EFFECT OF SPECIFIC TRAINING PROGRAM ON SELECTED MOTOR FITNESS ANTHROPOMETRIC AND PHYSIOLOGICAL PARAMETERS OF YOUNG SWIMMERS

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INTRODUCTION

Swimming is an individual or team sport that requires the use of one's arms and legs to move the body through water. Competitive swimming became popular in the 19th century. The goal of high-level competitive swimming is to break personal or world records while beating competitors in any given event. Swimming in competition should create the least resistance in order to obtain maximum speed. However, some professional swimmers who do not hold a national or world ranking are considered the best in regard to their technical skills. Typically, an athlete goes through a cycle of training in which the body is overloaded with work in the beginning and middle segments of the cycle, and then the workload is decreased in the final stage as the swimmer approaches competition.

Sport training is a systematic and scientific process spreading over a long time. For highest achievement the system of training has to be based and conducted on scientific facts and lines where it is not possible to do that, the training has to be based on the results Successful practice which has withstood the test of time sport. The knowledge and information acquired from these sciences have to be brought into actual practice. The sports training principles serve the purpose of applying this knowledge into practice. These principles serve as directives teachers, coaches and sportsperson for formulation, implementation and control of sports training on the basis of knowledge acquired from different training science disciplines. (Harre , 1982), (Matveyev, 1981), (Singh , 1991) have analysed the theoretical basis of training principles and identified the followings as cardinal principles of training. These principles are (i) Progression of load, (ii) Continuity, (iii) Planned and Systematic training, (iv) Individualization, (v) Active participation, (vi) General and Specific preparation, (vii) Clarity, (viii) Cyclicity and (ix) Ensuring results (Singh , 1991).

The goal of sports training is to enhance the sports performance in competition to make more successful in chosen sport. It is the aggregate of both physical fitness, anthropometric, physiological and the sports skills. They are based on well scientific principles and proven training techniques to create a customized, effective workout plan. Such a training program, combined with difficult work, will improve physical characteristics, physiological potentialities, psychological status and technical qualities.

STATEMENT OF THE PROBLEM

The main aim of sports training is to prepare a sports person for highest level sports performance in a man completion in specific sports. A sportsman's performance depends on different factors (physical characteristics, physiological potentialities, psychological status, tactical quality etc.).

Other hand sports training influences on such factors (physical characteristics, physiological potentialities, psychological status, tactical quality etc.), so in this study to find out the changes of selected factors through specific training programme, the problem stated as "**Effect of Specific Training Program on Selected Motor Fitness Anthropometric and Physiological Parameters of Young Swimmers".**

OBJECTIVES OF THE PROBLEM

The objectives of the study are:

1. To assess the selected motor fitness variables of the young swimmers after 24 weeks of observation.
2. To measure the selected anthropometric measurements and body composition dimension variables of the young swimmers after 24 weeks of observation.
3. To measure the selected hematological parameters of the young swimmers after 24 weeks of observation.
4. To assess the blood lactic acid accumulation of the young swimmers after 24 weeks of observation.
5. To observe the changes of selected performance related variables of the competitive young swimmers after 24 weeks of specific training programme.
6. An attempt will be made to find out the relationship among the selected variables.

DELIMITATION OF THE STUDY

The study has been delimited in the following:

Area: The study has been conducted in West Bengal, India.

District: Only one districts; South 24 Parganas has been selected as the study area.

No. of subjects: Total fifteen (15) young subjects have been selected as subjects in this study.

Sex: Only male subjects have been selected.

Age: 14-16 years in age ranged students have been considered.

Category: only young sprint swimmers have been selected as subjects in the study.

Duration of observation: Only 24 week's participations in specific training program of the subjects has been considered as observation period.

Variables: Following variables with numbers of parameters have been selected for the study:

I. Five (4) parameters for motor fitness variables.
II. Nine (9) parameters for anthropometric variables.
III. Six (6) parameters for physiological & biochemical variables.
IV. Five (5) parameters for Swimming performance related variables.

LIMITATIONS OF THE STUDY

1. The subjects taken for the study were not have the same characteristics as far as the selected variables may vary from person to person.
2. Psychological and sociological conditions of their day - to - day life interactions to their environment could not be controlled.
3. The food habits, hereditary aspects life styles of the subjects were not ascertained and this may influence the study.
4. Small number of young swimmers and 24 weeks observation employed in this study, the researcher think, may influence the study.
5. One training programme may also affect the other training programme due their growing age and training age is considered as limitation.
6. Performance is a discrete task and depending on influences on a number of factors in the present study all such factors to not be considered, which may be considered as limitation.

HYPOTHESES OF THE STUDY

1. It is hypothesised that there would be significant improvement on motor fitness variables of swimmers following specific training.

2. It is hypothesised that there would be no significant changes on anthropometric measurements and body composition dimension variables of swimmers following specific training.
3. It is hypothesised that there would be significant changes on hematological parameters of swimmers following specific training.
4. It is hypothesised that there would be significant changes on blood lactic acid accumulation of swimmers following specific training.
5. It is hypothesised that there would be significant changes on performance related variables of swimmers specific following training.
6. It is hypothesised that swimming performance would be significantly related to selected motor fitness, anthropometric physiological and performance related Parameters respectively.

REVIEW OF RELATED LITERATURE

Barbosa, C. A. et al. **(2020)** investigated the effect of four-weeks training period with hand paddle on free-style swimming performance. From the study it was observed that no significant changes in swimming performance ($p>0.05$). it was revealed that no significant changes in stroke rate and stroke length ($p>0.05$) after four weeks training with hand paddles. (Barbosa, Ferreira, Gourgoulis, Leis, & Barroso, 2019)

Charmas, M, and **Gromisz, W. (2019)** try to find out the effect of twelve-weeks swimming training on body composition in young women. From the study it was revealed that insignificant changes on body mass and body mass index ($p>0.05$) of experimental women subjects. It was also observed that statistically insignificant changes on fat weight and lean body mass ($p>0.05$) of young women. (Charmas & Gromisz, 2019)

Darchini, M. et al. **(2019)** worked on a study to identify the effect of a six-week core stability training program on the stroke index and freestyle swimming record in adolescent swimmers. From the study, results showed that the six-week core stability training program led to a statistically significant improved in the subjects 100m freestyle record ($p<0.05$), but there was statistically no significant improved in their stroke index parameter ($p>0.05$). (Darchini, Darzabi, Moghadam, & Nabavinik, 2019)

Ferreira, S. et al. **(2019)** to examined changes in physiological and biomechanical characteristics relative to 400m freestyle swimming performances during an eleven weeks

training in child swimmers. From the study it was observed that swimming performance significantly increased after proposed training period ($p<0.05$). After the training period, body weight and height were also increased significantly ($p<0.05$). After the training period it was observed blood lactate concentration increased existed, but the result was not statistically significant ($p>0.05$). After the training period, the stroke length and stroke index were significantly increased ($p<0.05$) and stroke rate was significantly increased($p<0.05$). (Ferreira, et al., 2019)

Gourgoulis, V. et al. **(2019)** worked on the impact of an eleven-weeks water training program with increased resistance on the swimming performance and kinematic characteristics of front crawl stroke in young swimmers. From the study it was revealed that significant improved in swimming ($p<0.05$). it was observed that significant improved in swim velocity ($p<0.05$) after training period. It was also showed that insignificant changes were in stroke length and stroke rate ($p>0.05$). (Gourgoulis, Valkoumas, Boli, Aggeloussis, & Antoniou, 2019)

Karpinski, J. et al. **(2019)** assess the impact of a six-week specific core exercise training program on performances in national level Polish swimmers. From the study it was observed that a statistically significant improved in 50m swimming performance after the training period ($p<0.05$). After six week the study, results were improvement existed, but these results were not statistically significant of stroke rate and stroke length both parameters ($p<0.05$). After six weeks training program, it was seen that swim velocity statistically significant improved ($p<0.05$). (Karpinski, et al., 2019)

Nugent, F. et al. **(2019)** worked on a study to determine the effect of low volume, high intensity training on Performance parameters in competitive youth swimmers. From the study it was observed that no significant improved swim velocity and blood lactate concentration after specific training program ($p>0.05$). After well-planned raining program, it was observed that no statistically significant improved stroke length and stroke index ($p>0.05$) and stroke rate decreased ($p>0.05$). After seven weeks intervention period, swimming performance was not statistically significant improved ($p>0.05$). (Nugent, Comyns, Nevill, & Warrington, 2019)

Sarkar, P.K., and **Das, S. S., (2018)** reported a study on influence of training on the motor fitness variables of young athletes with special references to duration. It was observed that the statistically significant improved selected motor fitness variables, such as leg explosive

strength, muscular strength endurance and muscular strength after completion of 13 weeks specific training programme. (Sarkar & Das, 2018)

Patel, S. R. et al. **(2019)** worked on a study to determine the effect on performance of young competitive swimmers. From the study it was revealed that 50m swimming kicking performance statistically increased ($p<0.05$) after twelve weeks specific training program of competitive swimmers. It was revealed that 50m swimming kicking performance and stroke rate statistically increased ($p<0.05$) after twelve weeks specific training program of competitive swimmers. (Patel, Sharma, Prajapati, Dave, & Varma, 2019)

METHODOLOGY

In this chapter the procedure followed and methodologies used for the present investigation have been described. It includes selection of subjects, selection of criterion measures, selection of instruments and tools, collection of data, administration of the tests, administration of the training program, reliability of the data, experimental design and statistical techniques for analyzing the data have been described

SELECTION OF SUBJECTS

Initially, twenty-eight (28) junior male district level swimmers were taken from Nimpith Vivekananda Sports Association of south 24 parganas district, ranging the age from 14 years to 16 years and their training age 2 years to 3 years. After that, thirteen (13) swimmers excluded from the study for not meeting inclusion criteria (eg. different training age, strokes and distances swimmers). Finally, fifteen (15) swimmers those are meeting inclusion criteria (only free-style sprint swimmers were considered for the study because prepare a homogeneous training programme) had been purposively selected as subjects for the study.

SELECTION OF THE VARIABLES

Taking into considerations of the criteria, feasibility, availability of instruments and relevance to the present experimental study, the following variables were selected.

MOTOR FITNESS VARIABLES:

1. Muscular strength

    1.a. Hand grip muscular strength (RH and LH)

2. Muscular strength-endurance

2.a. Arm and shoulder strength-endurance

2.b. Abdominal strength-endurance

3. Flexibility

4. Leg explosive strength

2. ANTHROPOMETRIC VARIABLES:

2.i. Anthropometric Measurements

2.i.a. Height

2.i.b Weight

2.i.c. Shoulder width

2.i.d. Chest circumference

2.i.e. Arm span

2.ii. Body Composition Dimension

2.ii.a. Body mass index

2.ii.b. Percentage of body fat

2.ii.c. Total body fat weight

2.ii.d. Lean body mass

3. PHYSIOLOGICAL & BIOCHEMICAL VARIABLES:

3.i. Hematological variables

3.i.a. Red blood cell count

3.i.b. White blood cell count

3.i.c. Platelets count

3.i.d. Hemoglobin concentration

3.i.e. Hematocrit

3.ii. Blood lactic acid

4. PERFORMANCE RELATED VARIABLES:

4.i. 100m Swimming performance

4.ii. Swim velocity

4.iii. Stroke rate

4.iv. Stroke length

4.v. Stroke index

EXPERIMENTAL DESIGN

The study was assigned as a one group experimental design consisting of a pre-test, mid-test and post-test. The subjects (N=15) were formulated to a group for experiment.

Pre-test were conducted for all the subjects (N=15) on selected motor fitness, anthropometrical, body composition, physiological and performance related parameters. After the experimental period of twelve (12) weeks intermediate test and completion of the experimental period of 24 weeks post-test were conducted and score were recorded.

Before onset of training all the tests (standarised) and measurement of all the five dimensions (anthropometrical, body composition, motor fitness, physiological & biochemical and swimming performance related potentialities) were conducted on all the subjects. Post-tests on each of the variables were conducted twice, first after 12 weeks and then after completion of 24 weeks training programme, respectively. The anthropometrical, body composition and motor fitness parameters test were conducted in one days in each state of training phase (pre, after 12weeks & after 24 weeks). The test of physiological & biochemical and swimming performance related parameters test was conducted in three consecutive days taking 5 subjects in each day. It means in state of training phase five (5) days were spent for conducting the tests. The tests procedure has been discussed separately.

TRAINING PROGRAMMES

The training programme has been segregated into two parts- dry-land strength-endurance training programme and swimming training programme according to the objectives of the study. All swimmers trained 2 sessions of dry-land strength-endurance training programme (Sunday & Wednesday evening) and 5 sessions of swimming training

programme (off Monday and Thursday) per week. Dry-land strength endurance training was divided into three training phases, (i) maximum strength training (1-12 wks), (ii) explosive strength training (13-18 wks) and (iii) strength-endurance training (19-24 wks). Swimming training programme was divided into five training zones, (i) aerobic training zone (1-12 wks), (ii) anaerobic threshold training zone (13-16 wks), (iii) high-performance-endurance training zone (17-20 wks), (iv) anaerobic training zone (21-22 wks) and (v) sprint training zone (23-24 wks).

The training schedule and the loading procedures adopted for the present study were planned after through an elaborate discussion with the professionally experienced and specialized coaches and supervisor. The training schedule was prepared according to the method mentioned for dry-land strength-endurance training (Garrido, et al., 2010; Das, 1995; Sing, 1984), and for swimming training (Sweetenham & Atkinson, 2003; Carew & Pyne, 1999; Atkinson & Sweetenham, 1999; Pyne , 1999a; Pyne, D., 1999b; Richards, 1999). The whole training program was conducted under the supervision of research scholar and four qualified coaches and all swimmers were trained under identical facilities and environmental conditions.

Dry-land strength-endurance programme

The detail of the training programme has been mentioned in the **Chart-1.** To achieve the target improvement, specific strength-endurance training programme was adopted. The training programme was designed in accordance with the youth resistance training guidelines ensuring appropriate progression for each individual swimmer. Progression and technique were closely monitored by weight training Specialist and research scholar throughout the training programme with all loads monitored and recorded for each individual swimmer. The specific exercise has been presented in the chart.

The salient feature of the training programme was that in the first twelve weeks (1-12 wks) schedule both the resistance and repetition were increased. It means for maximum strength development in the present schedule, load was gradually increased from 80% to 90% (Sing, 1984) and repetition was from 6 to 8 in number. For each exercise were practiced in 3 sets. In this phase sub-maximal load was given, due to the age and inexperience of the participants.

For development of explosive strength during thirteen to eighteen weeks (13-18 wks) the resistance increased and repetition was decreased. Load was 70% to 75% and repetition was 12 to 10 in number. For each exercise were practiced in 3 sets

For strength-endurance development during nineteen to twenty-four weeks (19-24 wks) the resistance at the rate of 5% increased at the initial 50% but the repetition was remained constant at 16 in number. for each exercise were practiced in 3 sets, but some exercise such as sit-ups, pull-ups, push-ups, counter movement jump and elastic band exercises sets was 5. A recovery period of 2 to 4 minute was allowed after every set of exercise

The swimming training schedule of all swimmers

The aerobic training zone represented swimming intensity below the anaerobic threshold. There are three types of aerobic training A1, A2, A3- provide balance to overall training and the range of aerobic development. The repeat distances to use when training at the level is 200m to 1500m, with very short rest between swims. The rest interval was 10 seconds to 20 seconds. The swimming intensity was set as 60 percent to 70 percentages.

The anaerobic threshold training zone the lactic acid accumulation begins to rise sharply. The repeat distances to use when training at the level is 200m to 400m. Shorter repeat distances use shorter rest interval. The rest interval varies according to distances, were 10 seconds for 50m, 10 to 20 seconds for 100m or 200m and 10 to 20 seconds for 200m or 400m. The rest interval was 10 seconds to 20 seconds. The swimming intensity was set as 70 percent to 80 percent.

In high-performance endurance training zone, swimmers work at high intensity that the swimmers maintain for the duration of the rest. In this training zone, swimmer produces high levels of lactic acid from high-performance endurance. The training repeats a distance that was made up of 150m, 100m, and 50m repeats. The rest interval was 10 seconds to 20 seconds. The swimming intensity was set as 80 percent to 90 percent in this zone

Anaerobic zone training commonly referred to as lactic training. The anaerobic training zone consists of three types of lactate training; lactate production, lactate tolerance, and peak lactate training. The length of the set in this zone is shorter than it is in the first three training zones due to the increased intensity of this type of work. During this type of training repeat distances varies, such as 50m to 100m swims for lactate production, 50m to 200m swims for lactate tolerance and 100m to 400m swims for peak lactate. The rest

interval was 20 seconds to 30 seconds. The swimming intensity was set as 90 percent to 95 percent.

Sprint training zone is the short maximum-speed training that is commonly referred to as high-velocity overloads (HVO). The Training repeats of 10m to 25m are best for training in this zone. The swimmers were performed 25m repeats with sufficient rest. Target time was set for each swimmer based on the method of calculating the speed training pace. After each set, the swimmer could do a 100m, 200m, 300m, or 400m swim-down. The distance should be long enough that the swimmer can swim the required speed on the next set. The intensity was set up 100 percent in this zone

CRITERION MEASURES

MOTOR FITNESS VARIABLES:

1. Muscular strength
   Hand grip muscular strength (RH and LH) (kg)
2. Muscular strength-endurance
   Arm and shoulder strength-endurance (no. of pull-ups)
   Abdominal strength-endurance (no. of sit-ups)
3. Flexibility (Inches)
4. Leg explosive strength (Mt.)

ANTHROPOMETRIC VARIABLES:

Anthropometric Measurements

5. Height (cm)
6. Weight (kg)
7. Shoulder width (cm)
8. Chest circumference (cm)
9. Arm span (cm)

Body Composition Dimension

10. Body mass index (Kg/m^2)
11. Percentage of body fat (%)
12. Total body fat weight (kg)
13. Lean body mass (kg)

PHYSIOLOGICAL & BIOCHEMICAL VARIABLES:

Hematological variables

14. Red blood cell count ($x10^6/\mu L$)
15. White blood cell count ($x10^3/\mu L$)
16. Platelets count ($x10^3/\mu L$)
17. Hemoglobin concentration (g/dL)
18. Hematocrit (%)
19. Blood lactic acid accumulation (Mmol/L)

PERFORMANCE RELATED VARIABLES:

20. 100m Swimming performance (Sec)
21. Swim velocity (cycle.m)
22. Stroke rate ($m \cdot s^{-1}$)
23. Stroke length (m.cycle)
24. Stroke index (m^2. (s. cycle)$^{-1}$)

STATISTICAL PROCEDURE ADOPTED FOR ANALYSIS OF THE DATA

The data collected from the different tests and measurements were statistically treated for analyses adopting procedure. Mean and standard deviations was first computed for each variable separately and are presented in tabular form in the chapter-IV.

For comparison among the means of a variable within the group Analysis of Variance (One-Way ANOVA) was applied. Wherever the F-ratio was found significant, Least Significant Difference (L.S.D) Post Hoc test was applied. Pearson Product-Moment Correlation coefficient was applied to find out the relationship of swimming performance, to each of these variables separately.

For the purpose of the present study, the level of significance was set up at 0.01 and 0.05 level of confidence which was deemed reasonable for the study.

RESULTS AND DISCUSSIONS

Motor Fitness Variables:

1. Muscular Strength: From the analysis of the results of muscular strength test, it appears that the specific program of dry-land strength-endurance and swimming training had

profound influence on hand grip muscular strength (RH & LH) and was improved significantly. The magnitude of improvements was almost identical for both the hands of the subjects after training. Therefore, from the analysis of the results of the present study and from the findings of the other researchers it may safely be concluded that for the improvement of the muscular strength performance specific training is needed and that too for a considerable period of time.

2. Muscular Strength-Endurance: From the analysis of the results of muscular strength-endurance test, it appears that the specific program of dry-land strength-endurance and swimming training had profound influence on muscular strength-endurance and was improved significantly. The conclusion from the present analysis may be drawn by stating that in sports performance, strength-endurance is essential by adopting adequate program specifically sustain the gain in strength-endurance for reasonable period of time, depending on the objectivity of the training program.

3. Flexibility: From the present study flexibility was significantly increased after specific training program. Research reports have indicated that development of flexibility is very specific to the joint, type of exercise program and physical capabilities. Therefore, the findings of the present study on flexibility measure are not unusual. It may therefore be concluded that flexibility may be improved through specific training programs.

4. Leg Explosive Strength: The result of this analysis indicated that leg explosive strength improved significantly during the training period. The conclusion from the present analysis may be drawn by stating that in sports performance, leg explosive strength is essential by adopting adequate program specifically sustain the gain in leg explosive power for reasonable period of time, depending on the objectivity of the training program.

Anthropometric Variables: Anthropometric variables considered in this study was consists of -i. anthropometric measurements, ii. Body composition dimension.

Anthropometric measurements

5. Height: The result of the analysis indicated that height was increased insignificantly during the specific training period. From the findings of the present analysis, it may be concluded that, height was slightly increased due to physiological growth of the subjects, may not be due to specific training program.

6. Weight: The result of the study indicated that weight was decreased significantly during the specific training period. From the findings of the present analysis, it may guess that, body weight may be altered due to effect of training, depending on the nature of the training characteristics.

7. Shoulder Width: The result of the study indicate that shoulder width was no significantly increased during the specific training period. From the findings, of the present study and reviewing the research reports relating to shoulder width, it may be concluded that shoulder width was changed due to influence of specific training, depending on a considerable period of time.

8. Chest Circumference: The result of the study indicate that chest circumference significantly increased during the specific training period. From the findings, of the present study and reviewing the research reports relating to chest circumference it may be concluded that chest circumference was changed due to influence of specific training, depending on a considerable period of time.

9. Arm Span: The result of the present study indicated that arm span was statistically no significantly increased during the specific training period. From the findings, of the present study and reviewing the research reports relating to arm span it may be concluded that arm span may be changed due to influence of specific training, depending on a nature of training and considerable period of time.

Body Composition Dimension

10. Body Mass Index: The result of the study indicated that body mass index found no significant change during the specific training period. Analyzing the data of the present study and reviewing the leading research reports it may safely be concluded that body mass index following training may change positively, negatively or no change, depending on a nature of training and considerable period of time.

11. Percentage of Body Fat: The result of the study indicated that percentage of body fat decreased significantly during the specific training period. In the present study the significant decrease of percentage of body fat exhibit that the training intensity was sufficient for reduction of percentage of body fat and may be imposed to the greater calorie burning effect of the training program.

12. Total Body Fat: The result of the study indicated that total body fat decreased significantly during the specific training period. In the present analysis also the significant reduction of total body fat indicates that training intensity was sufficient for reduction of total body fat and may be attributed to the greater calorie burning effect of the training program.

13. Lean Body Mass: The result of the study indicated that lean body mass no significant change during the specific training period. From the findings, of the present analysis and reviewing the research reports relating to lean body mass, it concluded that the effect of training on lean body mass is insignificant in children and adolescent but in case of adults, exercise training may have a significant influence on lean body mass.

Physiological & Biochemical Variables

Hematological Parameters

14. Red Blood Cell Count: The result of the study indicated that red blood cell counts significantly increased after twelve weeks and decreased after the end of twenty-four weeks, this variation was statistically significant. From the findings, of the present analysis and reviewing the research reports relating to red blood cell it may be concluded that red blood cell count may be altered due to influence of exercise training, depending on the severity and duration of exercise training.

15. White Blood Cell Count: The result of the study indicated that white blood cell counts significantly increased after twelve weeks and decreased after the end of twenty-four weeks, this variation was statistically significant. From the findings, of the present study and reviewing the research reports relating to white blood cell it may be concluded that white blood cell may be altered due to influence of exercise training, depending on the nature, intensity and duration of the training.

16. Platelets Count: The result of the study indicated that platelets significantly difference during the specific training period. From the findings, of the present study and reviewing the research reports relating to platelets it may be concluded that platelets altered due to influence of exercise training, depending on the nature of the training regimen.

17. Hemoglobin Concentration: The result of the study indicated that hemoglobin concentration increased after twelve weeks and decreased end of twenty-four weeks, this

variation was statistically significant. From the findings, of the present analysis and reviewing the research reports relating to hemoglobin concentration, it concluded that hemoglobin concentration altered due to influence of exercise training, depending on the nature of the training regimen

18. Hematocrit: The result of the study indicated that hematocrit increased after twelve weeks and decreased end of twenty-four weeks, this variation was statistically significant. From the findings, of the present study and reviewing the research reports relating to hematocrit it may be concluded that hematocrit may be altered due to influence of exercise training, depending on the nature of the training regimen.

19. Blood Lactic Acid Accumulation: The results of the present study indicated that blood lactic acid (rest & 75%, 85%, 90%, 95%, 100% workload) significantly decreased during the specific training period. From the findings, of the present study and reviewing the research reports relating to BLA it may be concluded that exercise training may have a significant influence on BLA.

Performance Related Variables

20. Swimming Performance: The result of the study indicated that swimming performance significantly increased during the specific training period. From the findings, of the present study and reviewing the research reports relating to swimming performance it may be concluded that specific training program may have a significantly enhanced of swimming performance.

21. Swim Velocity: The result of the study indicated that swim velocity significantly increased during the specific training period. From the findings, of the present study and reviewing the research reports relating to swim velocity it may be safely concluded that considerable time of training period may have a significantly enhanced of swim velocity.

22. Stroke Rate: The result of the study indicated that stroke rate slightly decreased, but statistically no significant changes during the specific training period. From the findings, of the present study and reviewing the research reports relating to stroke rate, it may be safely concluded that technical ability was improved during the specific training period. The swimmers were able to perform at the same physiological intensity at higher velocities and with lower stoke rate.

23. Stroke Length: The result of the study indicated that stroke length significantly increased during the specific training period. From the findings, of the present study and reviewing the research reports relating to stroke length it may be safely concluded that stroke length efficiency was improved during the specific considerable time of training period.

24. Stroke Index: The result of the study indicated that stroke index significantly increased during the specific training period. From the findings, of the present study and reviewing the research reports relating to stroke index, it may be safely concluded that stroke index efficiency was improved during the specific considerable time of training period

ON CORRELATION STUDY

Swimming performance with motor fitness variables: This study investigated the contribution of selected motor fitness variables to sprint swimming performance in young male swimmers. The main finding of this study was 100m front crawl swimming performance was significantly correlated to muscular strength, muscular strength-endurance, leg explosive strength.

Swimming performance with anthropometric variables: This study investigated the contribution of selected anthropometric variables to sprint swimming performance in young male swimmers. The main finding of this study was 100m front crawl swimming performance was significantly correlated to height, shoulder width, chest circumference and arm span.

Swimming performance with blood lactic acid (BLA): This study investigated the contribution of blood lactic acid to sprint swimming performance in young male swimmers. The main finding of this study was 100m front crawl swimming performance was significantly correlated to 85%, 90%, 95% and 100% of workload.

Swimming performance with performance related variables: This study investigated the contribution of selected performance related variables to sprint swimming performance in young male swimmers. The main finding of this study was 100m front crawl swimming performance was significantly correlated to performance related variables swim velocity, stroke length, stroke index.

Testing of Hypothesis

In hypothesis 1 it is expected that there would be significant improvement on motor fitness variables- muscular strength, muscular strength endurance, flexibility and explosive power of swimmers following specific training.

The findings of the study show that significant improvement on motor fitness variables- muscular strength, muscular strength endurance, flexibility and explosive power of swimmers following specific training. Hence hypothesis 1 is accepted

In hypothesis 2 it is expected that there would be no significant changes on anthropometric measurements and body composition variables- height, weight, shoulder width, chest circumference, arm span, body mass index, percentage of body fat, total body fat and lean body mass of swimmers following specific training.

Therefore, considering all aspects it may safely be concluded that Hypothesis 2 relating to anthropometric measurements and body composition variables is partially accepted. Hypothesis relating to body height, shoulder width, arm span, body mass index and lean body mass accepted. Relating to body weight, chest circumference, percentage of bodyfat and total body fat it is rejected.

In hypothesis 3 it is expected that there would be significant changes on hematological parameters- red blood cell (RBC), white blood cell (WBC), hemoglobin concentration (HGB), platelets (PLT), haematocrit (HCT) of swimmers following specific training.

The findings of the study show that significant changes on hematological parameters - red blood cell (RBC), white blood cell (WBC), hemoglobin concentration (HGB), platelets (PLT), haematocrit (HCT) of swimmers following specific training. Hence hypothesis 4 is accepted.

In hypothesis 4 it is expected that there would be significant changes on blood lactic acid (before and during exercise) of swimmers following specific training.

The findings of the study show that significant changes on blood lactic acid (before and during exercise) of swimmers following specific training. Hence hypothesis 4 is accepted.

In hypothesis 5 it is expected that there would be significant changes on performance related variables- swimming performance, swim velocity, stroke rate, stroke length and stroke index of swimmers following specific training.

Therefore, considering all aspects it may safely be concluded that Hypothesis 5 relating to performance related variables is partially accepted. Hypothesis relating to swimming performance, swim velocity, stroke length and stroke index accepted. Relating to stroke rate it is rejected.

In hypothesis 6 It is hypothesised that swimming performance would be significantly related to selected motor fitness, Anthropometric, Physiological and performance related Parameters respectively.

Therefore, considering all aspects it may safely be concluded that Hypothesis 5 relating to motor fitness, anthropometric, physiological and performance related parameters is partially accepted.

CONCLUSION AND RECOMMENDATION

Conclusions

The present study has its own limitations and considering these aspects following specific conclusions are drawn on the basis of the findings.

On Motor Fitness Variables

1. Following specific training program **Muscular strength** (hand grip muscular strength-Right Hand &Left Hand) improved significantly in young swimmers
2. **Muscular strength-endurance** (arm and shoulder muscular strength-endurance & abdominal strength-endurance) was increased significantly was improved significantly after the specific training period of young swimmers.
3. **Flexibility** (hip-trunk flexibility) was improved significantly after the specific training period of young swimmers.
4. **Leg explosive strength** was improved significantly after the specific training period of young swimmers.

On Anthropometrical Variables

Anthropometric Measurement

5. Influence of training has resulted no significant changed in **body height** in young swimmers.
6. **Body weight** was decreased significantly in swimmers after following specific training.
7. Influence of training has resulted no significant changed in **shoulder width** of young swimmers.
8. Influence of training has resulted significant improved in **chest circumference** of young swimmers.
9. **Arm span** was no significantly improved in the experimental group after specific training program.

Body Composition Dimension

10. Following training, **body mass index** (BMI) was no significant changed in the swimmers after specific training program.
11. Influence of training has resulted significant decreased in **percentage of body fat** of young swimmers.
12. **Total body fat** was decreased significantly after the specific training period of young swimmers
13. **Lean body mass** was no significant changed after the specific training period of young swimmers

Physiological & Biochemical Variables

On Hematological Variables

14. Following specific training program, **Red blood cell count** was significantly increased after twelve weeks and significantly decreased after the end of twenty-four weeks of specific training period.
15. **White blood cell count** was significantly increased after twelve weeks and decreased after the end of twenty-four weeks of specific training period.
16. **Platelets count** was significantly increased after twelve weeks and decreased after the end of twenty-four weeks of specific training period.

17. **Hemoglobin concentration** was significantly increased after twelve weeks and significantly decreased after the end of twenty-four weeks of specific training period.
18. **Hematocrit** was significantly increased after twelve weeks and significantly decreased after the end of twenty-four weeks of specific training period.

On Blood Lactic Acid

19. Following training, **before onset of exercise Blood Lactic Acid accumulation** was decreased significantly after the specific training period of young swimmers
20. Influence of training has resulted significantly decreased in **Blood Lactic Acid accumulation end of 75% Workload** of young swimmers.
21. **Blood Lactic Acid accumulation end of 85% Workload** was decreased significantly after the specific training period of young swimmers.
22. **Blood Lactic Acid accumulation end of 90% Workload** was decreased significantly after the specific training period of young swimmers
23. Influence of training has resulted significantly decreased in BLA end of 95% Workload of young swimmers.
24. **Blood Lactic Acid accumulation end of 100% Workload** was decreased significantly after the specific training period of young swimmers.

On Performance Related Variables

25. With the influence of training, **swimming performance** (100m free-style) was improved significantly after the specific training period of young swimmers.
26. **Swim velocity** was improved significantly after the specific training period of young swimmers.
27. No significant changed was observed in **stroke rate** measure due to specific training of young swimmers.
28. **Stroke length** was improved significantly after the specific training period of young swimmers.
29. **Stroke index** was improved significantly after the specific training period of young swimmers.

On correlation study

Swimming performance with motor fitness variables

30. **Hand grip muscular strength (RH)** was significantly correlated with swimming performance.
31. **Hand grip muscular strength (RH)** was significantly correlated with swimming performance.
32. **Arm and shoulder strength-endurance** was significantly correlated with swimming performance.
33. **Abdominal strength-endurance** was significantly correlated with swimming performance.
34. **Leg explosive strength** was significantly correlated with swimming performance.

Swimming performance with anthropometric variables

35. **Height** was significantly correlated with swimming performance.
36. **Shoulder width** was significantly correlated with swimming performance.
37. **Chest circumference** was significantly correlated with swimming performance
38. 38. **Arm span** was significantly correlated with swimming performance.

Swimming performance with blood lactic acid accumulation (BLA)

39. **BLA end of 85% workload** was significantly correlated with swimming performance.
40. **BLA end of 90% workload** was significantly correlated with swimming performance.
41. **BLA end of 95% workload** was significantly correlated with swimming performance.
42. **BLA end of 100% workload** was significantly correlated with swimming performance.

Swimming performance with performance related variables

43. **Swim velocity** was significantly correlated with swimming performance.
44. **Stroke length** was significantly correlated with swimming performance.
45. **stroke index** was significantly correlated with swimming performance.

RECOMMENDATIONS

In the light of findings of the present study the following recommendations have been drawn for the physical education teacher, sports scientists, coaches, exercise experts, sportspersons research scholar and other peoples.

1. The present research was delimited to young male swimmers, the same type of study may be made with female and senior swimmers also.
2. The present research study refers to the particular sportspersons, so a study may be conducted on the other sportspersons.
3. Along with physical exercise training for enhancement of psyche may be included in the training program and observance of psychological parameters may be made before and after training.
4. In the present study was delimited to selected motor fitness, anthropometrical, physiological and performance related parameters. So, the study may be extent to analyzed the swimmer's other important parameters, which directly related performance.
5. Blood lactic acid level may be measured more scientific instrument fore better result in future study.
6. Correctional study among blood lactic acid, oxygen uptake and heart rate may reveal a true picture of physiological adaptations which was not covered in the present study, may be of immensely useful.
7. The standards of performance differ from place-to-place owing to environment, socio-economic status and emotional conditions, so a study may be conducted on a wider range covering the whole state or county.

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