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DIFFERENCES IN SHOOTING ACCURACY AND EFFICIENCY TRENDS OF THE BEST HANDBALL REPRESENTATIONS AT THE 2021 TOKYO OLYMPIC GAMES

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Abstract
This study has been undertaken to perform the game analysis, to determine an efficacy difference in an offence of four first placed woman handball national teams at the Olympic games in Tokyo. One of the problems, which undergoes scientific research, is competition between teams and an efficacy in the mentioned sport. The performance of any technical element in the handball is impossible to perform without the adequate motoric ability, as well as the quality of the motoric ability is impossible to perform without the rational technique. In this study, based information were obtained from first THIRD handball national teams of France, Russia and Norway during eight matches at the Olympic games in Tokyo. The total of 12 offence's variables were obtained from 8 matches of woman's handball national teams and analysed: total number of shots (sut_uk), precise - efficient number of shots (sut_pre), total number of shots from 6 meters (sut_m6_uk), precise - efficient number of shots from 6 meters (sut_m6_pre), total number of shots from wings (sut_kril_uk), precise - efficient number of shots from wings (sut_kr_pre), total number of shots from 9 meters (sut_m9_uk), precise - efficient number of shots from 9 meters (sut_m9_pre), total number of shots from 7 meters (sut_m7_uk), precise - efficient number of shots from 7 meters (sut_m7_pre), total number of fast centres (brzc_uk) and total number of precise - accomplished fast centres (sut_brzc_pre). Based on the analysis in this study, it is evident that the game of national teams was based on shots from 9 m, shots from 6 m, and on the fast performance of the fast centre. By analysed results, could be concluded, that these variables significantly determinate the game in offence on this tournament.
Keywords: Women, handball, national teams, Olympic games

INTRODUCTION

The handball as a collective sport, and it is taking the unique place within collective sports. It belongs in the order of the poly-structural complex activities. This is collective sport in which two teams with per seven players outplaying each other in the court, and their aim is to accomplish the score in an offence and to prevent an opponent team in a defence, getting into possession of the ball. The handball game records the progressive development and constantly require an intensive competition for the ball, as well as a competition with time and space; a maximal concertation and attention, as well as fast reaction and expression of willing moments in different phases of the game. The increase in both speed and dynamics in the offence and defence phases, the speed of an element's performance with and without the ball in the game, the performance of fast actions in the offence, are characteristics of the modern handball. One of the problems, which undergoes scientific research, is competition between teams and an efficacy in the mentioned sport. The performance of any technical element in the handball is impossible to perform without the adequate motoric ability, as well as the quality of the motoric ability is

impossible to perform without the rational technique.

The technical-tactical element of elite teams is reaching a perfection, and the coaches' tactical idea gives an excitement and a beauty to this game therefore, their performance is representing an important link to achieve the best result. It is impossible to say, how much technical-tactical elements are going to be expressed in the maximum extend, because the handball is the sport in which prevails a direct contact game that is not, in most situations, allowing an expression of clean technical-tactical elements. Today studies are referring to identifying differences between a frequency and efficiency of a shot in relation to a team's efficacy as well (Apitzs, et al., 1997; Taborsky, 2008); and an influence of tactical elements in finals of the final match results (Srhoj, et al., 2001; Rogulj, et al.,2009). The complexity of the situation in the game requires a prepared handball player, capable to precisely adjust technical-tactical actions in the game and to effectively implement in an optimal time and intensity. A condition to achieve these requirements is a special structure and high level of phyco-motoric ability, a mastery of technical-tactical elements in the game situation and high

level of functional abilities (Kurelić, et al., 1975., Rogulj, 1990).

An efficiency is not the only one function of the situation and a physical quality of player, but also tactics of an opponent team, on which the connection of players within the team depends (the quality of corporation). In the research of the handball efficacy (Vuleta, et al., 1999), 5 lateral dimensions were obtained, of which three could be elaborated well: a factor of the game efficacy during an offence phase, a factor of the game efficacy during a defence phase and a factor of a goalkeeper. An efficacy in the handball represents an achievement of the best effect in the game regardless on a player's position. Taking into consideration all above, this study has been undertaken to perform the game analysis, to determine an efficacy difference in an offence of four first placed woman handball national teams at the Olympic games in Tokyo.

METHODS
Participants

In this study, based information were obtained from first THIRD handball national teams of France, Russia and Norway during eight matches at the Olympic games in Tokyo.

Instrument

In this study, the total of 12 offence's variables were obtained from 8 matches of woman's handball national teams and analysed: total number of shots (sut_uk), precise - efficient number of shots (sut_pre), total number of shots from 6 meters (sut_m6_uk), precise - efficient number of shots from 6 meters (sut_m6_pre), total number of shots from wings (sut_kril_uk), precise - efficient number of shots from wings (sut_kr_pre), total number of shots from 9 meters (sut_m9_uk), precise - efficient number of shots from 9 meters (sut_m9_pre), total number of shots from 7 meters (sut_m7_uk), precise - efficient number of shots from 7 meters (sut_m7_pre), total number of fast centres (brzc_uk) and total number of precise - accomplished fast centres (sut_brzc_pre).

Statistical analysis

The trend analysis (linear trend) was used to determine the efficient dynamics of each national team from one the match to another.

RESULTS
Trend analysis

The phenomena observed in time usually indicates a specific movement or dynamics. Trend is a fundamental developmental movement tendency of some phenomenon that differ by a shape (linear or curve), a direction (positive or negative) and an intensity (different degrees). When one phenomenon is analysed by the trend analysis, the development of that phenomena will be detected and its further movement will be predicted. In this study, the time period is related to matches. If the coefficient next to x is a>0, the trend is increasing then it is expected that number of goals would increase from the match to match, if it is a=0, the trend is stagnating then it is expected that a national team is scoring the same number of goals, and if it is a<0, the trend is decreasing then it is expected that a national team will score fewer goals as the competition draws to close.

Observing the linear trend of the French national team based on the coefficient determination, could be noticed a slight scattering (oscillation) in the number of precise - efficient shots during all 8 matches. The trend was increased from the match to match and it is expected that the French national team will score 27 goals per a match. (Diagram1).

Observing the linear trend of the variable total number of efficient goals from 6 m, it is evident a slight scattering (oscillation) of number precise - efficient shots from 6 m, therefore, the trend was increasing subsequently in the expectation that the French national team will achieve at least 7 goals per the match from the 6 m position. The highest number of scores from the 6 m line, the national team achieved in the seventh match, but the lover in the first match. (Diagram 2).

Diagram 1. The trend analysis of the scored goal's number accomplished by the French national team during 8 played matches
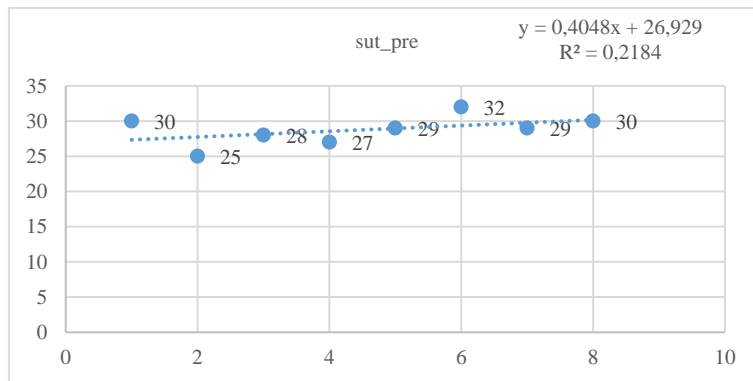

$$y = 0{,}4048x + 26{,}929$$
$$R^2 = 0{,}2184$$

Diagram 2. The trend analysis of scored goal's number from 6 m for the French national team during 8 played matches

$$y = 0{,}881x + 6{,}5357$$
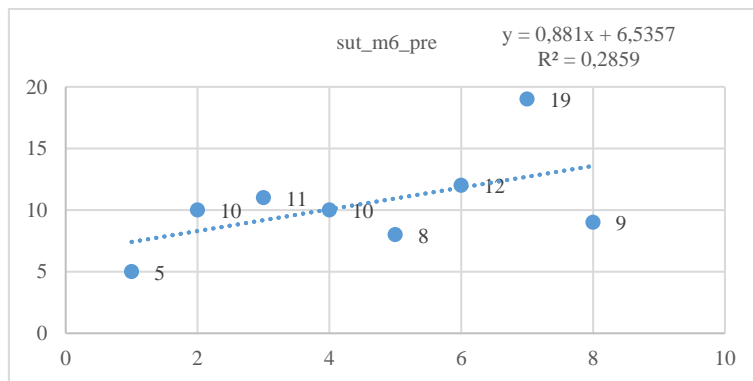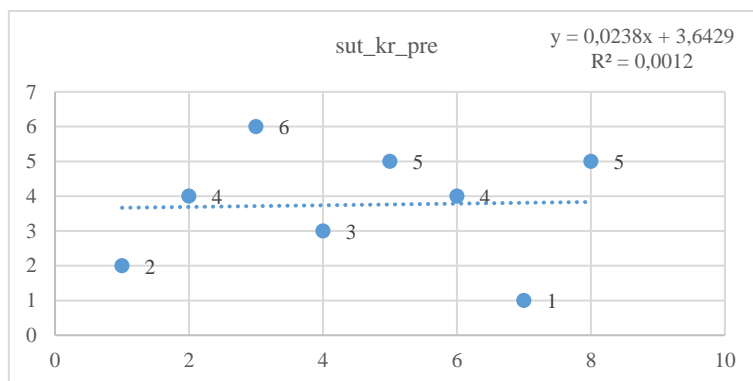$$R^2 = 0{,}2859$$

Diagram 3. The trend analysis of scored goal's number from wings of the French national team during 8 played matches

$$y = 0{,}0238x + 3{,}6429$$
$$R^2 = 0{,}0012$$

Observing the linear trend of the variable total number of precise - efficient shots from wings, it is evident a slight scattering (oscillation) of efficient number goals from the wings, the trend was stagnating and it is expected that the French national team will achieve at least 4 goals per the

match from the wing position. The highest number of scores from the wing's positions, the national team achieved in the third match, and the lowest in the seventh match. (Diagram 3).

Observing the linear trend of the variable total number of efficient goals from 9 m, it is evident a strong scattering (oscillation), the trend was

increasing in the number of 9 m precise - efficient shots. From the 9 m position, it is expected that the French national team will achieve 3 goals per the match. The highest number of scores from the 9 m position, the national team achieved in the fifth match, and the lowest in the second and forth match. (Diagram 4).

Diagram 4. The trend analysis of scored goal's number from 9 m of the French national team during 8 played matches
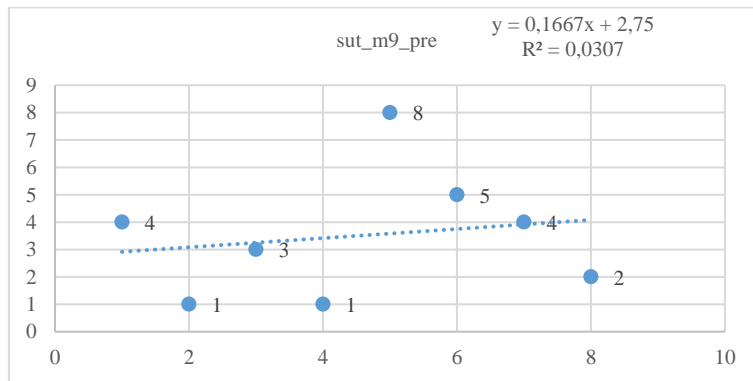
Observing the linear trend of the variable total number of efficient goals from 7 m, it is evident a weak corelation in number of precise - efficient shots from 7 m from the match to match, the trend was decreasing and it is expected that the French

national team will achieve 5 goals from the position from 7 m per the match. The highest number of scores from 7 m, the national team achieved in the eighth match, but with no scores was in the seventh match. (Diagram 5).

Diagram 5. The trend analysis of scored goal's number from 7 m of the French national team during 8 played matches
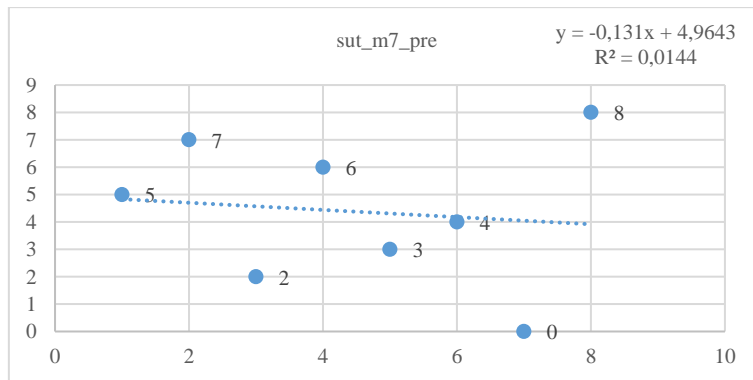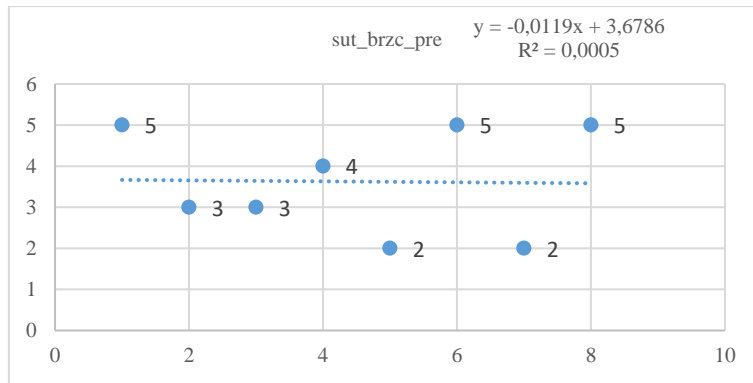

Diagram 6. The trend analysis of fast centre scored goals of the French national team during 8 played matches

Observing the linear trend of the variable total number of fast centre efficient goals, it is evident a weak corelation in realisation of fast centres per the match. The trend was decreasing and it is expected that the French national team will acheive 4 goals per the match. The national team was the most effective according to this variable in the first, sixth and eighth match in which the national team efficient five scores, while in the second, third, fifth and seventh, achieved the lowest number of goals. (Diagram 6).

Observing the linear trend of the Russian national team based on the coefficient determination, could be noticed a slight coloration in number of efficient goals during all eight matches, and oscillations were evident from the match to match. The Russian national team achieved the highest number of scores in the third and the lowest in the first and second match. It is expected that the Russian national team will score 28 goals per the match. (Diagram 7)
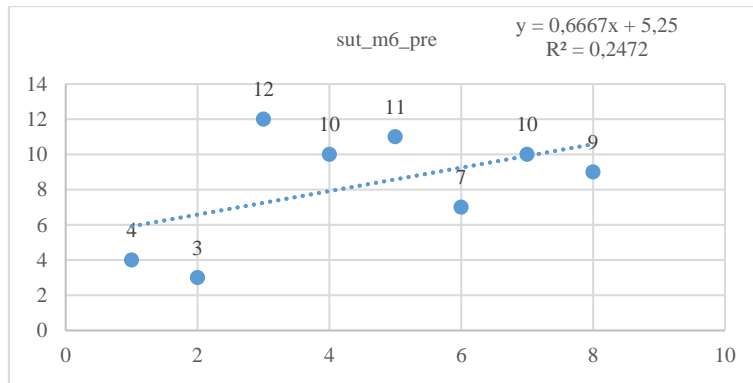
Diagram 7. The trend analysis of the scored goal's number accomplished by the Russian national team during 8 played matches
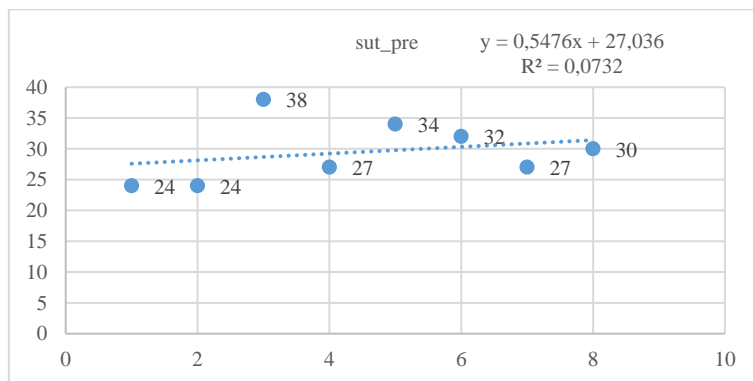
Observing the linear trend of the Russian national team based on the determination coefficient, it is evident a slight corelation in number of efficient goals in all eight matches, and yet oscillations from the match to match. The trend was increasing, and

the Russian national team achieved the highest number of scores from 6 m in third match, and the lowest number in the second match. It is expected that the Russian national team will score 5 goals from 6 m per the match. (Diagram 8).
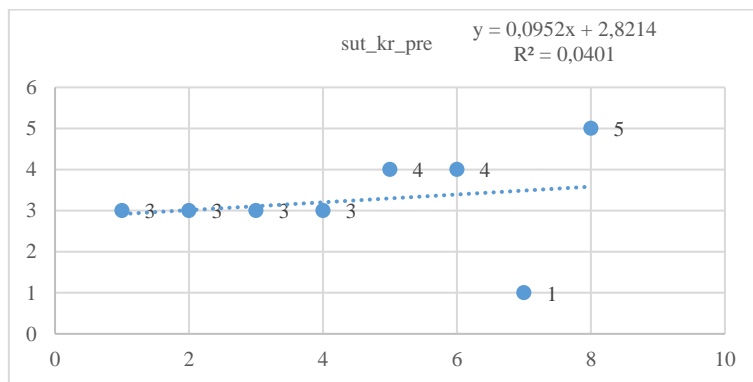
Diagram 8. The trend analysis of scored goal's number from 6 m of the Russian national team during 8 played matches

Observing the linear trend of the Russian national team based on the determination coefficient, it is evident a slight oscillation in number of efficient goals from wings in all eight matches. The trend was increasing. The Russian national team achieved the highest number of scores from wings in eighth match, and the lowest number in the seventh match. It is expected that the Russian national team will score 3 goals from wings position per the match. (Diagram 9).
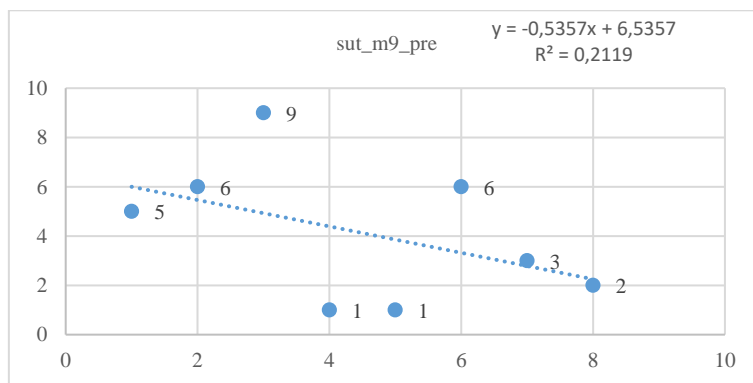
Diagram 9. The trend analysis of scored goal's number from wings of the Russian national team during 8 played matches

Observing the linear trend of the Russian national team based on the determination coefficient, there are evident oscillations in number of efficient goals from 9 m in all eight matches. The trend was decreasing. The Russian national team achieved the highest number of scores from 9 m in the third match, and the lowest number in the fourth and fifth match. It is expected that the Russian national team will score 7 goals from 9 m position per the match. (Diagram 10).
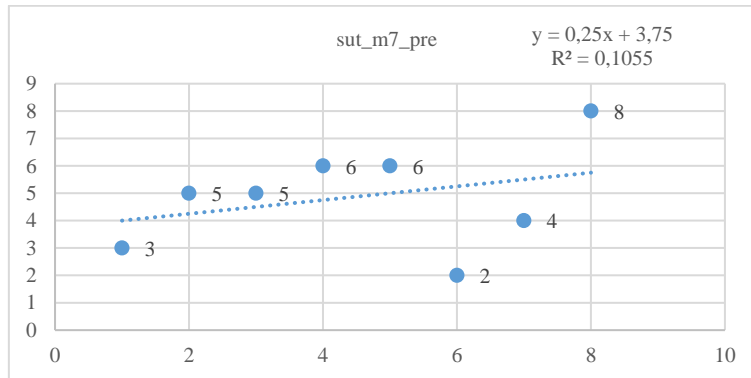
Diagram 10. The trend analysis of scored goal's number from 9 m of the Russian national team during 8 played matches

Observing the linear trend of the Russian national team based on the determination coefficient, there are evident oscillations in number of efficient goals from 7 m in all eight matches. The trend was increasing. The Russian national team achieved the highest number of scores from 7 m in the eighth match, and the lowest number in the sixth match. It is expected that the Russian national team will score 4 goals from 7 m position per the match.(Diagram 11).
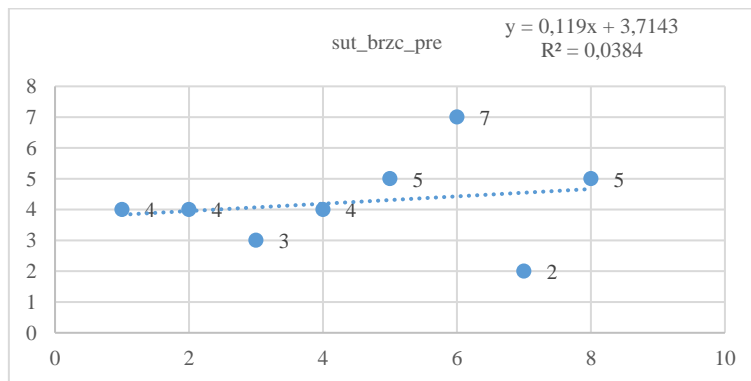
Diagram 11. The trend analysis of scored goal's number from 7 m of the Russian national team during 8 played matches

Observing the linear trend of the Russian national team based on the determination coefficient, there are evident oscillations in number of efficient fast centre goals in all eight matches. The trend was increasing. The Russian national team achieved the highest number of scores from fast centre in the sixth match, and the lowest number in the seventh match. It is expected that the Russian national team will score 4 goals from fast centre per the match. (Diagram 12).

Diagram 12. The trend analysis of fast centre scored goals of the Russian national team during 8 played matches

Observing the linear trend of the Norwegian national team based on the determination coefficient, it is evident a slight corelation in number of efficient goals in all eight matches. The trend was decreasing, in the beginning the efficacy was satisfactory (35 goals were expected) and later, it was decreasing from the match to match. The highest number of accomplished goals were in the first match, and the lowest number was in the sixth and seventh match. (Diagram 13).

Diagram 13. The trend analysis of the scored goal's number accomplished by the Norwegian national team during 8 played matches
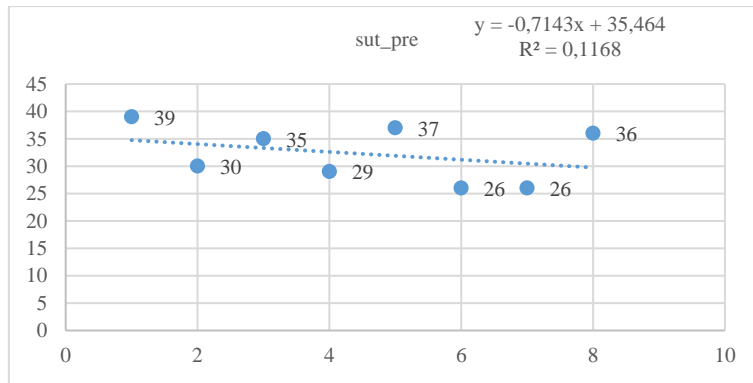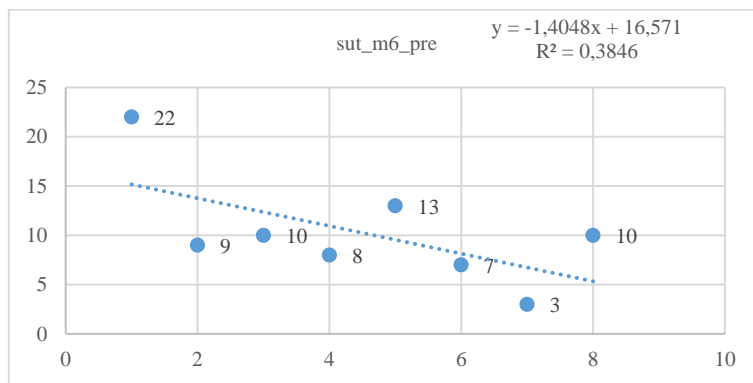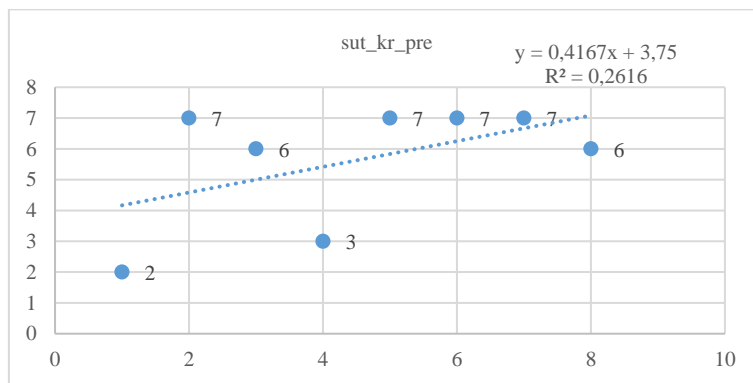
Diagram 14. The trend analysis of scored goal's number from 6 m of the Norwegian national team during 8 played matches

Observing the linear trend of the Norwegian national team based on the determination coefficient, there are evident oscillations in number of efficient goals from wings in all eight matches. The trend was increasing from the match to match. The Norwegian national team achieved the highest number of scores from wings in the second, fifth, sixth and seventh match, and the lowest in the first match. It is expected that the Norwegian national team will accomplish 4 goals from wings per the match. (Diagram 15).
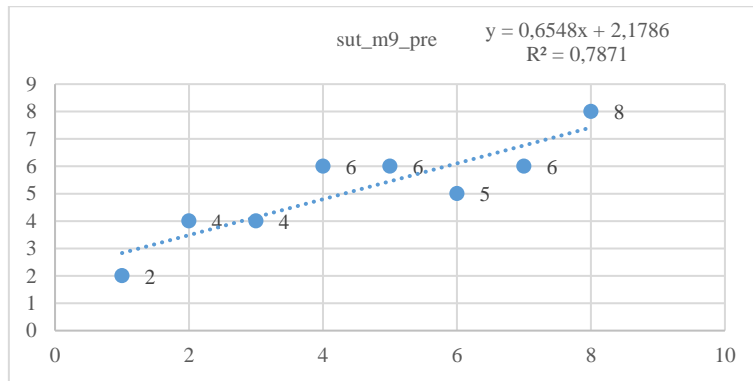
Diagram 15. The trend analysis of scored goal's number from wings of the Norwegian national team during 8 played matches

Observing the linear trend of the Norwegian national team based on the determination coefficient, it is evident a corelation in number of efficient goals from 9 m in all eight matches. The trend was increasing and yet, the Norwegian national team achieved the highest number of scores from 9 m in the eighth match, and the lowest in the first match. It is expected that the Norwegian national team will accomplish 2 goals from 9 m per the match. (Diagram 16).

Diagram 16. The trend analysis of scored goal's number from 9 m of the Norwegian national team during 8 played matches

Observing the linear trend of the Norwegian national team based on the determination coefficient, it is evident a corelation in number of efficient goals from 7 m in all eight matches. The trend was increasing. The Norwegian national team achieved the highest number of scores from 7 m in the second match, and the lowest in the first and sixth match. It is expected that the Norwegian national team will accomplish 3 goals from 7 m per the match. (Diagram 17).

Observing the linear trend of the Norwegian national team based on the determination coefficient, there are evident a oscillation (slight corelation) in number of efficient fast centre goals in all eight matches. The trend was decreasing. The Norwegian national team achieved the highest number of fast centre scores in the first match, and the lowest in the seventh match. It is expected that the Norwegian national team will accomplish 7 fast centre goals per the match. (Diagram 18).

Diagram 17. The trend analysis of scored goal's number from 7 m of the Norwegian national team during 8 played matches
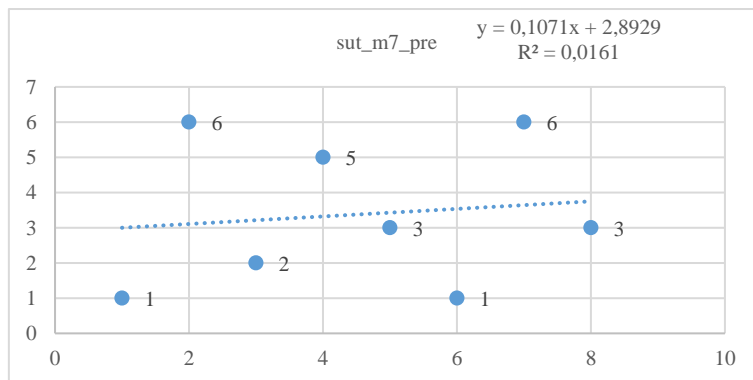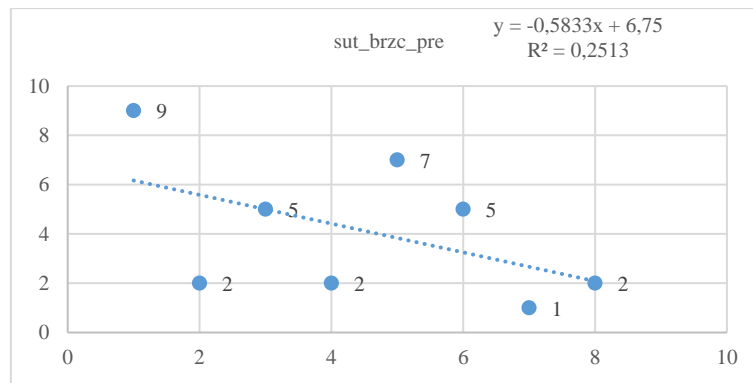

Diagram 18. The trend analysis of fast centre scored goals of the Norwegian national team during 8 played matches

DISCUSSION

Using the trend analysis, it is observed which national teams had increasing trend, which national teams stagnated and which national teams had decreasing trend from the match to match. Hence, it is evident that that French national team had slight oscillations in number of efficient goals from the match to match. In the variable, total number of efficient shots of the French national team, the trend was increasing in the efficacy, and therefore, it is expected that the mentioned national team will achieve at least 27 goals per the match (the cross section on Y axis is 27 and thus, it is expected 27 goals per the match). The number of goals per the match was between 25 and 32. The Russian national team oscillated, thus, the stagnation in the efficacy is evident from the match to match in mentioned national team. The number of goals was between 24 and 38 thus, it is expected that this national team will achieve 28 goals per the match. The efficacy of the Norwegian national team is decreasing from the math to match. The number of efficient goals was between 26 and 39 thus, it is expected that mentioned national team will achieve 25 goals per the match, and a smaller number of goals from the match to match. The French national team had increasing trend in the variable efficient shots from 6m, while the Russian and Norwegian national teams had the increasing trend from the match to match. Based on the determination coefficient, it is expected that the French national team will achieve 7 goals, the Russian national team 5 goals, the Norwegian national team 17 goals per the match. By the trend analysis, it is evident that the French and Russia national teams had oscillations in the variable shot form wing and the trend stagnated, thus, it is expected that the French national team will achieve 4 goals per the match and the Russian national team 3 goals per the match from the wing's position. The Norwegian national team had high oscillations and increasing trend thus, it is expected

that they will achieve 4 goals per the match from the wing's position. The French and Norwegian national teams had decreasing trend in the variable, efficient shots from 9 m, and it is expected that the French national team will achieve 3 per the match. The Russian national teams had decreasing trend, and it is expected that the Russian national team will achieve at least 7 goals per the match. By analysing efficient shots from 7 m, the Russian and Norwegian national teams had increasing trend while the French national team had decreasing trend. It is expected that the French national team will achieve 5 goals, the Russian national team 4 goals, the Norwegian national team 3 goals per the match in this variable. The Russian national team, out of all analysed national teams, had increasing trend thus, it is expected that they will achieve 4 goals per the match. For the French national team, the trend was stagnating in the variable efficient fast centre shot and it is expected that the French national team will achieve 4 fast centre goals per the match. The Norwegian national teams had decreasing trend, and it is expected that the Norwegian national team will achieve 7 goals per the match.

PRACTICAL ASPECTS

This study was directed with aim to analyse a match in the offence of the first third placed national teams at Olympic games in Tokyo. In this study, 12 variables were analysed. Based on the analysis in this study, it is evident that the game of national teams was based on shots from 9 m, shots from 6 m, and on the fast performance of the fast centre. By analysed results, could be concluded, that these variables significantly determinate the game in offence on this tournament. The continuity of efficacy in the game on this kind tournaments, are of great importance. It is supported by the trend analysis in the case of the French national team,

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which had very slight oscillations in all matches were achieved from 25 to 32 goals per the match. All other national teams were they oscillated from the match to match. Obtained information create assumptions about identifications those parameters by which national teams differ on these tournaments.

Following work of handball players (regardless to juniors, seniors, cadets, etc.) is of an exceptional importance for their further importance but also statistical indicators following handball matches are of an exceptional importance both for coaches and handball experts who are planning training processes. They are important for planning a training, a training process, as well as elimination of deficiencies and errors, from one side, and improvement of elements from the other side. Indicators' analysis that contributed to achieve these results, and elimination of qualitied exact information are important for the preparedness' level of national teams taken for this study, reveal important contribution in practical work with national selections and individuals who are applying for national team.

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