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The Effects of Football Specific Anaerobic Training Design on Athletes' Specific Anaerobic Ability

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Abstract
This study aimed to investigate the effects of different training routine designs in enhancing the athlete's specific anaerobic ability based on the specific characteristics of football. The proposed training design serves to improve football athletes' specific anaerobic ability. The study involved eighteen football players from the Xi'an Institute of Physical Education men's football team. This researcher collected the data via expert interviews, maximum heart rate experiment test and blood lactic acid test. The data was analysed statistically using t-test The anaerobic training method was measured using Polar Team 2 heart rate monitoring system and Lactate Pro. The training routine design involved 1) two types of specific anaerobic training routines with maximum speed and 2) anaerobic endurance training in four-goal small-sided games with two different interval ratios. The findings indicated that the two training routine designs exhibit a non-synchronization feature in terms of the variations in heart rate and exercise intensity in the training routine, with Type 1 lactic acid value approaching the normal endpoint and Type 2 slightly increasing. Meanwhile, the results showed that the heart rate and lactic acid levels in Type 1 are more significant than in Type 2 in four-goal small-sided games. This implied that the training routine designs of varied intensities and controlled variables can enhance the specific anaerobic ability of the football athletes. Through the different combinations and training schedules of aerobic training, anaerobic training, and muscle strength training in this research, relevant theories and design ideas are provided to support further studies. Future researchers can delve into how to monitor the changes in blood lactic acid values of athletes under different intensity training and explore more optimized training programs by changing different training content and requirements.
Keywords: Football, Specific Anaerobic Ability, Small-Sided Games, Training Routine Design

Introduction

According to Izzo & Giovannelli (2018), football is an intermittent game defined by approximately 1200 acyclical and unexpected activity changes (each ranging between 3 and 5 seconds) that include between 30 and 40 sprints, more than 700 twists, and between 30 and 40 tackles and leaps. This team game consists of periods of intense exercise alternated with moderate-intensity activity and technical and tactical elements (Sparkes et al., 2018). Recent research indicates that football players traverse around 8000 and 14000 meters in a football game (Aguiar et al., 2012), indicating that a variety of physical abilities such as quick twisting, leaping, sprinting, kicking, dribbling, and tackling may influence a player's performance (Izzo et al., 2019). All these movements are highly dependent on anaerobic energy supply as they involve high-intensity running and action (Agus et al., 2016).

Sozen and Akyıldız (2018); Simon (1994) defined anaerobic capacity as the ultimate ability of the human muscles' anaerobic metabolic energy supply system to produce ATP during exercise, representing the functional capacity of the muscles under the energy supply of phosphate and glycolysis. Anaerobic exercise needs explosive force and a load that surpasses the anaerobic threshold and is a kind of physical exercise that results in exhaustion. In football games, 10m to 20m sprints are very common, but sprints longer than 30m also account for a substantial percentage, and the average recovery time of a high-intensity sprint is between 150s and 200s (Stefan et al., 2019). Bangsbo et al (2006) claimed that sprints longer than 30m lengthen the athletes' recovery time, but athletes need to sprint repeatedly without complete recovery in the actual football game scenarios. The blood lactic acid levels of football players are also related to their aerobic and anaerobic abilities. The blood lactic acid level of excellent football players is shown to be significantly higher than that of ordinary athletes, which indicates that they use more anaerobic energy to complete the game, such as sprinting, changing direction and shooting (Heimo, 2013). Cairns (2006); Spencer et al (2005) have claimed that specific anaerobic training is beneficial to train the capacity to exercise continuously under repeated high-intensity exercise and the ability to endure lactic acid. Hence, the study focused on the specific anaerobic training design for football players, which is essential in improving the athlete's sprint efficiency and the speed endurance level of repeated high-intensity activity.

The anaerobic training design of football players can be categorized into two parts, i.e., speed training and speed endurance training. The speed endurance training involves lactic acid production speed endurance and lactic acid maintenance speed endurance. Specific anaerobic training plays an essential role in prompting football players to reduce the reaction time in the game, improve their sprint ability and quickly output power during high-intensity exercise (Harsh et al., 2017). It is helpful for high-intensity activities such as acceleration, sprinting and shooting in the game. Anaerobic capacity is also the basis for athletes to perform high-intensity exercises in competitions as it shortens the recovery time of athletes after high-intensity exercises (Cairns, 2006). The ability to perform multiple high-intensity exercises in competitions plays an important role (Evangelos et al., 2016).

With the rapid development of modern football and the continuous improvement of game quality, athletes must deal with more intense physical confrontations and ever-increasing competition tasks. The question aroused is how we can effectively improve the specific physical training level in football and maintain the athletes' competitiveness. Bangsbo and Mohr (2014) have concluded that prolonging the condition and athletes' sports life has become one of the main issues coaches consider nowadays. The essence of football specific physical training is to improve the functional potential of athletes based on training as similar to football games as possible and to meet the particular needs of the rapid development of skills and tactics for athletes' physical fitness. Therefore, researchers and coaches can promote football-specific physical fitness by integrating technical and tactical training into high-intensity and high-confrontational game situations (FIFA, 2014). In recent years, more and more scholars and coaches have a clearer understanding of football specific physical fitness and specific anaerobic training ability, how to organize training, how to implement and control the training process, and more importantly, how to recognize the physical fitness of football athletes (Hanapiah et al., 2020; Gabbett et al., 2009; Hoff et al., 2002). The difference between training in terms of training effect and load intensity requires more theoretical and empirical research to explore. Therefore, through theoretical analysis and the valuable opinions of experts in related fields, this article designed specific training methods and load control methods for football specific anaerobic training. This study also investigated the effects of different training routines on athletes' specific anaerobic ability by experimenting, analyzing and interpreting football specific anaerobic training. The difference in training intensity provides references for effectively enriching coaches' training design ideas and choosing training methods.

Methodology

This study involved 12 athletes from the men's football team of Xi'an Institute of Physical Education. The average age of the players was (21.33±1.33) years, the average training years was (8.88±3.12), and the average height was (177.06±8.94) cm, weight (68.06±5.06) kg and resting heart rate (56.11±5.86) beats/min.

The researcher conducted expert interviews to obtain the data. Through consultation with experts and scholars in related fields, opinions and suggestions on football specific anaerobic training methods and design ideas were widely collected. Two training methods, i.e., one-on-one training routines and four-goal small-sided games in small courts, were selected for experimentation. Regarding functional monitoring indicators, heart rate combined with blood lactate values were chosen as the monitoring indicators of exercise load intensity, and Xi'an Institute of Physical Education provides equipment support.

Meanwhile, the researcher applied a real-time heart rate test using the Finnish Polar Team2 heart rate monitoring system for the experimental test method. Its application in sports training has been pervasive and it mainly uses wireless heart rate monitoring to record, store and analyze the human heart rate. The data obtained by the heart rate test table monitors the data, which can reflect the sports physiology of football players in detail and in-depth. In this study, the researcher carried out each training design content of 18 subjects in real-time throughout the process. The researcher monitored, real-time recorded the heart rate changes, performed effective heart rate statistics from the beginning of the test to the end of the test, conducted video recording of the test process and finally analyzed the changes in heart rate.

In addition, the researcher conducted a blood lactic acid test using Lactate Pro portable blood lactic acid tester. It is a portable tester for measuring the concentration of human blood lactic acid quickly and accurately. It provides reference parameters for scientific training of football sports for scientifically guided training design and improving game performance. In this study, the fingertip blood of 9 players was randomly collected as an indicator of blood lactic acid during the normal endpoint before the start of each training design content, at the end of the third group, and the end of the fifth group. The blood lactic acid value of the 1st, 2nd and 4th group were taken but not compared in this study.

The researcher also carried out a maximum heart rate field test suggested by Bangsbo and Mohr (2012) to examine the anaerobic ability of the football athletes. The test was conducted on a 105×68 standard football field (Figure 1 and Figure 2). After a proper warm-up, each team member started at an interval of 15 s from the starting point. The first four laps were run at a moderate speed, and each lap was completed in 90 seconds. Lap 5 was completed at high speed and completed within 60 seconds. The first half of lap six was completed within 20 s, and the second half was completed at the fastest speed.

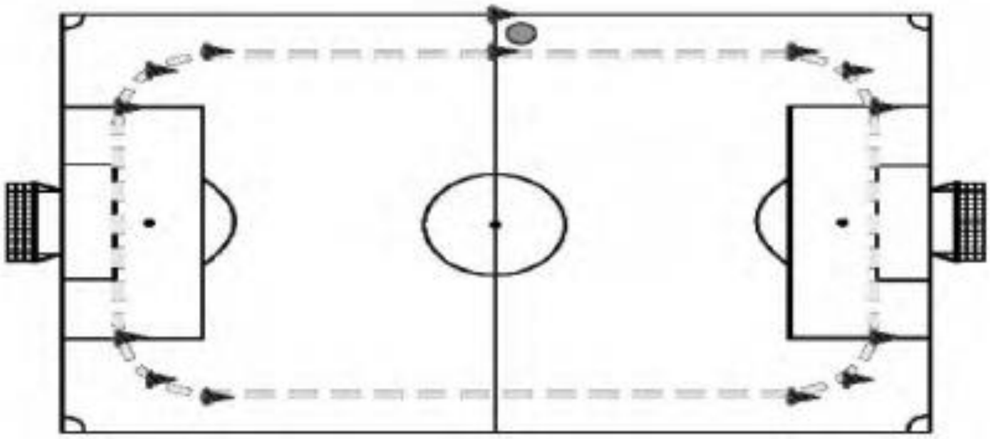

Figure 1. Field Test of HRmax

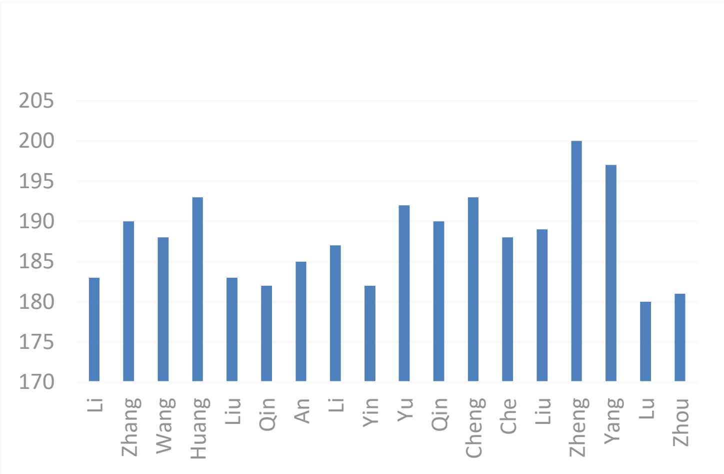

Figure 2. HRmax of subjects

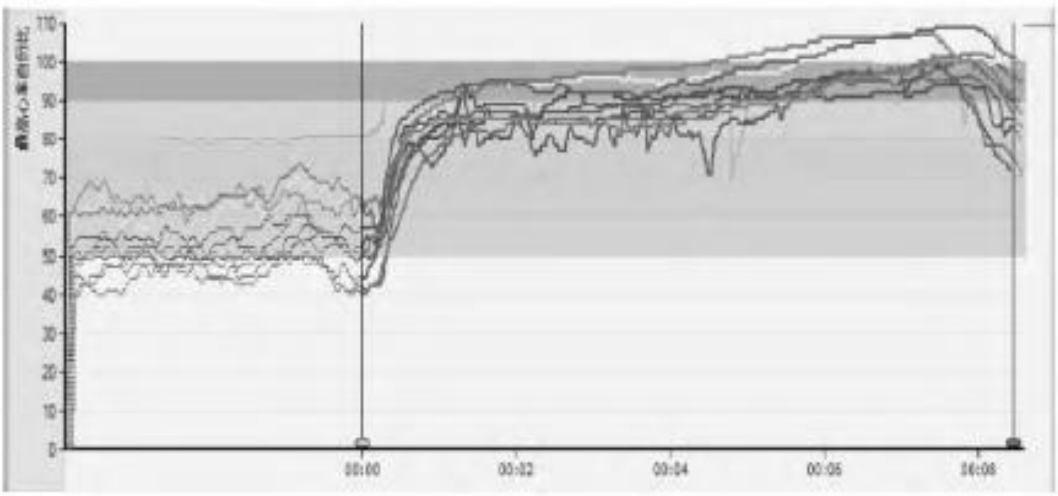

Figure 3. HRmax monitor

Lastly, the researcher applied the mathematical statistics method to import the information obtained from the Polar Team2 heart rate system into Excel 2007 software, sorted and analysed the primary data obtained and conducted matching samples of the heart rate indicators of the above-mentioned different groups of training design tests using the experimental subject t-test. The statistically significant difference was P<0.05.

Design of Football Specific Training Routine

The training site of Type 1 training routine was 20 m × 30 m, whereas the area of Type 2 training routine was 40 m × 50 m. For Type 1 training routine, the players practice in pairs, starting from both sides of the field simultaneously. The passer stands next to the marker and passes the ball to the penalty area line. Another group of players passes the ball to the center circle. At the same time, the two players immediately sprint to receive the opponent's pass and complete the shot, alternately in turn. (Figure 4). In Type 2 training routine, the player passes the ball to the corner of the penalty area, and the passer immediately turns around and sprints to the other penalty area. After receiving the pass, the player completes the shot and alternates in turn (Figure 5). The duration for Type 1 training routine was 2 to 5 s for five groups and the duration for Type 2 training routine was 5 to 10 s for five groups. The intermittent time and ratio of Type 1 training routine were 50 s and 1:10. On the other hand, Type 2 training routine recorded an intermittent time of 100 s and an intermittent ratio of 1:10.

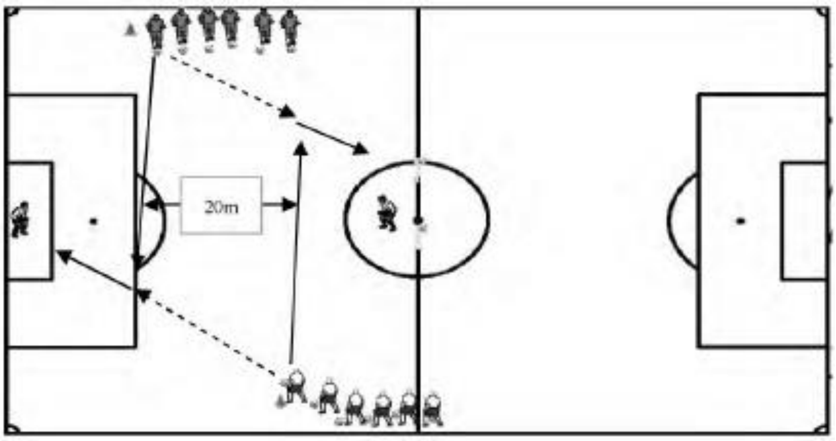

Figure 4. Type 1 training routine

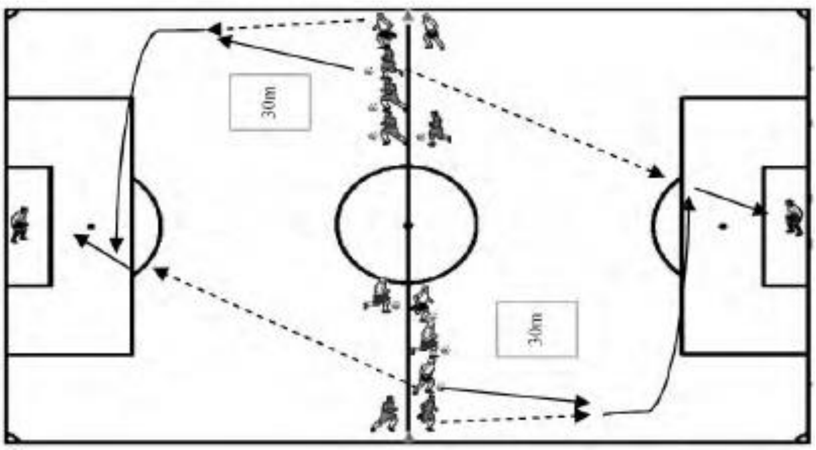

Figure 5. Type 2 training routine

Design of four-goal small-sided games

Clemente et al (2021) performed a systematic review and meta-analysis to determine the impact of small-sided games on the technical execution and tactical behaviors among youth team athletes. The systematic review and meta-analysis concluded that utilizing small-sided games training programs to improve technical performance among youth athletes had a substantial positive impact. Meanwhile, Najib et al (2020) examined the effect of small-sided games on attacking efficiency among youth football training by using tactical periodization. The findings suggest that tactical periodization may be beneficial when coaching young players on attacking efficiency. The findings indicated that the experimental group's small-sided training program was beneficial and substantially affected the player's ability to perform effectively in attacking.

Clemente et al (2021); Najib et al (2020) have suggested that using small-sided games as training tasks exposes players to relevant sub-contexts experienced during competitive full-sided matches, thus encouraging the development of technical, physical, and tactical skills required in full-sided games. Zulakbal et al (2018) claimed that small-sided games are effective to improve the cardiovascular endurance of football players. The four-goal small-sided games involved 18 participants and the site was 25 m × 35 m × 2. According to the regular rules of the game, there were three players in each team, and the 3v3 four-goal small-sided games were played in 3 fields. Each group is required to attack and defend three goals respectively, actively running to respond and the effective score is a touch of the ball. After losing the ball, the participants need to quickly counter-rob and enter the opponent's area after getting the ball. The researcher arranged personnel on both sides of the court to assist and immediately throw the ball into the court to resume practice after it goes out of bounds (Figure 6).

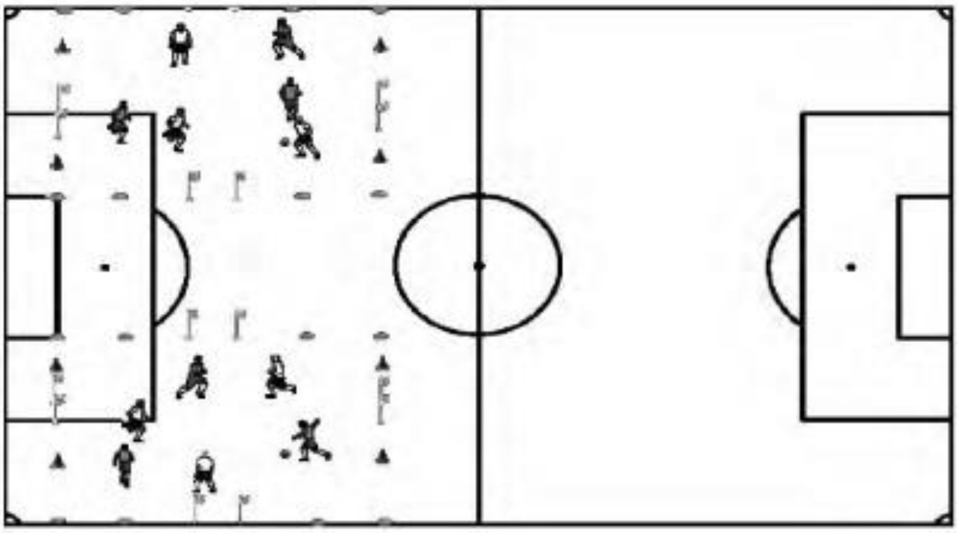

Figure 6. Four-goal small-sided game

The duration allocated was 90 s for five groups. For Type 1 training routine, the intermittent time was 180 s and the intermittent ratio was 1:2. Meanwhile, for Type 2 training routine, the intermittent time was 90 s and the intermittent ratio was 1:1.

Results and Findings

Changes in load intensity and blood lactic acid of athletes in each group of specific training routine.

In football games, athletes are required to have the ability to sprint at high intensity repeatedly. In actual game situations, most sprint distances are between 10-20 m, and sprints longer than 30 m also account for a certain proportion of the game. Bangsbo, Mohr and Krustrup (2006) and Bangsbo and Mohr (2014) have emphasized the strong impact of sprint activities on the game results. Hence, the researcher combined football specific training routine design ideas and included them in two training types (Table 1). Under the same other control factors, the researcher observed the athletes' heart rate changes and recovery and the blood lactic levels by adjusting each group's practice duration and sprint distance. The researcher aimed to find out the most suitable method for football players' absolute speed practice.

Table 1
Specific Training Routine

Exercise related elements	Type 1	Type 2
Ball	multi ball	multi ball
Field	20m×30m	40m×50m
Number of players	2 people × 6 groups	2 people × 6 groups
Practice duration	2 ~ 5 s	5 ~10 s
Running distance	20 ~30m	40 ~ 50m
Intermittent ratio	1:10	1:10
Intermittent time	50s	100s

Type 1 specific training routine: Athlete's load intensity and blood lactic acid changes

In the Type 1 training routine, the average heart rate of the five training groups was 155 beats/min, and the average maximum heart rate percentage was 81%. The average heart rate and the percentage of the maximum heart rate of the players in the five sets of training were (141 beats/min, 73%), (151 beats/min, 77%), (158 beats/min, 82%), (159 beats/min, 82%), (165 times/min, 83%). The minimum intermittent heart rate between the groups recovered to 87 beats/min. The segmented load showed the intensity percentage of 50%～59%, indicating a wave trend; the 60%～69% load percentage shows a downward trend; the 70%～79% intensity percentage shows an upward trend. And there was a very significant difference between the 70% to 79% increase in load percentage of the first and second training routine and the average heart rate of the second and third groups (Table 2). It showed that the athlete's heart rate change and training intensity show a non-synchronous characteristic in the anaerobic speed exercise. Since the training routine duration was short, the interval ratio of 1:10 can make the players fully recover, so the overall load intensity of the exercise was not high. It was suggested that when heart rate indicators are used to monitor athletes' anaerobic training, attention should be paid to combining them with other indicators to apply them in training practice comprehensively.

In addition, in terms of blood lactic acid indicators, the blood lactic acid values of the players in the Type 1 training routine at rest, at the end of group 3 and at the end of group 5 were 1.3 mmol /L, 1.9 mmol /L and 2.4 respectively. There was no significant change compared with the school lactic acid level at rest. Through video observation and subjective judgments of athletes, shooting was completed under high running conditions, and higher requirements were put forward for the grasp of technical movements and running timing, which was in line with the actual situation of the game. This shows that Type 1 training routine can meet the requirements of anaerobic speed exercises.

Table 2
The Intensity of Type 1 Training Routine and Paired T-Test

Load intensity (strength percentage)	Group 1	Group 2	Group 3	Group 4	Group 5
50-59%	9.96±1.37*	5.03±0.78	6.49±2.15	5.13±2.56	5.05±2.27
60-69%	37.56±3.74 **	32.23±4.98△	21.33±5.02	19.25±4.80▲	15.52±3.93
70-79%	52.48±5.71*	62.74±6.41△	72.18±5.92	75.62±3.63▲	79.43±5.69
Average heart rate	139.1 ±4.26*	148.4±3.89△△	156.8±5.67	159.2±6.35	160.3±4.43
Maximum heart rate	154.4±7.36*	160.7±3.31	169.4±4.93	172.9±5.53	175.8±5.87

Note: * means $p<0.05$; ** means $p<0.01$; the first group is compared with the second group. △ means $p<0.05$; △△ means $p<0.05$; the second group is compared with the third group. ▲ means $p<0.05$; comparison between group 4 and group 5.

Type 2 specific training routine: Athlete's load intensity and blood lactic acid changes
Type 2 specific training routine made appropriate adjustments in terms of the field's size, duration, and technical aspects based on Type 1. The athletes were required to turn around and sprint to receive the pass from the other half of the field immediately after passing the ball from the side of the midfield. The athletes need to complete the shot quickly and significantly improve the practice's running distance, duration, and technical difficulty. The average heart rate of the five groups of exercises in Type 2 was 164 beats/min, and the average maximum heart rate percentage was 84%. The average heart rate and the percentage of the maximum heart rate of the players in the five sets of exercises were (157 beats/min, 81%), (164 beats/min, 84%), (166 beats/min, 85%), (165 beats/min), 85%) and (167 times/min, 86%) respectively. The intermittent heart rate between groups recovered to 101 beats/min. The segmented load showed a similar trend to Type 1's training routine. However, there was a very significant difference in the average heart rate between group 1 and group 2 and the 80% to 89% increase in load percentage of group 3 and group 4 (Table 3).

Table 3
The Intensity of Type 2 Training Routine and Paired T-Test

Load intensity (strength percentage)	Group 1	Group 2	Group 3	Group 4	Group 5
60-69%	3.79+2.77	2. 48 +0.78	5.81+1.69△	2.68+2.73	4.50+1.68
70-79%	40.95+4.11	36.87+3.63	29.48+4.16	26.74+5.67▲	22. 28+5.52
80-89%	55.26+5.97	60.65+4.38	64.71+5.51△△	70.58+4.08	73.22+6.35
Average heart rate	157.2+1.73 **	164.5+2.27	166.6+4.49	165.3+5.23	167.8+6.42
Maximum heart rate	172.8+5.66	176.3+3.19	178.5+5.67	179.1+3.57	182.9+6.06

Note: ** means p<0.01; the first group is compared with the second group. △ means p<0.05; △△ means p<0.05; the third group is compared with the fourth group. ▲ means p<0.05; comparison between group 4 and group 5.

In terms of blood lactic acid index, athletes' blood lactic acid values in the Type 2 training routine at rest, at the end of group 3 and group 5 were 1.4 mmol/L, 3.9 mmol/L, and 4.5 mmol/L, respectively. It reflected that the maximum speed training impacts the energy source of short-term high-intensity exercise. The original phosphate energy supply system was the primary energy source for high-intensity exercise within 10 s. As the exercise time increases, the body gradually begins to produce lactic acid. However, due to the control of the training duration and the interval time, the blood lactic acid value of the players will not rise to a very high level, indicating that the 1:10 interval ratio can make the players fully recover. Therefore, in the next group of exercises, the phosphate energy supply system can continue to generate energy quickly.

Changes in load intensity and blood lactic acid of athletes in four-goal small-sided competitions in each group

The study conducted by Jones & Drust (2007) proved that small-sided games' running characteristics and technical characteristics are very similar to those of official games. The empirical research of small-sided games further confirms that small-sided games are the most crucial part of a regular football game. Efficient physical training methods have significant simulation effects. Thus, the researcher designed the 3v3 small-sided games training based on the previous research experience, increased the number of goals, changed the scoring method and thus improved the running distance and frequency. The researcher controlled the different intermittent types to test the final training effect (Table 4).

Table 4
Four- Goal Small-Sided Games

Exercise related elements	Type 1	Type 2
Ball	multi ball	multi ball
Field	20m×30m	40m×50m
Number of people	2 people × 6 groups	2 people × 6 groups
Practice duration	2 ~ 5 s	5 ~10 s
*Intermittent ratio	1:2	1:1
*Intermittent time	3 min	1 min 30 s

Note: * is the adjusted compliance factor

Type 1 four-goal small-sided game: Athlete's load intensity and blood lactate changes

Based on the analysis of athletes' heart rate changes of 3v3 Type 1 four-goal small-sided game, during the training, the minimum heart rate was 127 beats/min, the maximum heart rate was 192 beats/min, the average heart rate was 172 beats/min and the maximum heart rate percentage was 89%. Table 6 showed that the average heart rate and percentage of the maximum heart rate of each group in the five groups were (167 beats/min, 86%), (175 beats/min, 91%), (169 beats/min, 88%), (177 times/min, 92%), (172 times/min, 89%). The minimum intermittent heart rate between training groups was 124 beats/min. Before the start of the training, the blood lactic acid index at the end of the third group and the end of the fifth group showed that the average lactic acid reached 2.2 mmol /L, 12. 7 mmol /L and 6.4 mmol /L, respectively. The segmented load showed very significant differences in the 80%

～89% load percentage decrease and 90%～100% increase of the load percentage between the first and second groups. Secondly, the third and fourth groups showed 70% ～79%, 80% ～, 89% load percentage decrease, and 90%～100% load percentage increase, respectively have very significant differences (Table 5). The training routine has shown that by changing the scoring elements, load structure, interval ratio and other routine training methods, the load intensity can be effectively regulated to meet the basic requirements of different types of anaerobic training.

Table 5
The Load Intensity of Type 1 Four-Goal Small-Sided Game and Paired T-Test

Load intensity (strength percentage)	Group 1	Group 2	Group 3	Group 4	Group 5
70-79%	16.82+3.09	11.35+4.66◎	13.32+2.15△△	3.86+2.01	1.11+0.54
80-89%	33.62+7.34 **	25.91+8.25	21.54+7.32△△	15.35+4.28	12.02+4.67
90-100%	49.56+7.48 **	62.74+8.63	65.13+9.16△△	80.79+4.28▲	86.87+5.12
Average heart rate	167.3+4.41*	175.6+4.78	169.3+5.03△	177.5+6.27	172. 4+3.93
Maximum heart rate	180.5+3.39	184.6+3.72	185.8+4.65	186.1+3.43	188.7+2.12

Note: * means $p<0.05$; ** means $p<0.01$; the first group is compared with the second group. ◎$p<0.05$; the second group is compared with the third group.△ means $p<0.05$; △△ means $p<0.05$; the third group is compared with the fourth group. ▲ means $p<0.05$; comparison between group 4 and group 5.

Type 2 four-goal small-sided game: Athlete's load intensity and blood lactate changes
The football athlete's load intensity and blood lactate changes can be seen from the heart rate changes (Table 6). The minimum heart rate during the training routine was 124 beats/min; the maximum heart rate was 189 beats/min, the average heart rate was 165 beats/min, accounting for 85% of the maximum heart rate percentage. The average heart rate and the percentage of the maximum heart rate of each group in the five groups of training routine were (168 beats/min, 87%), (164 beats/min, 85%), (157 beats/min, 81%), (172 beats/min, 81%) and (166 times/min, 86%), respectively. The minimum intermittent heart rate between training routine groups was 117 beats/min. The segmented load showed a very significant difference between the 80% to 89% load percentage of the first and second groups of training routine exercises. There were very significant differences between the third and fourth groups at 80%～89% load percentage decrease and 90%～100% load percentage increase respectively. In addition, the sampling test results before the start of the exercise, at the end of the 3rd group and at the end of the 5th group, showed that the average blood lactate reached 1.5 mmol/L, 8.9 mmol/L, and 7.7 mmol/L, respectively. The blood lactic acid index at the end of the three groups was the highest, and the blood lactic acid value at the end of the 3rd group was closer to that at the end of the 5th group, indicating that in the 1:1 load structure, the athlete's body produced a state of incomplete recovery due to different degrees of fatigue.

Table 6
The Load Intensity of Type 2 Four-Goal Small-Sided Game and Paired T-Test

Load intensity (strength percentage)	Group 1	Group 2	Group 3	Group 4	Group 5
70-79%	14.00+3.31	15. 16+2.97	7.72+2.54	6.64+3.05	6.01+3.42
80-89%	35.79+6.97 **	22.32+5.78	31.93+6.24△△	11.67+5.12	10.12+4.26
90-100%	50.21+6.71	62.52+7.07	60.35+8.53△△	81.69+7.51	83.87+4.96
Average heart rate	168.4+3.72	164.5+4.83	157.2+5.85△	172.1+3.26▲	166.3+4.46
Maximum heart rate	182.3+4.57	184.1+3.49	183.8+6.84	185.7+2.77	186.2+2.48

Note: ** means p<0.01; the first group is compared with the second group. △ means p<0.05; △△ means p<0.01; the third group is compared with the fourth group. ▲ means p<0.05; comparison between group 4 and group 5.

Discussion

At this stage, the use of scientific and technological means to monitor the heart rate and training load of athletes has been used prevalently in the practice of football specific physical training. However, when using heart rate indicators to monitor the maximum speed of football players, attention should be paid to the changes in the athletes' heart rate and the intensity of exercise. The synchronization feature causes an inevitable delay in the change of heart rate in short-term high-intensity exercise. Usually, it can reach the maximum gradually after a group of high-intensity exercises or repetitions, which requires attention in training routines.

Since the Type 2 specific training routine exercise was significantly higher than Type 1 in duration and distance, the difficulty of outflanking football shoot in Type 2 was also much greater than the former, which ultimately leads to the difference in maximum heart rate and load intensity. However, both training routine types can meet the basic requirements of anaerobic speed training. During the routine training, the heart rate changes showed a certain degree of lag, manifested in the apparent improvement after the two training routines and steadily reaching the peak. According to the study conducted by Christensen, Krustrup and Gunnarsson (2011), the measurement of athletes' maximum oxygen uptake and blood lactate during anaerobic training showed that 90% to 100% of the maximum oxygen uptake level is the appropriate intensity for anaerobic speed exercise. It further clarified that 70% to 95 % is the intensity range of lactic acid production in anaerobic speed endurance training. This two overlapped and crossed in the 90% to 95% intensity range. Absolute speed exercises with a shorter duration will not cause a significant increase in the body's lactic acid level. The study of Mohr, Thomassen and Girard (2016) also pointed out that since the maximum speed exercise with a duration of about 5 to 10 s and the anaerobic speed endurance lactic acid production exercise have a certain degree of overlap. Therefore, the athlete's lactic acid production speed will also be developed accordingly. The endurance level tested the athlete's blood lactate through 5 × 30 m intermittent sprint training. The results showed that the blood lactate values of the third group and the fourth group were 5 mmol/L and 6 mmol/L, respectively. The test results of the studies are similar.

Based on the athlete's heart rate and blood lactic acid index, it can be seen that the overall strength of Type 2 was significantly higher than that of Type 1. The lactic acid level of the body was maintained at a quiet value during the Type 1 training routine. In contrast, Type 2 was slightly improved, confirming the intersection of absolute speed and endurance training. However, the phosphoric acid energy supply system is generally the primary energy source for short-term high-intensity exercise. Coaches can design targeted ball training to strengthen the athlete's anaerobic speed ability according to the corresponding training purpose, thereby improving the specific event. The physical level also makes the technical and tactical levels adapt to the requirements of the game.

In the overall load intensity of the two training routines, the maximum heart rate percentage of Type 1 was 89%, which was higher than the 85% of Type 2. The two types had a certain degree of difference in blood lactate value. The highest blood lactate value of Type 1 was 12.7 mmol/L, whereas the highest value of Type 2 was 8.9 mmol/L. The average heart rate of Type 2 was 165 beats/min, which was significantly lower than the 172 beats/min of Type 1. Through video analysis combined with heart rate indicators, it can be seen that due to the increase in the number of goals in the game, the athletes can make full use of the field and choose a reasonable attack direction. At the same time, the effective scoring method affected the player's running distance and thus, the intensity of the training routine significantly improved. Bangsbo (2011) pointed out that 35% to 95% of the maximum heart rate is the load intensity range of anaerobic speed endurance training. The load intensity of 35% to 75% is conducive to lactic acid tolerance anaerobic speed training. The load intensity of 75% to 95% can be suitable for maximum lactic acid production anaerobic speed endurance training. Jones and Drust (2007); Sassi et al (2005) sampled the blood lactate value of athletes in the first and second half of the game and found that the average blood lactate value of athletes in the game was about 1-10 mmol/L. Some players even reached 12 mmol/L of blood lactate value in a game. Therefore, the blood lactate value in the Type 1 training routine is in line with the tolerable anaerobic speed training requirements.

To sum up, by adjusting the interval time, Type 1 training routine is more in line with the maximum generative exercise of anaerobic speed endurance. This is because the 1:2 interval ratio enables athletes to obtain more adequate adjustments with a 3 min interval. Time can also allow players to maintain a higher load intensity for the next set of exercises. However, the 1:1 interval ratio in Type 2 cannot allow the athlete's body to fully recover, thus causing the accumulation of fatigue degree in each group. This decreased the load intensity. Therefore, under incomplete recovery conditions, the Type 2 training routine is more suitable for tolerable anaerobic speed endurance training requirements.

Conclusion

In conclusion, the design of football specific anaerobic training should be based on the combined training routines, which are similar to the actual game situation. Researchers and coaches should emphasize the primary training method mixed with load monitoring and the training form, rules, goal, ball, players, field, load structure. Coaches can scientifically adjust and control elements such as duration and interval time during the training process, thus improving the athlete's specific physical ability.

In the specific training routine design, the two training types' heart rate changes and exercise intensity showed asynchrony characteristics. The Type 2 training routine exercises showed the intersection of absolute speed exercises and speed endurance exercises. It shows that the Type 1 training routine exercise with a duration of about 5 s is suitable for the requirements of absolute speed training. The Type 2 exercise with about 10 s can also produce lactic acid in speed endurance exercise.

In the four-goal small-sided competition training design, the heart rate and blood lactate value of Type 1 were higher than those of Type 2, and the interval ratio of 1:2 and the duration was 1.5 minutes. Type 1 training routine was consistent with anaerobic speed endurance and maximum lactate production. Meanwhile, the 1:1 inter-group interval ratio and the time of 1.5 minutes of Type 2 training routine exercises can achieve the purpose of anaerobic speed lactic acid tolerance training.

The proposed football specific anaerobic training design can be used by coaches to improve athletes' specific anaerobic ability. Through the different combinations and training schedules of aerobic training, anaerobic training, and muscle strength training in this research, relevant theories and design ideas are provided to support further studies. Future researchers can delve into how to monitor the changes in blood lactic acid values of athletes under different intensity training and explore more optimized training programs by changing different training content and requirements.

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