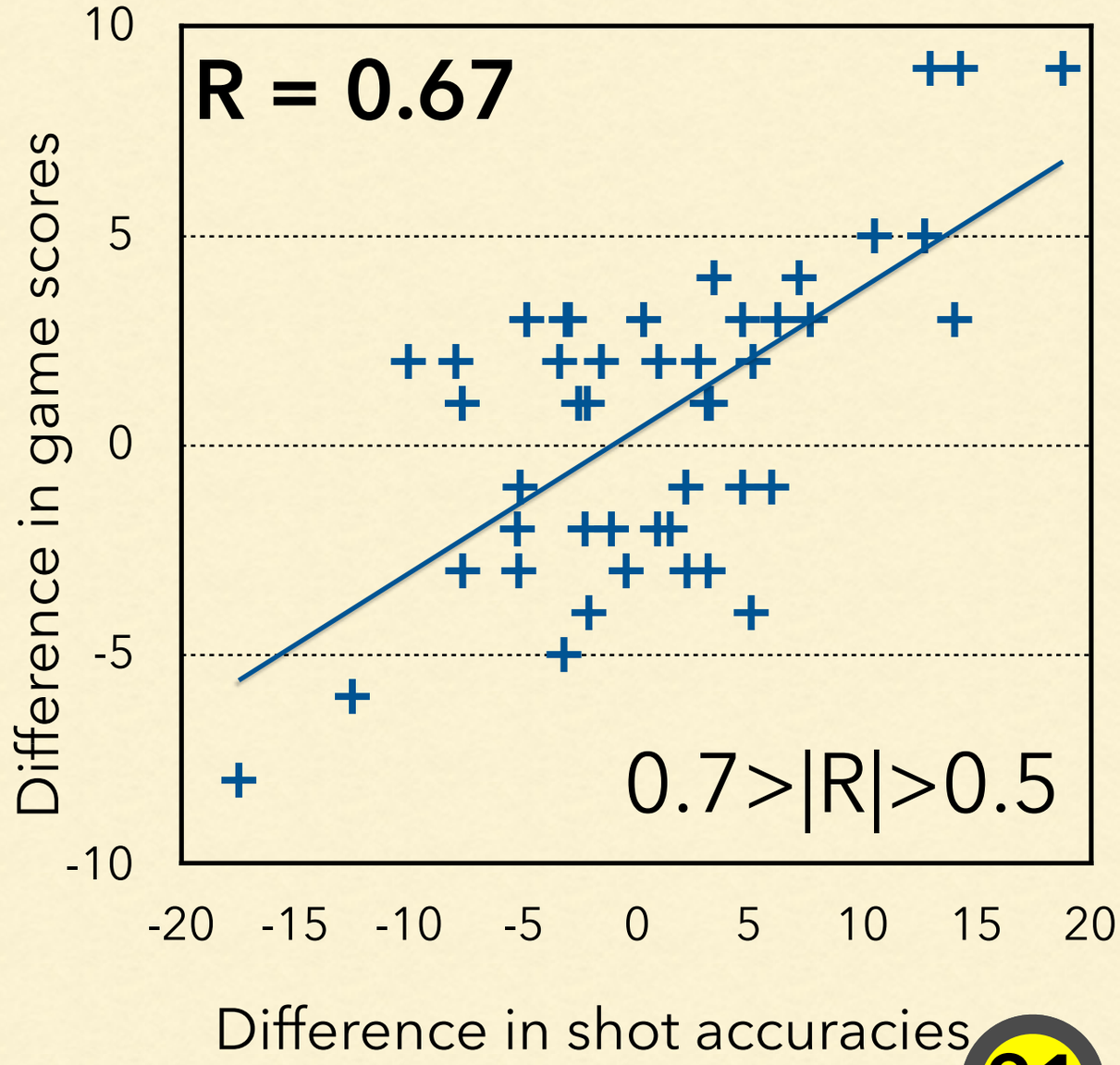
RESULT AND DISCUSSION

ANALYSIS OF SOCHI WINTER OLYMPICS

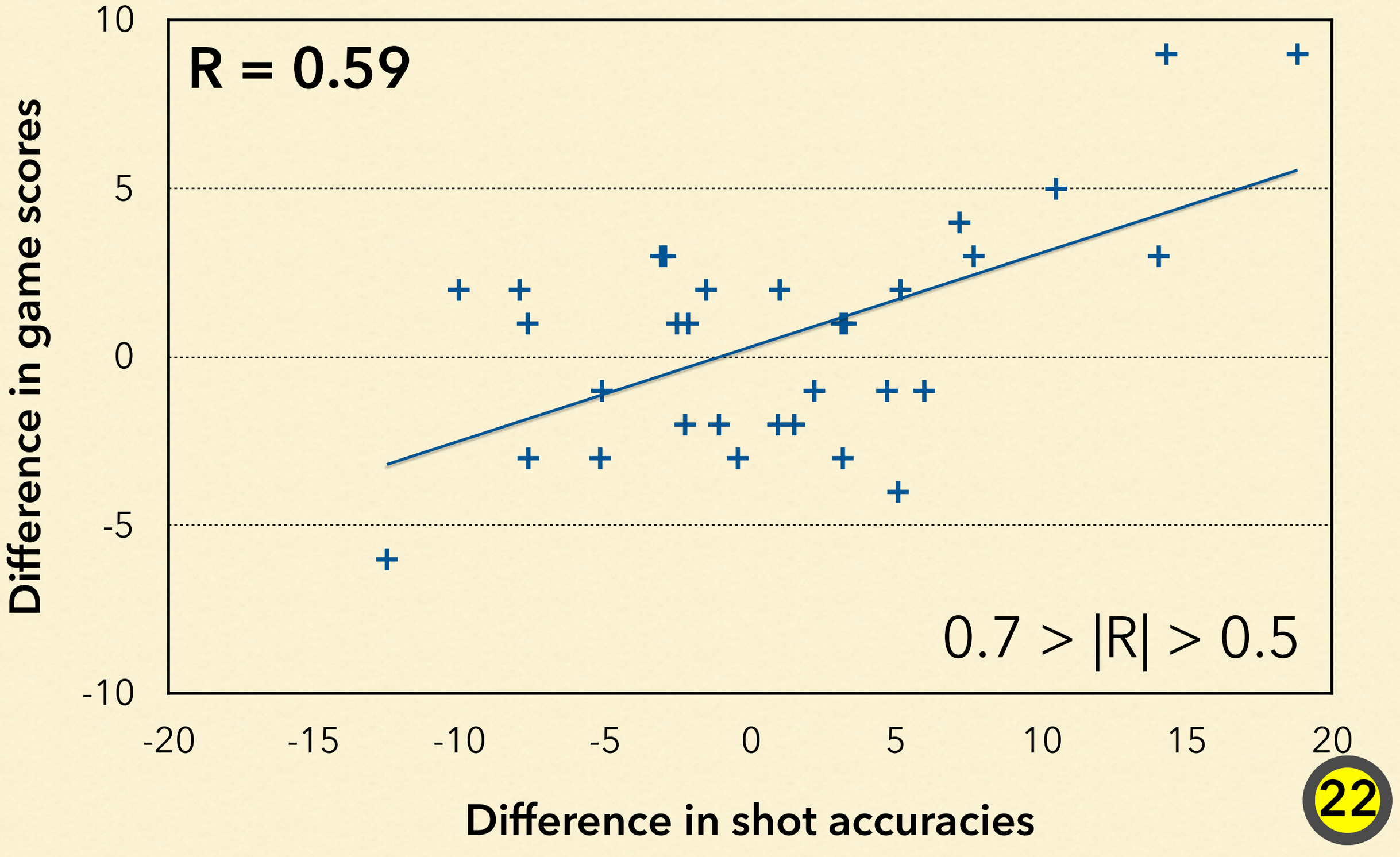
MEN



WOMEN



SOCHI WINTER OLYMPICS BEST4



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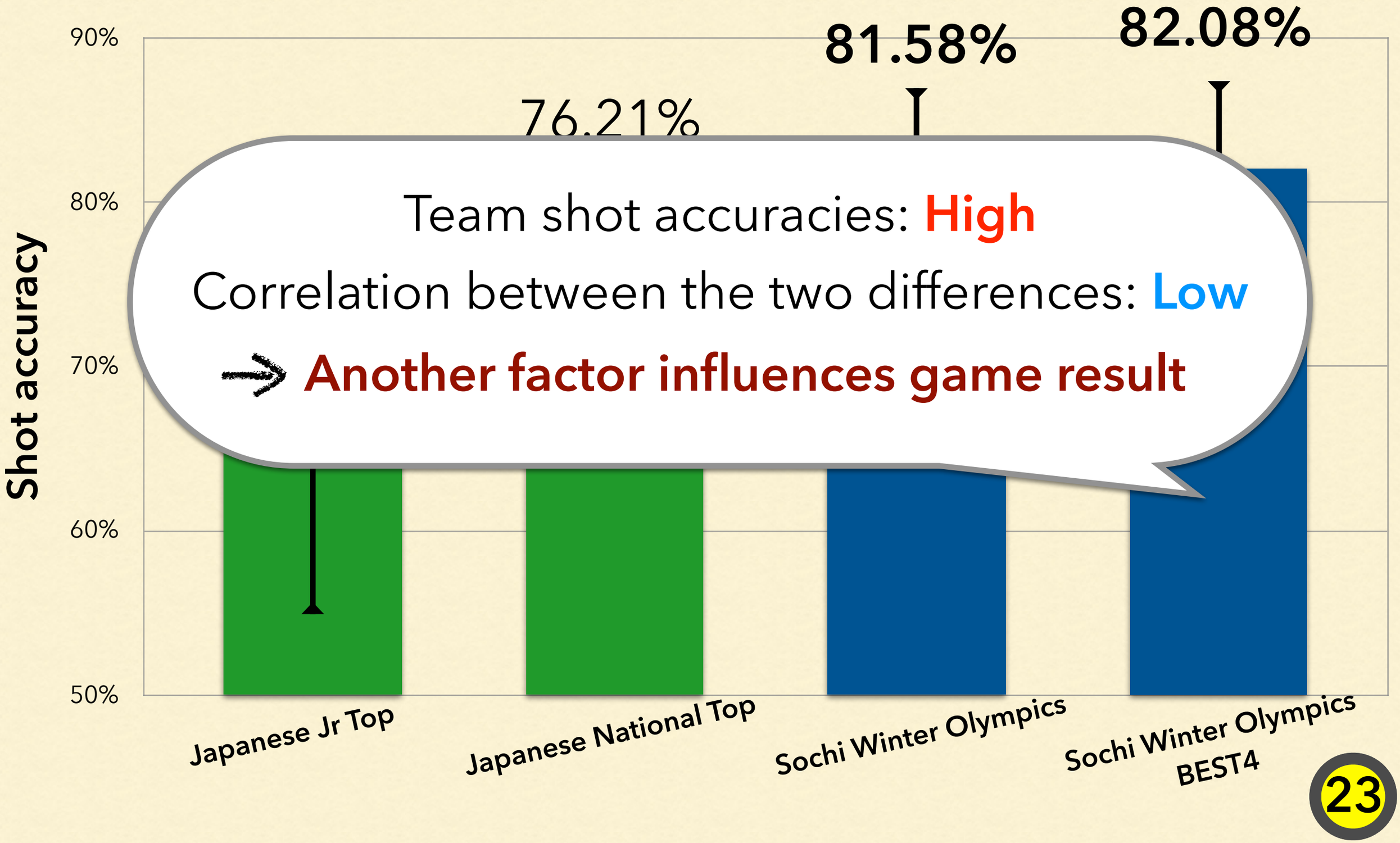
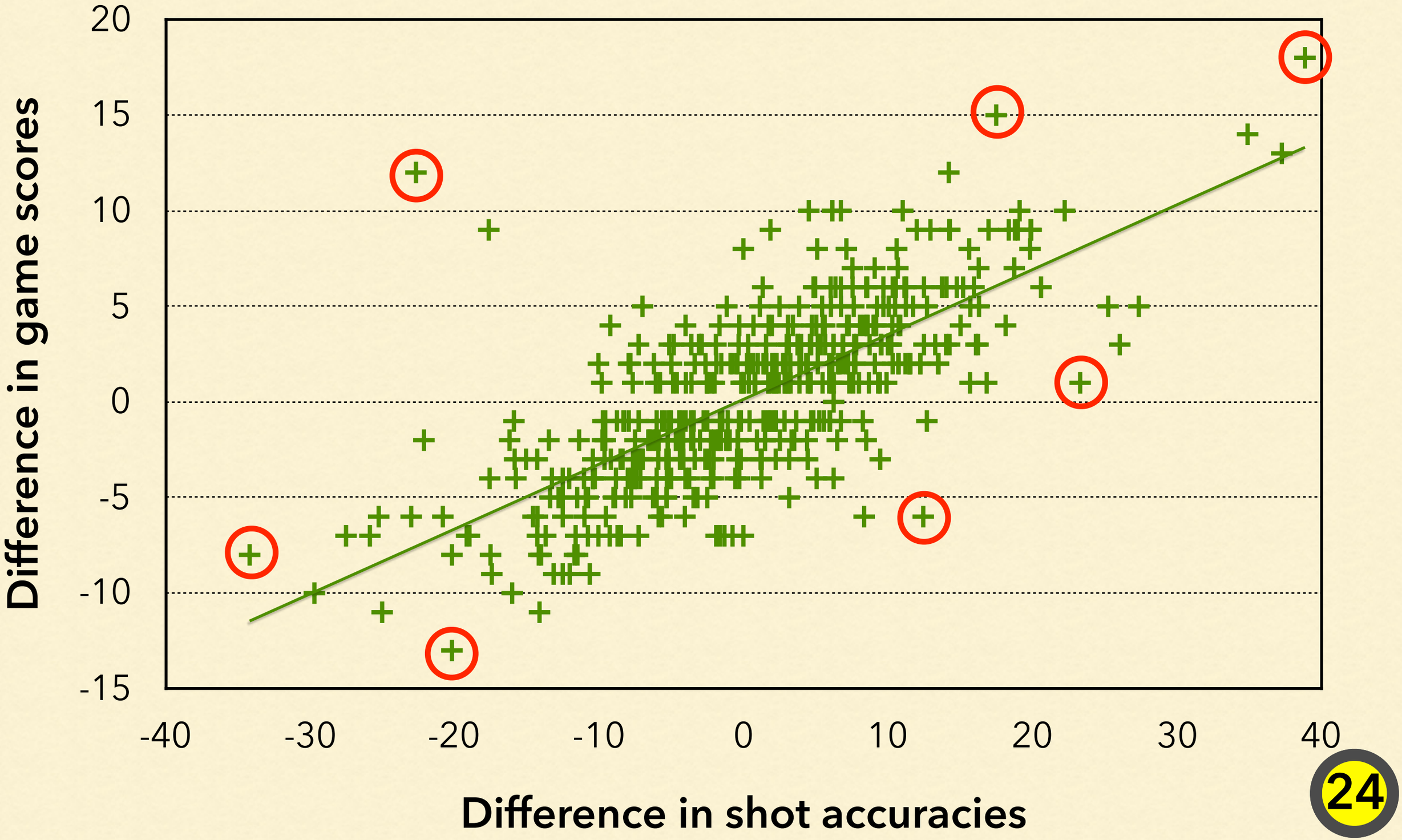
ANALYSIS OF SOCHI WINTER OLYMPICS

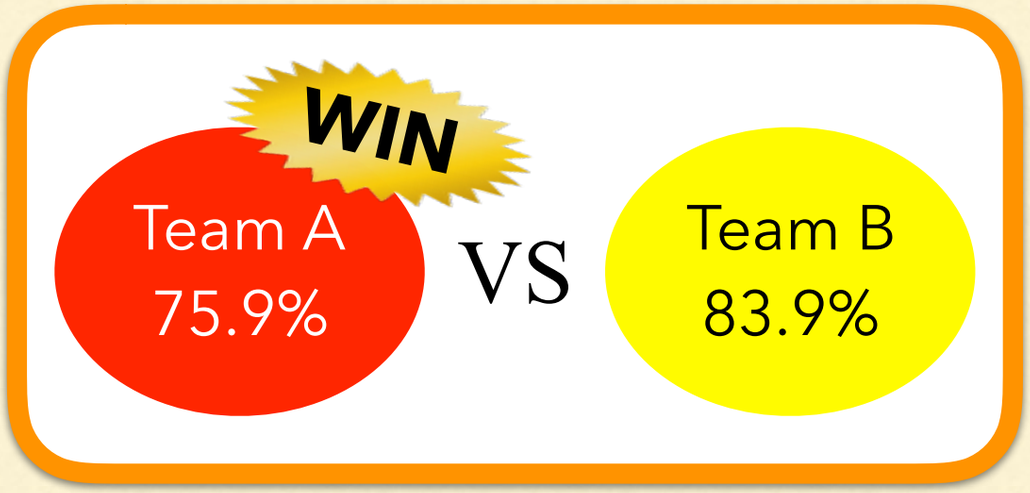


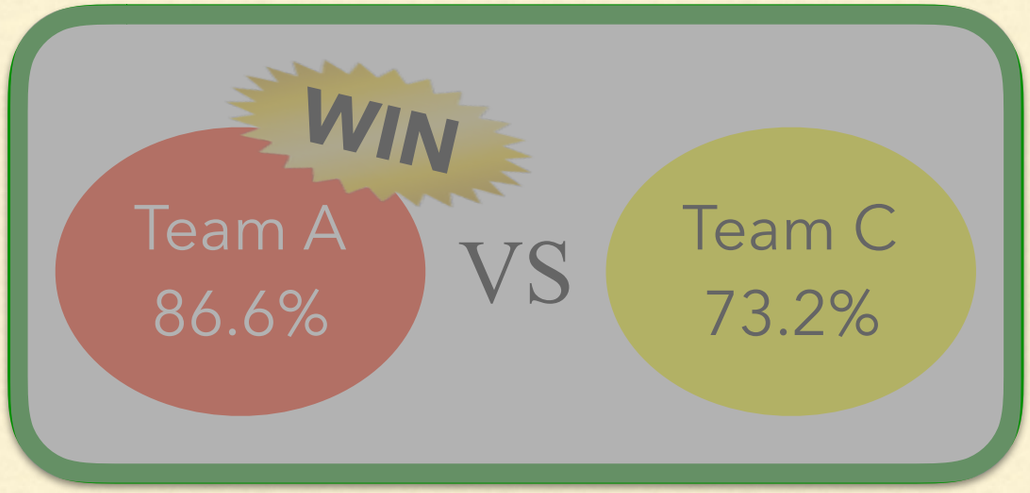
WHY CORRELATION DECREASES?

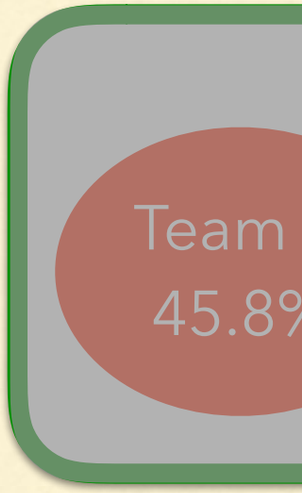


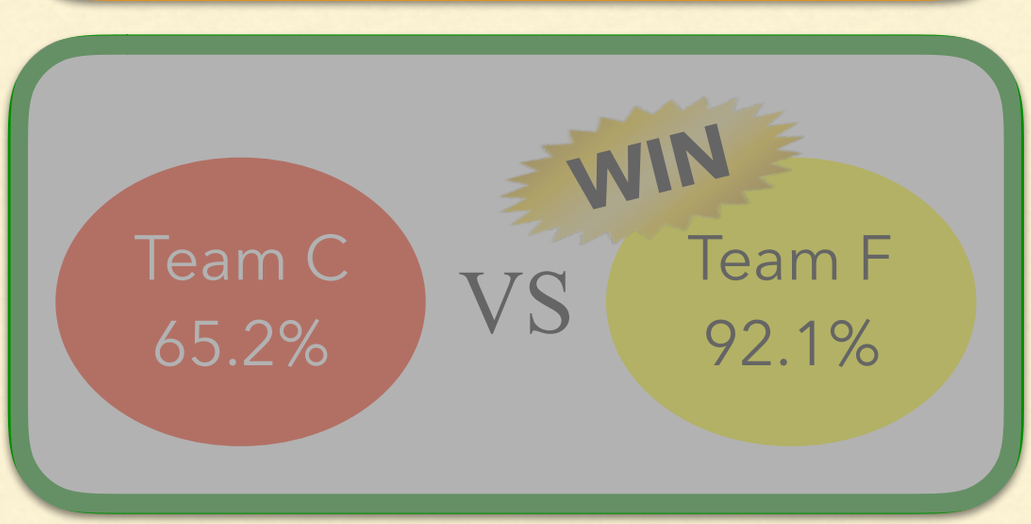
How do tactics or strategies affect game result?

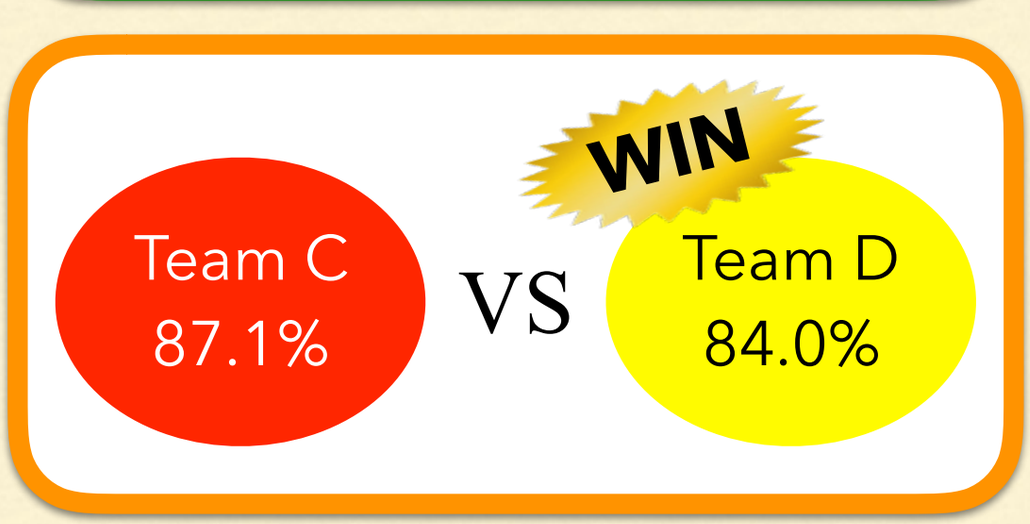
→Analyzed games in which the team of superior shot accuracy lost due to failure in tactics

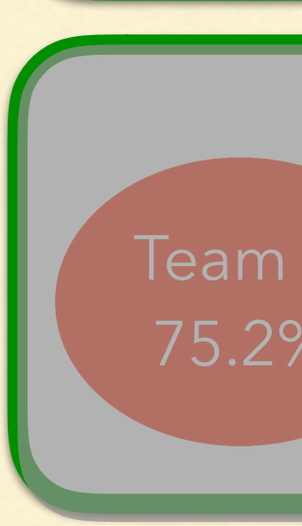


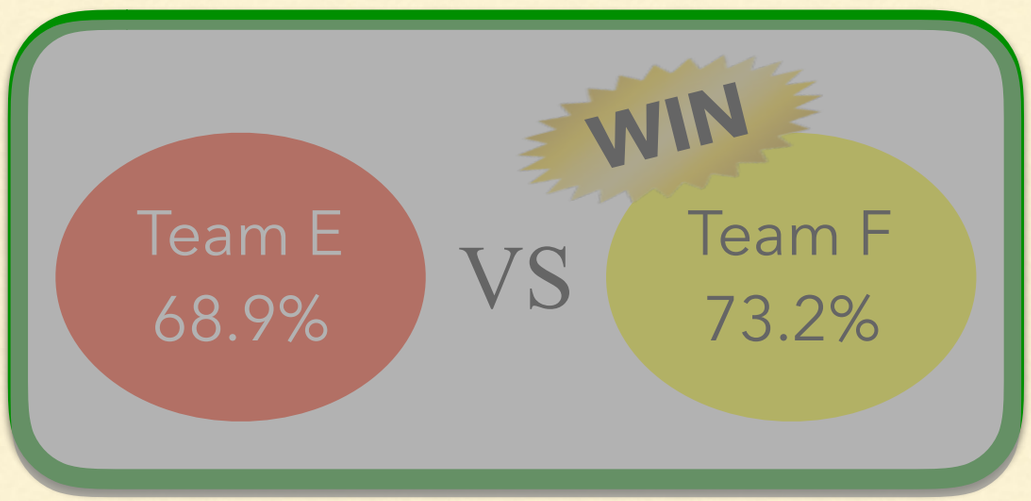


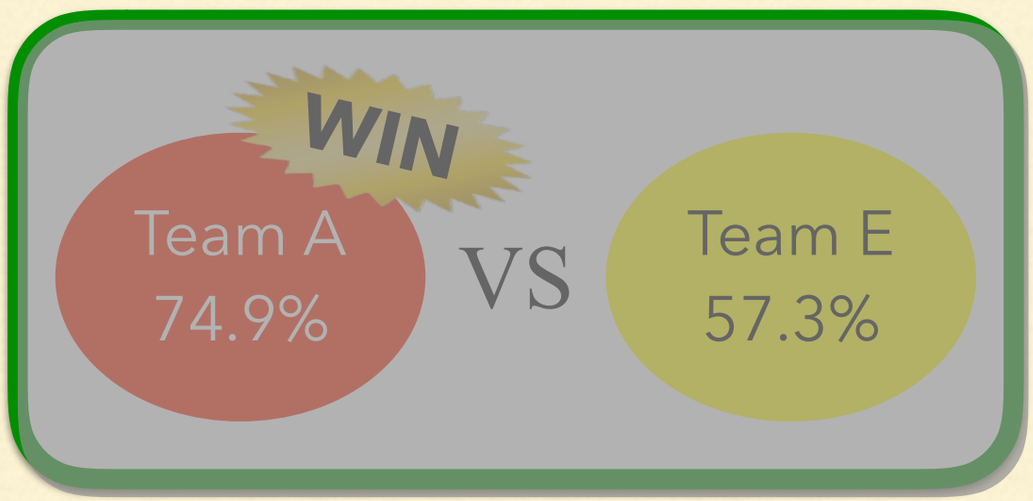




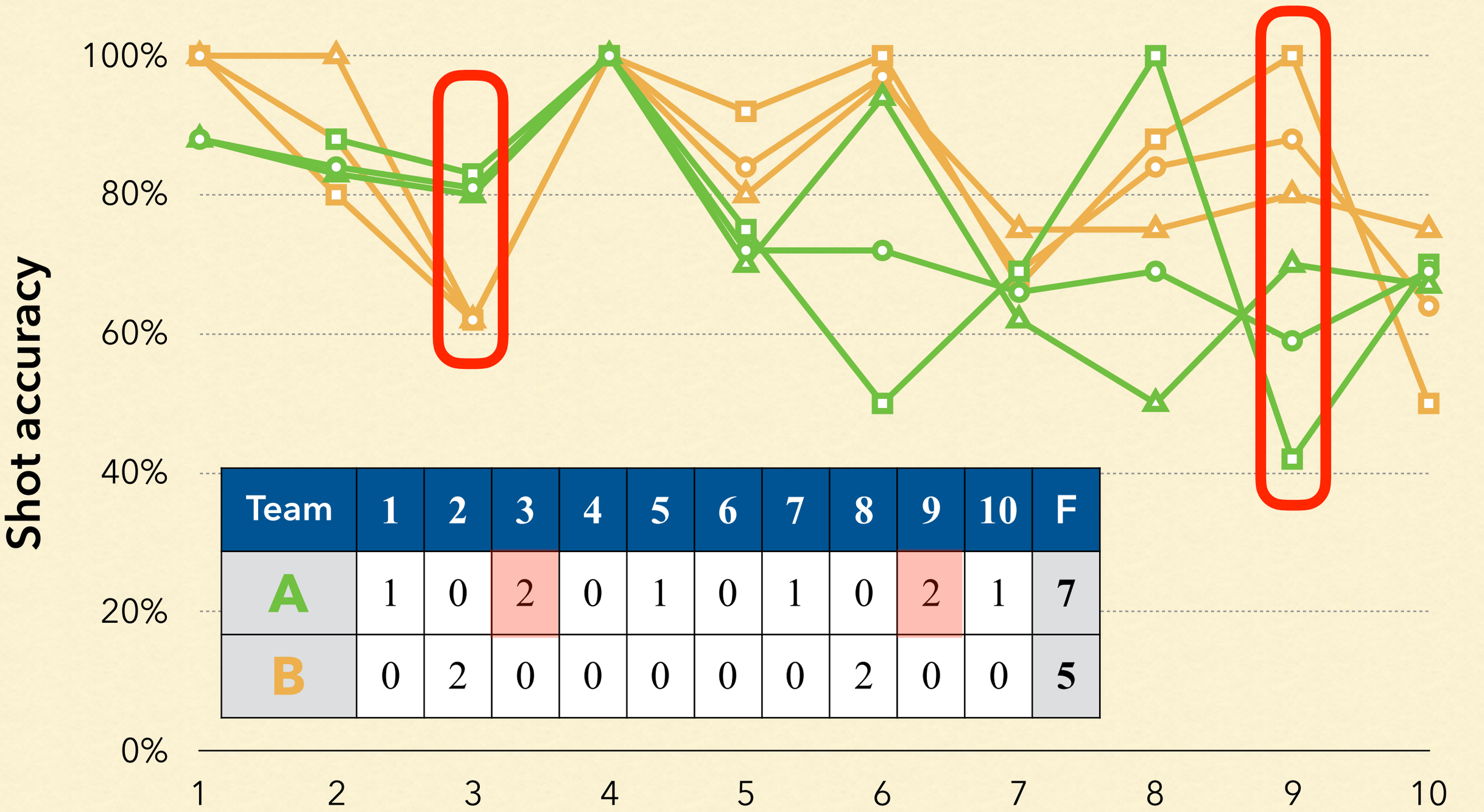






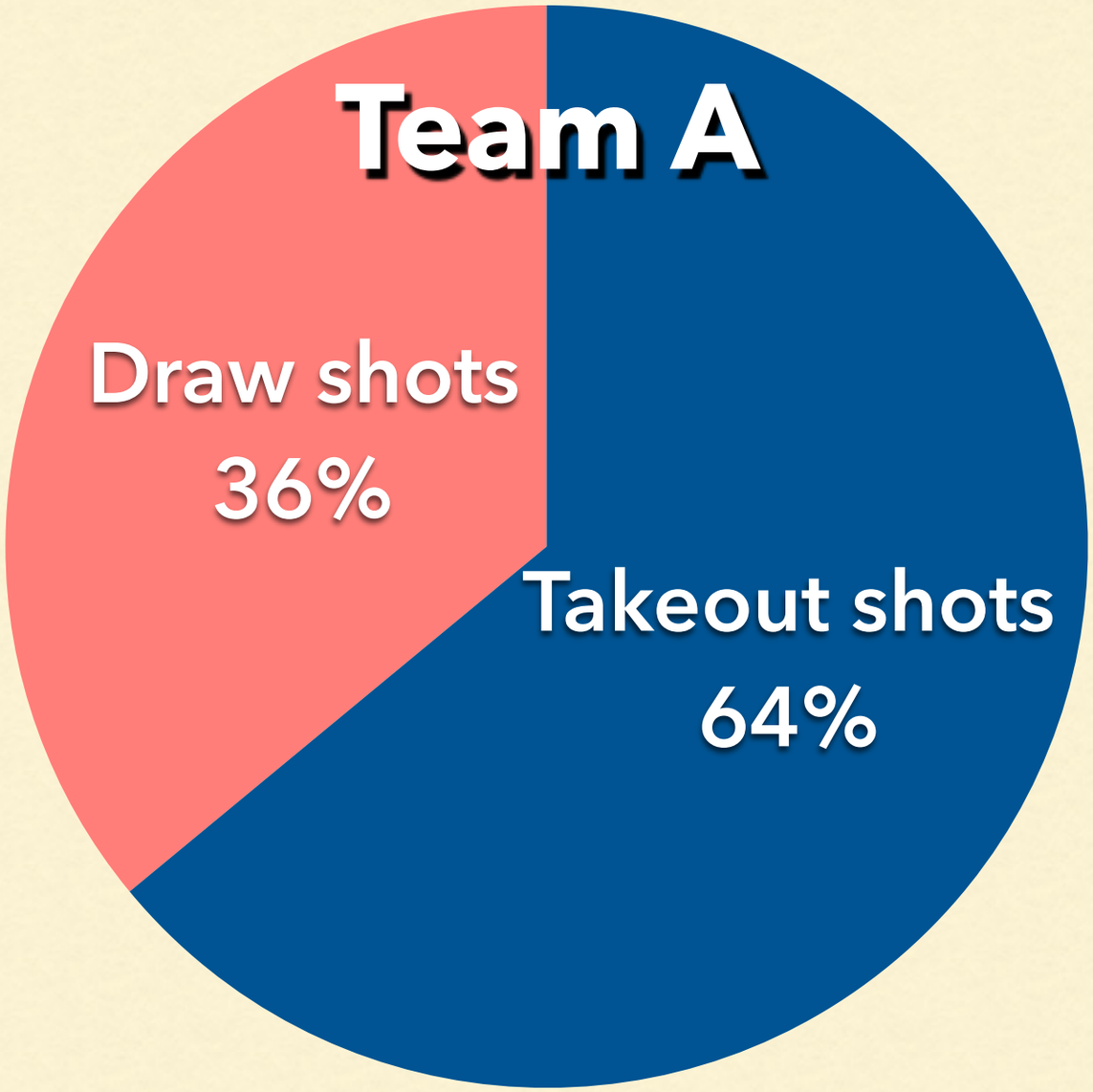


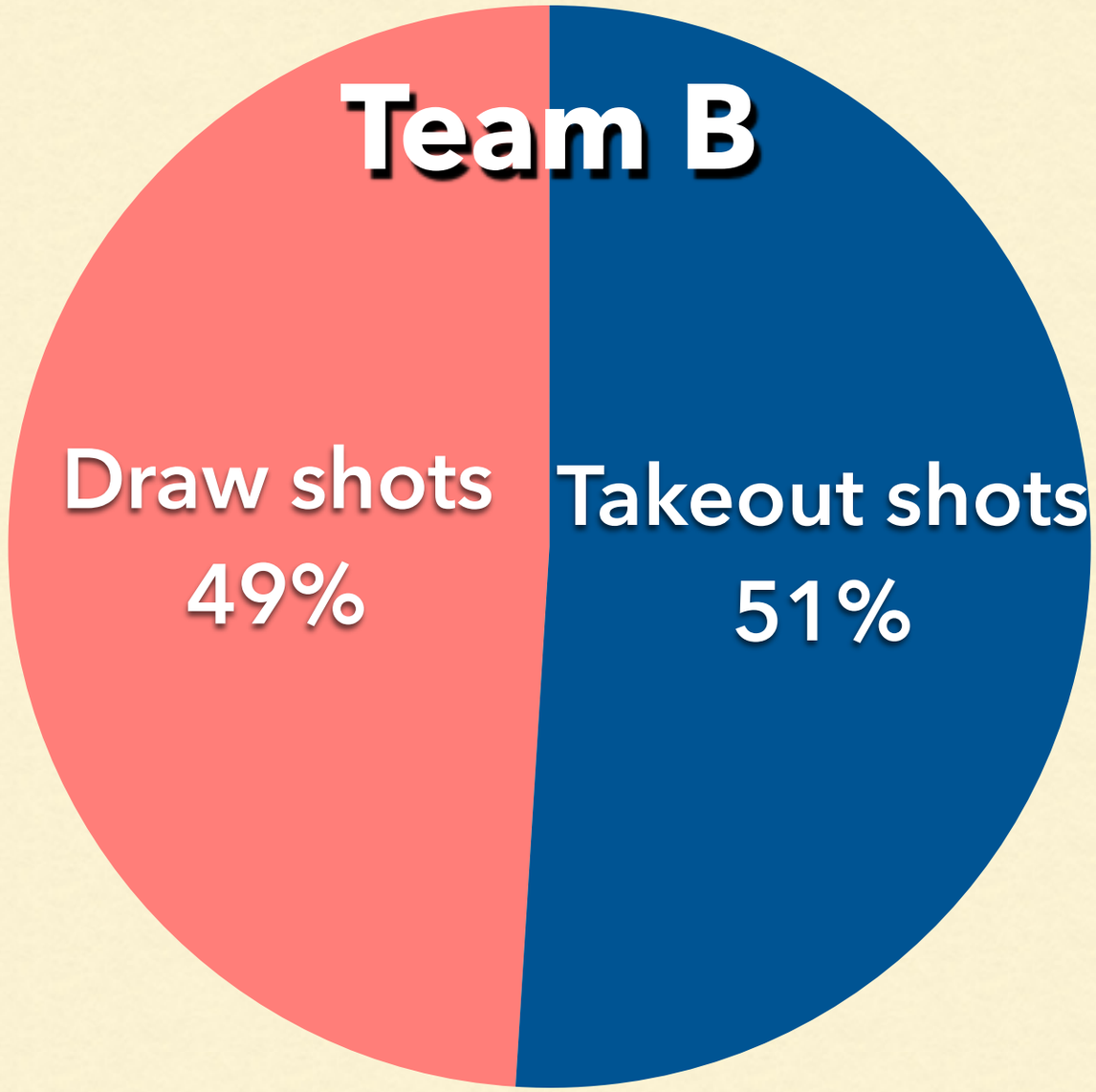
ANALYZING GAMES OF OUTLIERS ①



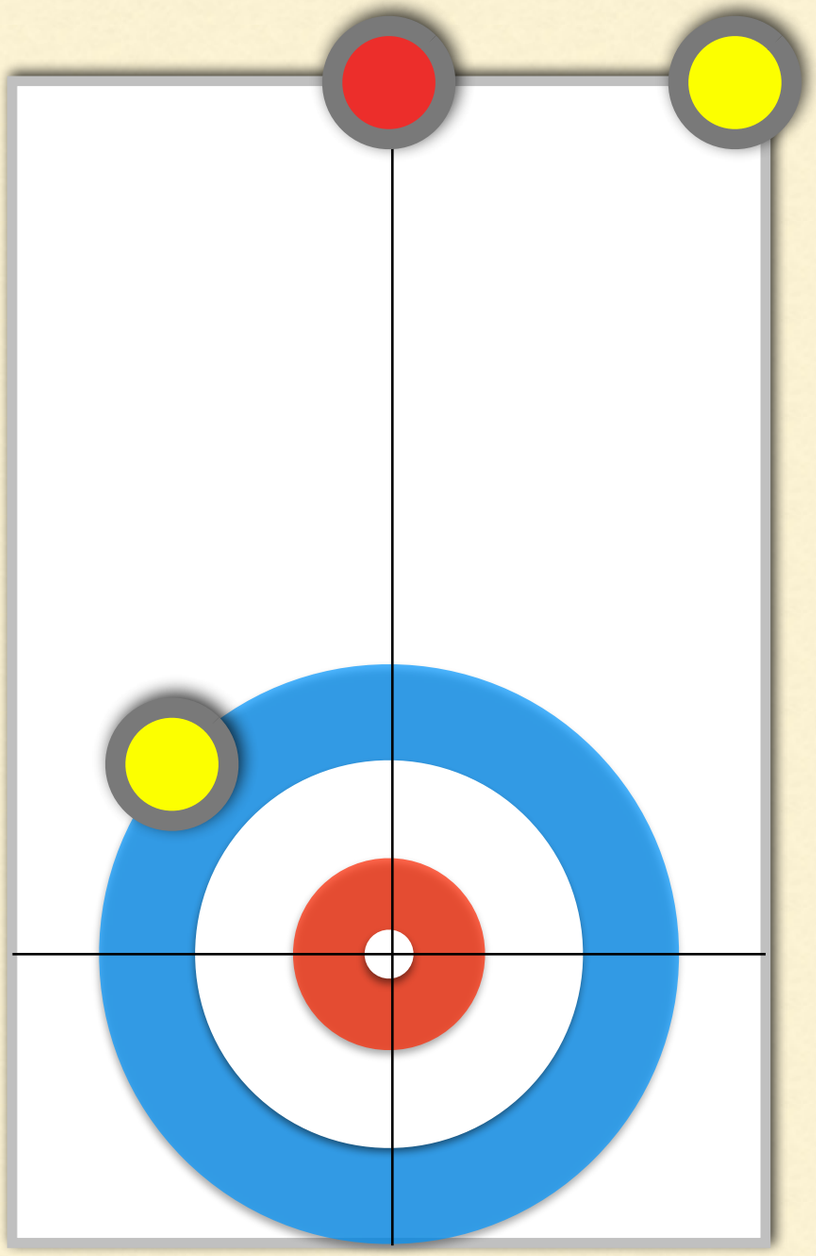
Team	1	2	3	4	5	6	7	8	9	10	F
A	1	0	2	0	1	0	1	0	2	1	7
B	0	2	0	0	0	0	0	2	0	0	5

RATIO OF SHOTS PERFORMED BY EACH TEAM





EFFECT OF SHOT



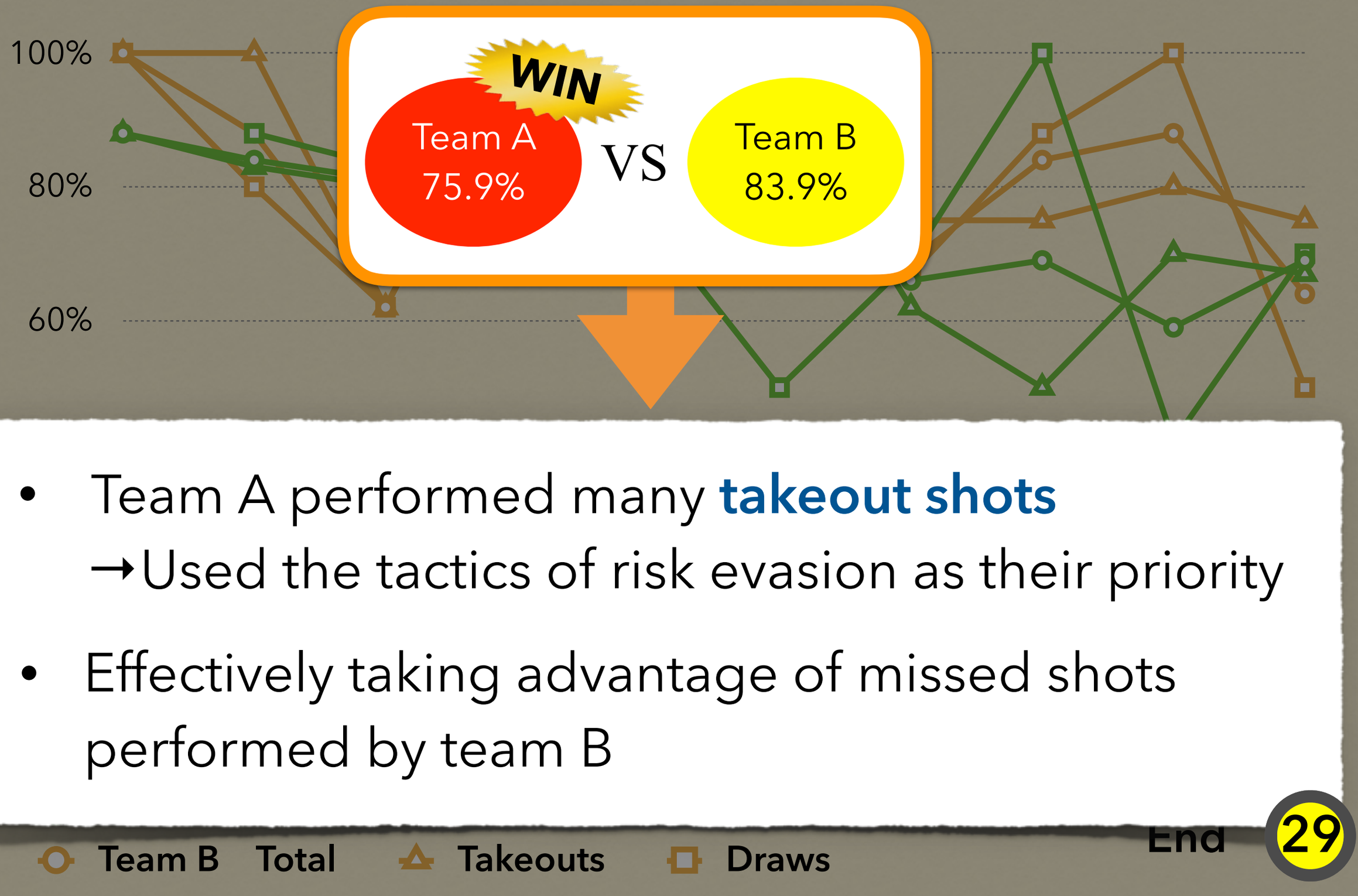
Draw shots

Raise the score probability of one’s own team

Takeout shots

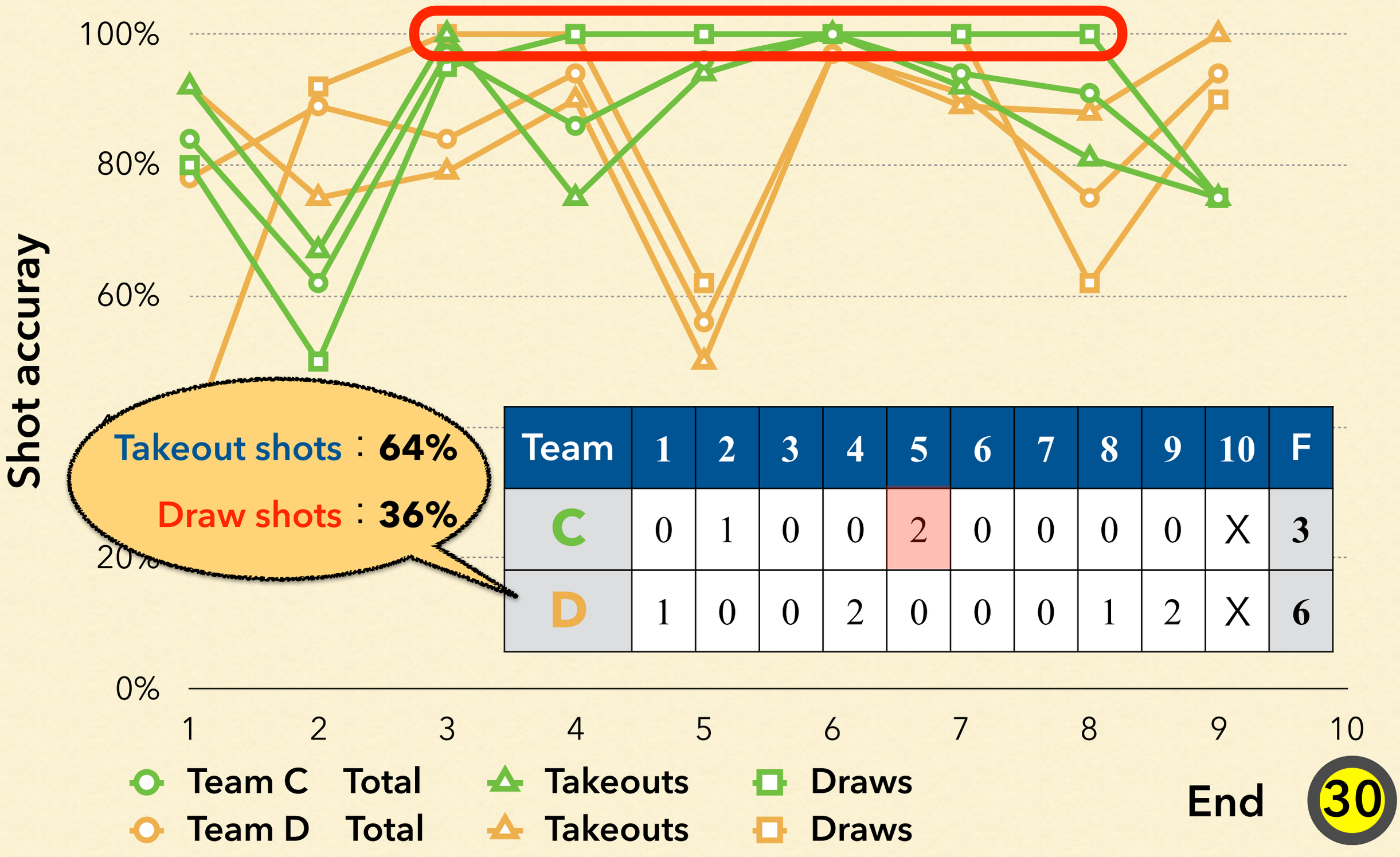
Reduce the score probability of opponent team

ANALYZING GAMES OF OUTLIERS ①



- Team A performed many **takeout shots**
  →Used the tactics of risk evasion as their priority
- Effectively taking advantage of missed shots performed by team B

ANALYZING GAMES OF OUTLIERS ②

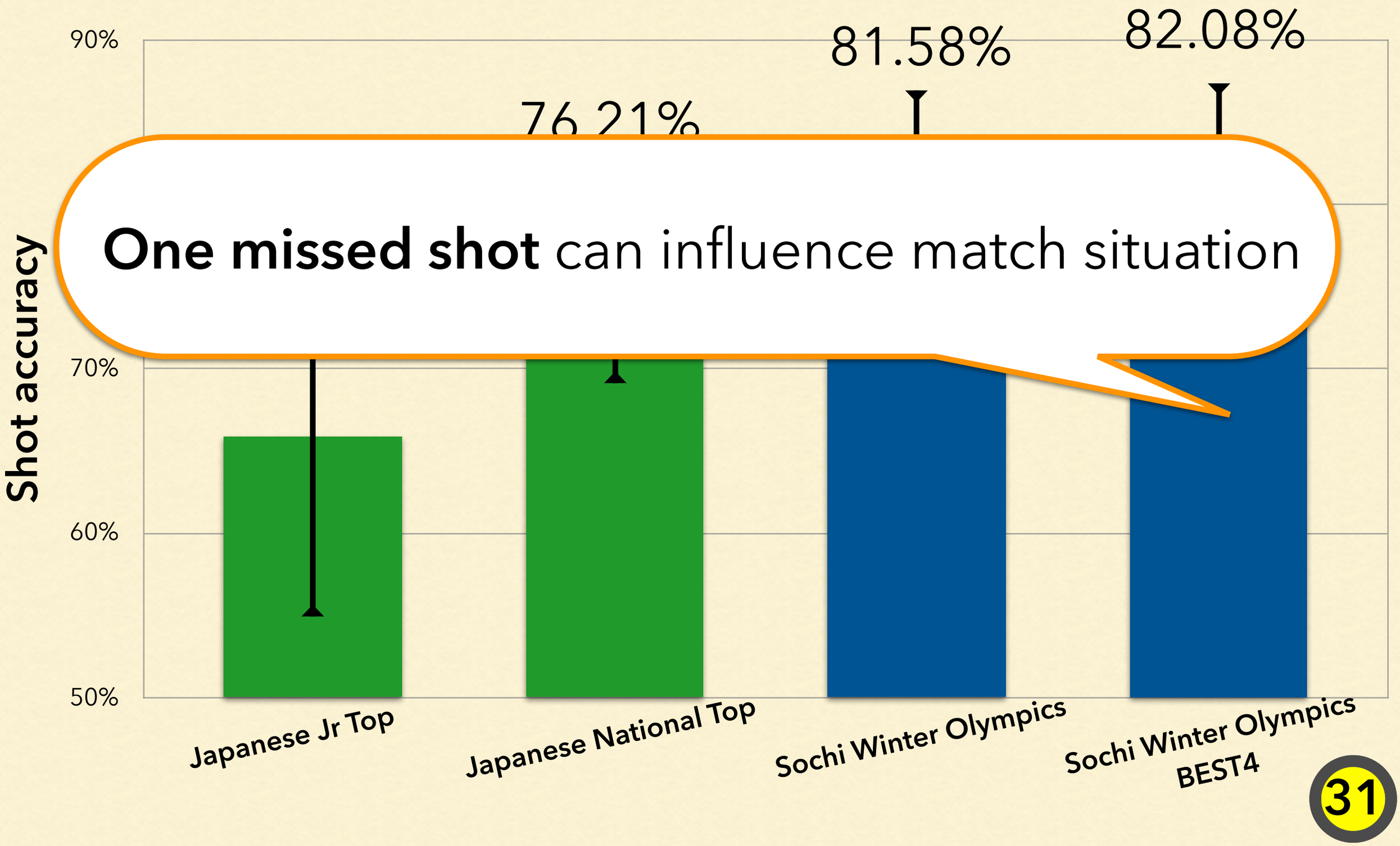


Takeout shots：**64%**

Draw shots：**36%**

Team	1	2	3	4	5	6	7	8	9	10	F
C	0	1	0	0	2	0	0	0	0	X	**3**
D	1	0	0	2	0	0	0	1	2	X	**6**

SHOT ACCURACY FOR EACH LEVEL



One missed shot can influence match situation

How do tactics or strategies affect game result?

→Analyzed games in which the team of superior shot accuracy lost due to failure in tactics

Winning team took
the tactics of risk minimization

The selected tactics and **pressure for opponent**
influenced game result

CONCLUSIONS

- Analyzed game information of a number of curling matches by using ***iCE***
  →Difference in shot accuracies is related to the difference in game scores

- Analyzed game information of outliers from tactical point of view
  →Selected tactics and pressure on opponent team had an impact on game result

FUTURE WORK

- Continue analyzing game information of outliers from tactical point of view
  →Extract characteristics from games of outliers

- Aim to support the Japanese national team in the Winter Olympic games in 2018