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# Relationship Between Sprint Time, Cardiovascular Fitness And Srpe During In-Season's Training Among Professional Soccer Players

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***Abstract : The purpose of this study was to examine the relationship between sprint time, cardiovascular fitness and session's rate of perceived exertion (sRPE) among the professional soccer players during in-season's training sessions. Thirty participants who officially registered as Perbadanan Kemajuan Negeri Perak Football Club professional soccer players participated in this study. Data were collected during actual in-season training sessions from December 2016 to April 2017. Sprint time performance was determined by the 20m sprint test, 20m Yoyo Intermittent RecoverCODS and y Test Level 1 was used to determine the cardiovascular fitness level of the players. Ten scales rating for the sRPE were asked at the end of every training and testing sessions to determine the self-perception intensity of the players. Pearson Correlation Coefficient was used to analyzed the data and only significant relationships (r=-.657, p=0.00) were found between sprint time performance and cardiovascular fitness performance. Thus, it can be concluded that players who score better time in 20m sprint have a better score in YYIR1. On the other hand, players with high time in 20m sprint scored a less value in YYIR1.***

***Keywords: Soccer, cardiovascular fitness, sprint time***

## 1. INTRODUCTION

Soccer has been known as one of the prestigious and popular sports in the world (1, 2). Most of the professional soccer players are highly paid based on their ranking and performances (3-5). The well-planned training program can produce performance enhancement and decreasing the risk of injury among soccer players (6). However, the variation of the training program received by soccer player resulted in a different perspective of the outcome. The specific soccer match demands need to be incorporated in every training program since the speed endurance and high aerobic capacity are needed in a modern soccer match and most of the professional soccer players performed (7).According to Haugen, Tønnessen, Hisdal and Seiler (8), sprint ability was important to soccer players, it is because, before a goal, straight-line sprinting was the most frequent action happen either to scoring or assisting other players to score and in time-motion analysis, it shows short sprint occurs frequently in soccer game. In addition, aerobic fitness also essential for soccer athletes to perform at an optimal level (9, 10). Speed endurance ability help player to perform a high-speed repeated sprinting in a short distance (11, 12) and at the same time,

this movement needs to be consistently performed at a high pace throughout the soccer match (13).

In order to produce a great result, it is not only focusing on how or what the training implemented, but it also needs to consider how to monitor the training load given and how to evaluate the outcome of the training provided. By monitoring a training load on the players, the outcome for current physical fitness performance, level of fatigue, rate of recovery and progressive intensity loading can be measured, therefore most of the elite soccer team practically used performance monitoring tools in order to make sure their training program was on the positive track (14-16). Fitness testing and monitoring performance were very important because evidently, there was a different perception of how hard the training is (termed dose-response) between coaches and players (17). While the coaches may think that the training is easy for the players, the players themselves may think and feel otherwise. Apparently, most of the current tests prescribed for performance monitoring can be classified as external in nature, meanings they are external to the athletes, which is the intensity performed by the players is evaluated from the heart rate monitoring, GPS monitoring or fitness testing, not from the players perception or self-evaluation (18). However, with many studies on prescribed training load and effect on performance, a method called session's rate of perceived exertion or sRPE has been created and validated, in which it is internal in nature or more towards self-perception or evaluation on the individuals own performance (19-21). The external evaluation of training intensity and internal self-perception or evaluation of training intensity need to be closely monitored and compliment each other to ensure the training program was progressive towards the upward and positive track. A previous study by Gil-Rey et al. (22) on the relationship between quantifying perceived load received by the players with the improvement in aerobic capacity and neuromuscular ability also has been conducted and it shows a significant relationship.Currently, limited study and published data in the area of performance monitoring in the Malaysian soccer league. The actual training program implemented in the professional soccer team needs to be examined based on the actual case study. The main purpose of this study was to examine the relationship between sprint time, cardiovascular fitness and session's rate of perceived exertion (sRPE) on the PKNP FC professional soccer players during an in-season performance monitoring program.

## 2. RESEARCH METHODS

### 2.1 Participants

Thirty professional soccer players from PKNP's FC were purposely selected involved in this study. All participants were actively participated in a team training program and clear from any major injuries which need a rest for more than one week.

### 2.2 Data Collection

The study was a descriptive case study. All of the training program and fitness testing protocol or performance monitoring plan was decided by the head coach of the team based on their training plan towards pre-season and in-season match preparation. There was no treatment given or applied in this study. This study was descriptive of the current status of the team performance in their performance monitoring plan. The sprinting time, YYIR1 test score and sRPE were tested in six series of fitness testing conducted within four-month of performance monitoring program throughout the pre-season and in-season training session in preparation for the match.A multi-weight and height (Kyoto, Japan) scale was used in this study to measure the height and weight of the players. To measure a distance of 20m sprint and YYIR1, a 50m normal measurement tape was used. In order to measure a sprint time, a

handy sport Casio stopwatch was used. The cardiovascular fitness performance test was conducted using the Yoyo Intermittent Recovery Level 1 test protocol (23).

All participants were brief on the study conducted on the first fitness testing session and the inform consent form was provided. In every fitness testing session, the participants underwent a standardized 10 minutes warm-up protocol before fitness testing.Fitness testing started with the 20m sprint test. The 20m sprint test was a maximal sprinting effort testing on the players. The players were on a ready position at the starting line, with a standing start and at least one foot touches the starting line, the participants ready and started the sprint on their own while the timekeeper took the sprint time manually at the finishing line. Once the players take off from the starting line, automatically the timekeeper starts the stopwatch and stop the watch once the torso of the player reaches the finishing line. The timekeeper was standing parallel at the finishing line. All participants underwent three trials and the best time was recorded to be analyzed. The resting time in between trials was 1 minute 30 seconds.Thirty minutes after the sprint test completed, the Yoyo Intermittent Recovery Level 1 (YYIR1) test was conducted. The YYIR tests are a simple method for examining an athlete's capacity to perform repetitive high-intensity aerobic exercise. YYIR1 protocol was an incremental speed of 2 x 20-meter shuttle run with the recovery of 5-meter distance in 10 seconds. The speed of between the beep sound progressively increased throughout the test and the participants need to adapt and adjust the running speed according to the beep sound. The participants need to place at least one foot on the starting line before start with beep sound. They had to reach the starting line before the beep sound and only can leave the starting line after the beep sound. The participants performed a shuttle run as much as possible according to the sound recorded and given one time warning before being eliminated if unable to reach the starting line according to running speed for the second time. Once eliminated or withdrawn from the test, their shuttle score were recorded.

20 minutes after the eliminated or voluntary stop from the YYIR1 test, the assistant coach of the team approaches the participants and asked the sRPE score. The printable ten scales rating for the sRPE was showed to the participants and the number of scales was declared.

### 2.3 Statistical analysis

Descriptive statistics were performed to determine the mean and standard deviation (SD) of demographic data. Relationship between Sprint Time, Cardiovascular Fitness Performance and sRPE. were analyzed using the Pearson Correlation. All statistical analyses were conducted using Statistical Package for Social Science (SPSS) version 22 (IBM, USA).

## 3. RESULTS AND DISCUSSION

### 3.1 Results

(Table 1.) showed the demography of participants involved in this study.

Table 1. Descriptive Statistic of Demographic Data

| | **Age (mean ± SD)** | **Weight (mean ± SD)** | **Height (mean ± SD)** |
|---|---|---|---|
| Mean | 24.68 ± 3.12 | 69.38 ± 8.45 | 176.15 ± 7.48 |
| Minimum | 21.1 | 55 | 163 |
| Maximum | 32.7 | 84 | 190.5 |

(Table 2.) showed the mean and standard deviation of sprint time, cardiovascular fitness and sRPE for overall six series of fitness testing

Table 2. Descriptive Statistic of Sprint Time, Cardiovascular Fitness And sRPE

| | **Sprint (mean ± SD)** | **YYIR1 (mean ± SD)** | **sRPE (mean ± SD)** |
|---|---|---|---|
| Mean | 3.28 ± 0.26 | 19.04 ± 1.26 | 6.78 ± 1.11 |
| Minimum | 2.94 | 15.80 | 4.00 |
| Maximum | 4.45 | 22.40 | 8.00 |

(Table 3.) showed relationship between sprint time, cardiovascular fitness and sRPE. There was only significant relationship between sprint time and YYIR1. While there was no significant relationship between sprint time and sRPE, there was also no significant difference between YYIR1 and sRPE.

Table 3. Correlations between Sprint Time and Cardiovascular Fitness Performance and sRPE

| **Variables** | | **Pearson Correlation** | **Sig. (2-tailed)** |
|---|---|---|---|
| Sprint time | YYIR1 | -.657 | .000 |
| Sprint time | sRPE | .019 | .800 |
| YYIR1 | sRPE | -.051 | .498 |

(Table 4.) showed a significant relationship between sprint time and cardiovascular fitness. It was suggested that a positive improvement on cardiovascular fitness performance also will lead to reducing in 20m sprint time and vice versa.

Table 4. Correlations between Sprint Time and Cardiovascular Fitness Performance

| **Variables** | **Pearson Correlation** | **Sig. (2-tailed)** |
|---|---|---|
| S1-Y1 | -0.72 | 0.00 |
| S2-Y2 | -0.75 | 0.00 |
| S3-Y3 | -0.60 | 0.00 |
| S4-Y4 | -0.50 | 0.00 |
| S5-Y5 | -0.55 | 0.00 |
| S6-Y6 | -0.61 | 0.00 |

Correlation is significant at the 0.01 level (2-tailed)
S=sprint time (sec), Y=YYIR1 (ml•kg-1•min-1)

(Table 5.) showed there was no significant relationship between sprint time and sRPE.

Table 5. Correlations between Sprint Time and sRPE

| **Variables** | **Pearson Correlation** | **Sig. (2-tailed)** |
|---|---|---|
| S1-SRPE1 | 0.00 | 0.97 |
| S2-SRPE2 | -0.00 | 0.97 |
| S3-SRPE3 | -0.04 | 0.82 |
| S4-SRPE4 | -0.16 | 0.38 |
| S5-SRPE5 | -0.36 | 0.05 |
| S6-SRPE6 | 0.06 | 0.72 |

Correlation is significant at the 0.01 level (2-tailed).

S=sprint time (sec)

(Table 6.) showed there was no significant relationship between YYIR1 and sRPE

Table 6. Correlations between Cardiovascular Fitness Performance and sRPE

| Variables | Pearson Correlation | Sig. (2-tailed) |
|---|---|---|
| Y1-SRPE1 | -0.13 | 0.47 |
| Y2-SRPE2 | 0.10 | 0.59 |
| Y3-SRPE3 | -0.03 | 0.87 |
| Y4-SRPE4 | 0.48 | 0.00 |
| Y5-SRPE5 | 0.31 | 0.08 |
| Y6-SRPE | 0.20 | 0.27 |

Correlation is significant at the 0.01 level (2-tailed).
Y=YYIR1 (ml•kg-1•min-1)

**3.2 Discussion**

This study aim to determine the relationship between sprint time, cardiovascular fitness and sRPE. A significant relationship between sprint time and cardiovascular fitness indicates that players who score better time in 20m sprint have a better score in YYIR1. On the other hand, players with high time in 20m sprint scored a less value in YYIR1.

The speed-endurance training either speed-endurance production or speed-endurance maintenance implemented on the players provides a great improvement on the sprint ability and aerobic capacity of the participants. Besides that, speed training conducted also provides an influence in improvement of sprinting time. Speed-endurance capacity known as match specific demands in soccer and related training program implemented on the participants shows an improvement towards ability of the participants to perform better in match environment, training session and testing session.

The ability to acquire a high aerobic capacity will be a significant advantage for a soccer player as a main and important role to maintain the intensity level which also characterized as short burst activities during a soccer match is the aerobic system capabilities (24).

In a study conducted by Meckel et al. (25), they found correlation between 20m sprint time and repeated sprint ability performance. A player that performs a better score in repeated sprint ability performed better in 20m sprint. These findings support that the players' cardiovascular fitness ability reflect on the sprinting performance. A player's fitness ability needs to be at a highest level in order to make sure they can complete the sprinting in a shortest time.

According to Sanders et al. (26), a soccer players with high aerobic fitness ability performed faster sprinting time in repeated sprint ability test with a distance less than 40 meters. It is not only proven in a study on a soccer players, in a study conducted for a volleyball players also showed, the repeated sprint ability training drill can improve on aerobic capacity and anaerobic performance of the players (27).

## 4. CONCLUSION

In conclusion, sprint time have relationship with cardiovascular fitness but no relationship between sprint time and sRPE, also no relationship between cardiovascular performance and sRPE. It can be suggested, the relationship between sprint time and cardiovascular fitness performance in this study proved that the training program was attached to PKNP FC professional soccer players were success to develop players speed and cardiovascular fitness, however players maybe not achieved a proper recovery time because sRPE was reflected the ability to recover in a high-intensity drill. Thus, it can be concluded that the self-perception of intensity by the players was in line with external intensity as shown by the fitness test result.

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