EFFECT OF CONCURRENT TRAINING AND SELECTED NUTRITIONAL DESIGN ON SELECTED PHYSICAL FITNESS COMPONENETS: THE CASE OF MALE FOOTBALL PLAYERS OF NEKEMTE KENEMA B GROUP, ETHIOPIA

MSc. THESIS

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Effect of Concurrent Training and Selected Nutritional Design on Selected Physical Fitness componenets: The Case of Male Football Players of Nekemte Kenema B Group, Ethiopia

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DEDICATION

This thesis manuscript is dedicated to my lovely mother.

STATEMENT OF THE AUTHOR

I, the under signed declare that this thesis is the result of my own work, all sources and materials used for this thesis have been appropriately acknowledged. This thesis is submitted in partial fulfillment of the requirement for degree of MSc in Sport Nutrition at Haramaya University. I confidently declare that this thesis has not been submitted by any scholar to any other institutions or University for the award of any academic degree, diploma, or certificate.

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BIOGRAPHICAL SKETCH

The Author was born in North Shoa, Gohatsion Town in Augast 08, 1995 from her father Belay Abebe and her mother Gadise Tolesa. She attended her Elementary Education at Mojo Primary School and her Secondary and Preparatory School at Gohatsion General Secondary and Preparatory schools.

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ACRONYMS AND ABBREVIATIONS

ACSM	American College of Sport Medicine
BC	Body Composition
BF	Body fat
BMI	Body Mass Index
CDER	Concurrent Distinict Endurance Resisitance
CG	Control Group
CPER	Concurrent Parallel Endurance Resistance
CT	Concurrent Training
EG	Experimental Group
FFM	Fat Free Mass
FIFA	Federation International Football Association
FM	Fat Mass
HIIT	High Intensity Interval Training
MD	Mean Difference
PoT	Post Test
PT	Pre Test
RT	Resistance Training
SMM	Skeletal Muscle Mass
SPSS	Staticall Package for Social Sciences
Vo_2max	Maximum Oxygen Intake

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ABSTRACT

The purpose of the present study was to find out the effect of ''Concurrent Training combined with Selected Nutritional Design on Selected Physical Fitness componenets of Male Football Players of Nekemte Kenema B Group''. To achieve the purpose of this study, 28 male football players of Nekemte kemena were selected by using census sampling technique and their age ranged from 20 to 24. The subjects were underwent twelve weeks of concurrent training combined with selected nutritional design for three days per week with duration of 70 minutes. Subjects of were tested on selected criterion measures namely, selected componenets of physical fitness tests like explosive strength (vertical jump test), endurance (12 min cooper test) and body composition (BMI) variables prior to and after the 12 weeks consmuption of nutrional design combined with training period. The data collected from the participants pre and post-test were statistically examined to find out the significant improvement by using SPSS version 20, descriptive and paired t-test. In all cases, the criteria for statistical significance were set at (P≤0.05). The results showed that there was significant improvement on the selected physical fitness componenets; explosive strength (power), endurance and body composition variables of male subjects. The differences recorded for the performance characteristics of selected componenets of physical fitness showed better improvements on vertical jump, Vo_2max and BMI. It was concluded that concurrent training combined with nutritional design of 12 weeks for male football players of Nekemte kenema achieved better fitness performance on selected componenets of physical fitness.

Key words: Concurrent training, Nutrition, Endurance, Body composition

1. INTRODUCTION

1.1. Background of the Study

Football is the most popular sport in the world. The basic skills of a footballer are running, passing, dribbling and shooting. Since the football match lasts 90 minutes, the footballer must have good endurance skills. power and speed are important features without forgetting self confidence (Eskola *et al.,* 2003).

Nutrition, physical performance and the level of functional capacity of the human beings are interrelated. Any dietary deficiency that adversely affects the health of the individual is likely to impair his or her physical performance capacity. Thus, nutrition and wellbeing plays a vital role in the field of sports and overall performance of an athlete. Different sports involve different levels of exercise sessions and a balanced diet to have an overall good fitness status. It has been supported by various researches that good nutrition has a very important role in maintaining good health and fitness of the sportsperson so that they can train and compete well (Ackland *et al.*, 2012).

Concurrent Training (CT) is the combination of resistance and endurance training in a periodized program to maximize all aspects of physical performance. Unless an athlete is in a pure-power sport like olympic weightlifting, or a pure-endurance sport like long distance cycling; a combination of both power-related and endurance-related attributes are required to excel in mixed-type sports. Boxing, basketball, soccer, hockey and many other team-based sports fall under this category (Geoff, 2017).

For an elite soccer player, it is very important to provide adequate energy to meet the challenges of high-intensity, intermittent exercise. Achieving the highest performance during training and competition, improving and accelerating recovery, achieving and maintaining an optimal body weight and physical condition, and minimizing the risk of injury and illness are key issues in contemporary elite soccer (Strudwick *et al.*, 2016).

Explosive strength (power) refers to an individual’s ability to exert a maximal amount of force in the shortest possible time interval.Example, a sprinter forcefully driving into the starting blocks, a high-jumper propelling himself off of the ground, a football player

exploding off the line, or a weight lifter squatting a near maximal load. While each of these movements is markedly different from one another, both in form and speed of movement, they all require explosive strength (Jordan, 2012).

Endurance training is the act of exercising to increase endurance. The term endurance training generally refers to training the aerobic system as opposed to the anaerobic system. The need for endurance in sports is often predicated as the need of cardiovascular and simple muscular endurance, but the issue of endurance is far more complex (Michael, 2008).

Athletes performing various sports may require minimum or more percent body fat depending on the duration of their training. Strength and agility which are necessary for optimal performance are greatly affected by body composition. Body weight greatly influencies the speed, endurance and power of athletes (Ackland *et al*., 2012)

Nutritional design for football player is very important to provide adequate energy to meet the challenges of high-intensity, intermittent exercise. Several studies have estimated and measured total energy expenditure in football (osgnach *et al*., 2010). Mean energy expenditure (above rest) for a match has been estimated to be approximately 3000 to 3600 kcal per day were estimated for daily training (Rico-Sanz 2000).

1.2. Statements of the Problem

Concurrent resistance and endurance training programs have received much attention as a form of training. Several studies have shown that concurrent training (resistance and endurance training in the same session or program) interferes with the development of muscle strength or power (Chtara *et al.,* 2008). Additionally, sports medicine and exercises science organisations, including the American College of Sports Medicine (ACSM) (Riebe, 2014), recommend concurrent training in order to maximize the benefits of exercise at all levels. On the other hand, compatibility of resistance and endurance training, do not show any reduction in strength adaptations after concurrent strength and aerobic endurance training (Izquierdo *et al.,* 2004; Izquierdo *et al.,* 2005; Glowacki *et al.,* 2004; Balabinis *et al.,* 2003).

Moreover, some studies have shown that the effects of a concurrent training type with regard to whether it is performed on the same day or on the alternate days each week (Bell *et al.,* 2004; Glowacki *et al.,* 2004), but the results were controversial and less conclusive. However, the difference in training methods as the difference in concurrent training order may explain, in part, these discrepancies in previous studies.

No research has been conducted on the effect of concurrent training combined with nutritional design on some physical fitness componenets in Ethiopia specifically on Nekemt kenema B Group male football players. Therefore, the aim of the current study was to investigate the effect of concurrent training and nutritional design on some physical fitness componenets of Nekemte Kenema male football players and to understand the importance of concurrent training with nutritional design on some selected components of physical fitness.

Research Hypothesis:

H1: Concurrent training combined with selected nutritional design would have significant effect on body composition of male football players.

H1: Concurrent training combined with selected nutritional design would have significant effect on explosive strength of male football players.

H1: Concurrent training combined with selected nutritional design would have significant effect on endurance performance of male football player.

1.3. Scope of the Study

- The study was conducted on Nekemt Kenema male football players with the aim of examining effect of concurrent training combined with nutritional design on some physical fitness componenets of male football players.
- The ages of the subjects were ranged between 20-24 years old.
- This study was also focus on the following independent and dependent variables;

A. Independent variables; Concurrent training and selected nutritional design

B. Dependent variables; Body composition, Power (explosive strength) and Endurance

- The duration of treatment was also delimited to 12 (twelve) weeks only.

1.4. Significance of the Study

The findings of this study would significant in the following ways:

1. This study would help to improve the selected physical fitness components of male football players as a result of concurrent training combined with nutritional design.
2. The findings of the study would help the individuals to compare and contrast the changes that occur in the selected physical fitness components of male football players before and after the training.
3. This study would provide scientific base and guidance to the physical educationist, teachers, coaches , and students regarding the concurrent training and nutritional design.
4. On the other hand, the study was show singnificance result the subjects was use concurrent training combined with selected nutritional design to improve their selected physical fitness componenets,on this study the result was significant.
5. The present study would give some more basic knowledge to the sports professionals to conduct related research by including other variables, duration of training, gender and age groups.

1.5. Objective of the Study

1.5.1. General Objective

The general objective of this study was to investigate the effect of concurrent training combined with nutritional design on selected physical fitness componenets of football players.

1.5.2. Specific Objectives

1. To investigate the effect of concurrent training combined with selected nutritional design on body composition of Nekemte Kenema B Group male football players.
2. To compare the effect of concurrent training combined with selected nutritional design on explosive strength of Nekemte kenema B Group male football players.

3. To compare the effect of concurrent training combined with selected nutritional design on endurance performance of Nekemte Kenema B Group male football players.

1.6. Definition of the Terms

Concurrent Training (CT):is defined as the combination of resistance and endurance training in a periodized program (Geoff, 2017).

Endurance: refers to the ability of a given muscle to exert force, consistently and repetitively, over a period of time (Daniel, 2017).

Explosive Strength: is the ability to exert maximal force in minimal time (Louie, 2017).

Nutritional Science: studies how the body breaks food down (catabolism) and how it repairs and creates cells and tissue (anabolism) (Christian, 2017).

Physical Fitness: is a state of health and well-being and, more specifically, the ability to perform aspects of sports, occupations and daily activities (Tremblay *et al*., 2010).

2. REVIEW OF RELATED LITERATURE

2. 1. Football

Football is one of the most popular and a played sport in the world and it has reached almost all the countries on earth. According to the statistic provided by FIFA with the data 270 million people are active worldwide in football. Football requires training which puts stress on both the anaerobic and aerobic energy systems (Morgans *et al*., 2014). Many factors such as technical, tactical and physiological areas affect the performance of athletes in soccer (Masieri, 2018) and even if not considered a science, but following certain method of training may help to improve performance of players and hence increase the efficiency of the whole team.

2.2. Nutrition

Nutrition is extremely important factor for success of competitive power and strength athletes (Slater and Phillips, 2011). Athletes with result oriented mindset need to focus on content, timing, and amount of food. Besides to training, high quality nutrition is essential for athletes' performance and recovery (Ilander 2014). ACSM (2016) stated that energy intake and energy expenditure of the exercise (energy availability) create the most important basis for successful sports nutrition and health maintenance design.

Many aspects contribute to achieve better results in sport, and hence in soccer, nutrition is one of these (Maughan and Shirreffs, 2007). Soccer players face high calorie expenditure during a ninety-minute game, which can be estimate between 1500 to 2000 calories as stated). Several studies show the effect of energy substrate utilization on physical performance of athletes during training and games (Bangsbo *et al.*, 2006).

2.3. Nutrition Considerations for Adolescent Athletes

Nutrition plays a significant role in the performance of athletes. In (2009), a comprehensive review of nutrition and athletic performance was published by three governing organizations related to the field of nutrition. Their position on nutrition and athletic performance is stated as follows: "It is the position of the Academy of Nutrition and

Dietetics, Dietitians of Canada, and the American College of Sports Medicine that physical activity, athletic performance, and recovery from exercise are enhanced by optimal nutrition. These organizations recommend appropriate selection of foods and fluids, timing of intake, and supplement choices for optimal health and exercise performance" (Rodriguez *et al.,* 2009).

2.4. The Role of Nutrition and Exercise Induced Adaptation on concurrent training

2.4.1. Resistance-training

Resistance-training stimulates myofibrillar protein synthesis and breakdown, the balance of which determines the degree of muscle hypertrophy. Appropriate nutritional strategies can have a synergistic effect upon intramuscular processes associated with muscle adaptation (Tipton and Witard, 2007).

Consumption of this same protein and carbohydrate supplement immediately before exercise also increased amino acid delivery to the muscle and improve net muscle protein balance. These findings (amongst others) highlight that the timing of carbohydrate and protein intake can influence the intramuscular events responsible for muscle adaptation (Hawley and Burke, 2010).

2.4.2. Endurance-training

Investigations have shown that increasing carbohydrate intake prior to an endurance event can enhance performance of prolonged events (>1hr) such as cycling, distance running and football (Karlsson and Saltin, 1971). Therefore, when training for sports in which carbohydrate is the most heavily metabolized fuel, it is recommended that athletes should consume a diet rich in carbohydrate.Carbohydrate supplementation before, during, and after a training bout can attenuate the rate of muscle glycogen depletion during exercise and speed the rate of glycogen resynthesis after exercise (Jeukendrup, 2004).

2.4.3. Concurrent Endurance and Strength-Training

When developing several physical and fitness attributes, athletes ideally use a periodised approach to training allowing sequential development of the fitness requirements (Bompa and Haff, 2009). However, time constraints and demands of competitive schedules mean a periodised approach is not always possible. Consequently, athletes are often required to train different physiological systems simultaneously, during the same training cycle. This approach is particularly true for the development of strength and endurance, dictating the inclusion of both strength and endurance training methods within the training regime.

Additionally, sports medicine and exercises science organisations, including the American College of Sports Medicine (ACSM) (Riebe, 2014), recommend concurrent training in order to maximize the benefits of exercise at all levels. Despite delivering scientifically based standards on exercise prescription, the organization fails to consider the possibility of a negative interaction between strength and endurance training, which could lead to compromises in program outcomes.

Elite athletes are typically required to train multiple times each day. These training sessions can have diverse mechanical demands (e.g. resistance-training and endurance-training) and therefore can lead to significant metabolic stress on the body. In 2000 Greg and his co-workers highlighted the importance of nutritional strategies when multiple training sessions are performed on the same day (Goto *et al.*, 2007).

2.4.4. Effect of Concurrent Training on Body Composition

The high prevalence of overweight and obesity in developing countries are a result of continued changes to lifestyle patterns, such as diet and physical activity, leading to an accelerated increase in overweight, obesity, and related chronic diseases in many countries. (García *et al.*, 2017) This study aimed to analyze the effect of 12-week low-volume high intensity interval training (HIIT) based concurrent training program on body composition, upper and lower body muscle strength, mobility, and balance in older adults, as well as to compare it with a low-moderate–intensity continuous training. Body composition and physical functioning were assessed before (pretest) and after (posttest) a 12-week intervention.

A two way repeated measures analysis of variance was used to test for an interaction between training program and groups. This HIIT-based concurrent training program led to greater improvements in body composition, muscle strength, mobility, and balance in healthy older people than a regular low-moderate– intensity continuous training, despite the reduction in overall training volume.

study was designed to determine the changes in body composition, Body Weight (BW), Fat Mass (FM), Body Fat Percentage (BF%) and, Skeletal Muscle Mass (SMM) of High Intensity Interval Training (HIIT) and Concurrent Training (CT), comparing them to a Control Group (CG) for four months of intervention in overweight and obese women.67 obese and overweight women were randomly assigned to three groups.

Before and after 16 weeks of HIIT (intervals at ≥ 80% Maximal Heart Rate) and CT (strength training, 65%-75% 1RM + endurance training, 60%-80% Maximal Heart Rate), participants underwent Dual-Energy X-Ray Densitometry (DEXA). Findings show improvements of body composition in overweight and obese women. In this context, although the results were not highly marked, CT seems to be a better approach for the prevention and management of the women overweight and obesity than HIIT (Jorge *et al.*, 2017**)**.

Study evaluated the effect of concurrent resistance and endurance training on body composition, aerobic power and muscular endurance in college students and compared the two concurrent exercise protocols. Forty-two male students (22.02±1.91 years of age) were divided into three groups: Concurrent Distinct Endurance-Resistance (CDER), Concurrent Parallel Endurance-Resistance (CPER) and No Training controls (C). The subjects performed two training protocols per week for 12 weeks. In CDER group, resistance training and endurance training were performed on different days each week (two and two days per week). CPER group performed endurance and resistance training two days per week (Hamid *et al.*, 2011**)**.

After a 12-week training period, fat-free mass, muscular strength squat and bench press (kg), muscular endurance pull-ups and sit-ups (numbers), aerobic power, flexibility and

Sargent jump height increased similarly in both experimental groups (CDER and CPER). Also, decreases in body fat percentage, mean time in 60 m running and agility occurred in CDER and CPER. A significant difference in body fat percentage was seen in CPER when compared to CDER and C. Body mass increased significantly in CPER when compared to CDER and C. Although body mass increased only after the CPER protocol application, it can be concluded that both CDER and CPER protocols were similarly effective in positive transformation of body composition, aerobic power and muscular endurance.

2.4.5. Effects of Concurrent Training on Explosive strength

study was compare the effects of an 8-weeks training period of resistance training alone (GR), combined resistance and endurance training (GCON) and a control group (GC) on explosive strength and VO2max in a large sample of prepubescent boys and girls. 125 healthy were assigned into 2 training groups to train twice a week for 8 weeks: GR (19 boys, 22 girls), GCON (21 boys, 24 girls) and a control group (GC: 18 boys, 21 girls; no training program). A significant but medium-sized increase from pre- to the post-training in the vertical jump.Concurrent training is equally effective on training-induced explosive strength, and more efficient than resistance training only for VO2max, in prepubescent boys and girls. This should be taken into consideration in order to optimize strength training school-based programs (Marta *et al.*, 2013).

Evidence suggests that the interference of strength and aerobic training order over an 8-week period on explosive skills and maximal oxygen uptake (VO2max) in prepubescent children. One hundred and twenty-eight prepubescent children aged 10-11 years (10.9±0.5 years) were randomly selected and assigned to one of the three groups: intrasession concurrent aerobic prior to (GAS: n=39) or after strength training (GSA: n=45) or control group (GC: n=44; no training program). The GC maintained their baseline level performance, and training-induced differences were found in the experimental groups.

All programs were effective, but GSA produced better results than GAS for muscle strength variables, and GAS produced better results than GSA for aerobic capacity variables. The present study explored an unknown issue and added useful information to the literature in this area. These training methods should be taken into consideration to optimize explosive

strength and cardiorespiratory fitness training in school-based programs and sports club programs (Alves *et al.*, 2016).

Paper affords an update review over the state of art regarding the importance of physical fitness and the significance of different combination approaches between resistance and aerobic training, as well as conditioning methods exercise alone on physical fitness improvements, specifically explosive strength and cardiorespiratory fitness in prepubertal children. The main research conclusions can be summarized as: i) Resistance training can be reliable to improve muscle strength in prepubertal children; ii) In adolescents, concurrent resistance and aerobic training is equally effective to improve explosive strength compared to resistance training alone, and more efficient in aerobic capacity than resistance training alone; iii) Performing aerobic prior to resistance training produces endurance gains, while performing resistance prior to aerobic training appears to be more adequate to obtain strength improvements (Alves, *et al.*, 2018).

2.4.6. Effects of Concurrent Training on VO_2 max

Petré *et al*., 2018The effects of concurrent strength and endurance training have been well studied in untrained and moderately-trained individuals. However, studies examining these effects in individuals with a long history of resistance training (RT) are lacking. Additionally, few studies have examined how strength and power are affected when different types of endurance training are added to an RT protocol. The purpose of the present study was to compare the effects of concurrent training incorporating either low-volume, high-intensity interval training (HIIT, 8-24 Tabata intervals at ~150% of VO2max) or high-volume, medium-intensity continuous endurance training (CT, 40-80 min at 70% of VO2max), on the strength and power of highly-trained individuals.

However, aerobic power ($_{VO2\ max}$) only improved after RT + HIIT (4 ± 3%, $p < 0.01$). We conclude that strength gains can be obtained after RT + CT and RT + HIIT in athletes with a prior history of RT. This indicates that the volume and/or intensity of the endurance training does not influence the magnitude of strength improvements during short periods of concurrent training, at least for highly-trained individuals when the endurance training is

performed after RT. However, since VO_2 max improved only after RT + HIIT and this is a time efficient protocol, we recommend this type of concurrent endurance training.

The earlier study suggested whether concurrent sprint interval and strength training (CT) would result in compromised strength development when compared to strength training (ST) alone. In addition, maximal oxygen consumption ($_{VOmax}$) and time to exhaustion (TTE) were measured to determine if sprint interval training (SIT) would augment aerobic performance. Fourteen recreationally active men completed the study. ST (n = 7) was performed 2 days/week and CT (n = 7) was performed 4 days/week for 12 weeks. CT was separated by 24 h to reduce the influence of acute fatigue. Body composition was analyzed pre- and post-intervention. Anaerobic power, one-repetition maximum (1RM) lower- and upper-body strength, VO_2 max and TTE were analyzed pre-, mid-, and post-training.

Training intensity for ST was set at 85 % 1RM and SIT trained using a modified Wingate protocol, adjusted to 20 s. Upper- and lower-body strength improved significantly after training ($p < 0.001$) with no difference between the groups ($p > 0.05$). VO2max increased) for CT, whereas ST remained unchanged. A significant difference in VO2max ($p < 0.05$) was observed between groups post-intervention (CT: 42.3 ± 7.1 vs. ST: 36.0 ± 3.0 ml/kg/min). Preliminary findings suggest that performing concurrent sprint interval and strength training does not attenuate the strength response when compared to ST alone, while also improves aerobic performance measures, such as Vo_2max at the same time(Cantrell *et al.*, 2014).

3. MATERIALS AND METHODS

3.1. Description of the Study Area

The study was conducted at Nekemte town wich is located in East Wellega Zone of the Oromia regional state. It has a latitude and longitude of 9°5′N 36°33′E and an elevation of 2,088 meters. Nekemte is found at East wollega Zone wich is located in south western Ethio -pia and found at adistance of 332 Km away from Addis Ababa, the capital city of Ethiopia (CSA, 2007).

3.2. Research Design

This study was use quasi-experimental design. The pretest-posttest enables the researcher to examine the effect of concurrent training combined with selected nutritional design on physical fitness components of Nekemte Kenema B Group football players. The players were consume selected nutritional combined with concurrent training in twelve weeks.

3.3. Sources of Data

The primary sources of data was collected by collecting data through the experimental process (recording pretest and post test result) on selected physical fitness componenets of football players of Nekemte kenema.

3.4. Study Population

The study population was all Nekemt kenema B Group male football players. (The Total numbers of Nekemte kenema male Football players were 28).

3.5. Sample and Sampling Technique

The sample of the current study was all Twenty eight (28) football players of Nekemte kenema and the subjects was selected by using census sampling technique.

3.6. Inclusion and Exclusion Criteria

The subject that included in the study were all of (28) football players with the age of (20-24) Nekemete kenema football club. All of male football players included as the study population and female football players, coach and assistant coach were excluded from experimental trial.

3.7. Method and Procedure of Data Collection

3.7.1. Method of Data Collection

Quantitative data were collected through the appropriate physical fitness test measures before and after giving concurrent training combined with nutritional design for 12 consecutively weeks to male football players of Nekemte kenema B Group. The training program given for 12 weeks, 3 days per week and duration of training was 70 minutes per days and designed nutrition was given for 12 weeks. Endurance measured by cooper 12 min run, explosive strength by vertical jump and body composition measured by body mass index. The data recorded by the investigator with the help of assistant data recorder.

3.7.2. Procedure of Data Collection

The ethical clearance was obtained from concerning body and meet the participants of the study, during the familiarization session, participanst was informed of all procedures and familiarized with physical fitness components measures to reduce the possibility of a learning effect. Next to these Subjects were instructed to give additional knowledge on sport nutrition by preparing lecturer notes and advices participants as to have take selected nutrition with concurrent training. Then, concurrent training combined with selected nutritional design was consumed during treatment period of twelve (12) weeks. At the beginning of each period sample perform the pretest to find out their level of selected physical fitness components, also at the end of the intervention period sample done the posttest to figure out the effect of the treatment.

3.7.2.1. Explosive Strength (Vertical Jump Test)

1. Purpose: to measure the leg muscle power
2. Equipment: measuring tape or marked wall, chalk for marking wall (or Vertec or jump mat**).**
3. Procedure: stands side on to a wall and reaches up with the hand closest to the wall keeping the feet flat on the ground, the point of the fingertips is marked or recorded. Make note of how high the subjects can reach. This is called the standing reach height. Then stand a little away from the wall, and jump high as possible using both arms and legs to assist in projecting the body upwards.
4. Attempt to touch the wall at the highest point of the jump. Make note of where touched the wall at the height of the jump. Measure the distance between the standing reach height and the maximum jump height, and that is your result (Robert, 2008).

3.7.2.2. Tests for Endurance (12 min run)

The 12 minute run is a popular maximal running test of aerobic fitness, in which participants try and cover as much distance as they can in 12 minutes.

1. Purpose: to test aerobic fitness (the ability of the body to use oxygen to power it while running)

2. Equipment required: flat oval or running track, marker cones, recording sheets, stop watch.

3. Pre-test: Explain the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender, test conditions.

4. Procedure: Place markers at set intervals around the track to aid in measuring the completed distance. Participants run for 12 minutes, and the total distance covered is recorded. Walking is allowed, though the participants must be encouraged to push themselves as hard as they can to maximize the distance covered (Robert, 2008).

1.7.2.3. Tests for Body Composition (BMI or Body Mass Index)

1. BMI: - It is a measure of body composition.
2. BMI is calculated by taking a person's weight and dividing by their height squared.
3. Equipment: scales and stadiometer as for weight and height.
4. Procedure: BMI is calculated from body mass (M) and height (H). BMI = M / (H x H) ^{2}, where M = body mass in kilograms and H = height in meters.
5. The higher the score usually indicating higher levels of body fat (Ode, 2007).

3.8. Method of Data Analysis

The data collected on pre- test and post- test from the subjects were analyzed by using paired T- test by and SPSS version 20.0 software at level of significance $p \leq 0.05$.

3.9. Data Quality Control

To ensure quality of the data and avoid mistakes, results was assessed and recorded by the researcher himself with the assistant data collectors by using standard fitness test materials.

4. RESULT AND DISCUSSION

4.1. Demographic characteristic of the study subjects

A total number of 28 male foot ball players of Nekemte kenema B Group were selected as study subjects. Age 21.3±1.07years, height 1.65±.05 in meter, weight 59.55±5.01 in kilogram. All 28 study subjects of participants were participated from initial till end.

4.2. Explosive strength

TABLE 4.1: Descriptive mean and standard deviation values of explosive strength results of the subjects.

Variable	N	Test	POT	Std. deviation
Vertical jump(cm)	28	Pretest	37.28	2.507
		posttest	42.5±2.47	2.47

Value in the form of mean ± SD, PT=pretest, POT=post-test

Table 4.1 shows that the pretest means value and standard deviations of the subjects on explosive strength were 37.28±2.507 whereas, post-test mean and standard deviations was 42.5±2.47 with the mean value difference was considered statically significant at $p \leq 0.05$.
To find out the means difference, the paired t-test was applied and the results are presented in table 4.2.

TABLE 4.2: **The Mean Difference Values and Significance Levels of Pre and Post Test result of subject on explosive strength variable.**

Explosive strength	Paired Differences				t	Df	Sig. (2-tailed)
	MD	Std. Deviation	95% Confidence Interval of the Difference				
			Lower	Upper			
Pretest – Posttest	5.21	2.33	-6.118	-4.31	11.83	27	.000

*df- degree of freedom, * Significant at 0.05 level of significance, t-value needed for significance at 0.05 level of significance = df (1, 27) = 1.314*

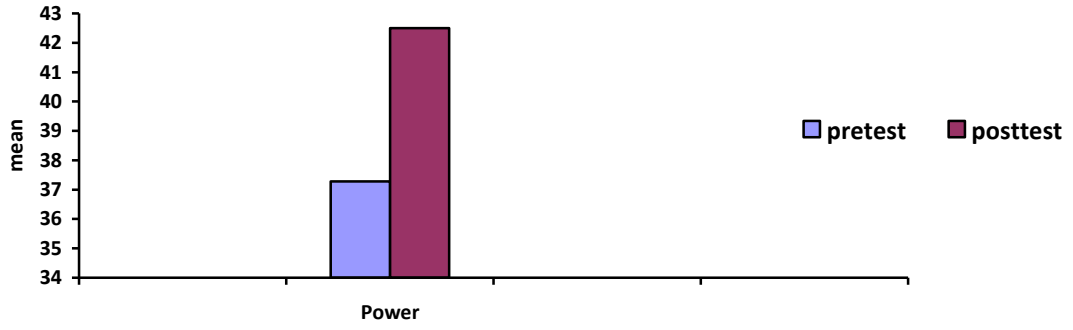
From the table 4.2 it is clear that the t-value applied to the pre-test means was 11.83 which was greater than the required table value of 1.314 for significant at 0.05 level of confidence with the degrees of freedom 1 and 27. As the above table shows the pre-test and post-test mean difference of the subjects on explosive strength were 5.12 respectively which was greater than the confidence interval level of 0.00 at 0.05 level of confidence. It indicates that, a significant difference was existed among the pretest and posttest on the lower body explosive strength (power). The findings of the current study shows that there was statically significant improvement on explosive strength of Nekemte kenema B group Football players from pretest to postets (MD=5.21) due to 12 weeks concurrent training combined with nutritional design.

This finding directly inline with the pervious finding of (Marta *et al.,* 2013) who compare the effects of an 8-weeks training period of resistance training alone (GR), combined resistance and endurance training (GCON) and a control group (GC) on explosive strength and VO2max in a large sample of prepubescent boys and girls. A significant but medium-sized increase from pre- to the post-training in the vertical jump (Effect size=0.22, F=34.44, $p<0.01$) and VO_2 max (Effect size=0.19, F=32.89, $p<0.01$) was observed. Concurrent training is equally effective on training-induced explosive strength, and more efficient than resistance training only for VO_2 max, in prepubescent boys and girls.

The findings of current study also agree with the reports of (Alves, *et al.*, 2018) whos' paper affords an update review over the state of art regarding the importance of physical fitness and the significance of different combination approaches between resistance and aerobic training. In adolescents, concurrent resistance and aerobic training is equally effective to improve explosive strength compared to resistance training alone, and more efficient in aerobic capacity than resistance training alone.

Nader, 2006 Similarly to the endurance training, these specific latter studies demonstrate that effective improvements in explosive strength can be obtained in young elite soccer players by increasing the workload when the training focuses only on one exercise type and is performed in a short-term period. As explained above, the main issue is optimizing the dose-response relationship when more exercise types (explosive strength, endurance, and technical-tactical exercises) are involved in the training over a longer period of time (soccer season). In addition, during concurrent training, the antagonistic intracellular signaling mechanisms could determine the inhibition of strength improvements (inhibition of muscle hypertrophy) when the strength and endurance variables are stimulated simultaneously in a training schedule.

Figure 1. Showing the mean comparison of explosive strength results of the Study subjects pre and posttest.



The above figure clearly showed that there was a significant difference observed between pretest and post test results on the experimental group in explosive strength of the study subjects.

4.4. Vo_2max

TABLE 4.3: Descriptive Mean and Standard Deviation Values on Vo_2 max Results of The Subjects.

Variables	N	Test	Mean	Std. Deviation
Vo_2 max	28	Pre-test	44.28	2.93
		Post- test	49.09	2.98

Table 4.3 shows that the pre-test means value and standard deviations of the subjects on Vo2max were 44.28 ±2.93 were as, post-test mean and standard deviations were 49.09±2.98 respectively with the mean value difference were considered statically significant at $p \leq 0.05$. To find out the means difference, the paired t-test was applied and the results were presented on table 4.4.

TABLE 4.4: The Mean Difference Values and Significance Levels of Pre and Post Test Result of Subject on Vo2max Variable.

Vo2max	Paired Differences				t	Df	Sig. (2-tailed)
	MD	Std. Deviation	95% Confidence Interval of the Difference				
			Lower	Upper			
Pretest – Posttest	4.81	3.51	-7.14	-4.44	8.75	27	.000

*df- degree of freedom, * Significant at 0.05 level of significance, t-value needed for significance at 0.05 level of significance = df (1, 27) = 1.314*

From the table 4.4 it was clear that the t-value applied to the pre-test means was 8.75 which were greater than the required table value of 1.314 for significant at 0.05 level of confidence with the degrees of freedom 1 and 27.

As the above table shows the pre-test and post-test mean difference of the subjects on Vo $_2$max were 4.81 respectively which were greater than the confidence interval level of 0.00 at 0.05 level of confidence. It indicates that, significant differences were existed among the pretest and posttest on cardio vascular endurance. The findings of the current study shows that there was statically significant improvement on Vo_2 max of Nekemte kenema B group Football players from pretest to postets (MD=4.81) due to 12 weeks concurrent training combined with nutritional design.

The findings of the current study are inline with the findings of (Petré *et al*., 2018) who studied on effects of concurrent strength and endurance training has in untrained and moderately-trained individuals. However, studies examining these effects in individuals with a long history of resistance training (RT) are lacking. Additionally, few studies have examined how strength and power are affected when different types of endurance training are added to an RT protocol. aerobic power (VO_2 max) only improved after RT + HIIT (4 ± 3%, $p < 0.01$). However, since VO_2 max improved only after RT + HIIT and this is a time efficient protocol, we recommend this type of concurrent endurance training. The findings of the current study also agree with the findings.

Cantrell *et al.,* 2014 who examined whether concurrent sprint interval and strength training (CT) would result in compromised strength development when compared to strength training (ST) alone. In addition, maximal oxygen consumption (VO_2 max) and time to exhaustion (TTE) were measured to determine if sprint interval training (SIT) would augment aerobic performance. Anaerobic power, one-repetition maximum (1RM) lower- and upper-body strength, VO_2 max and TTE were analyzed pre-, mid-, and post-training.VO_2 max increased 40.9 ± 8.4 to 42.3 ± 7.1 ml/kg/min ($p < 0.05$) for CT, whereas ST remained unchanged. A significant difference in VO2max ($p < 0.05$) was observed between groups post-intervention (CT: 42.3 ± 7.1 vs. ST: 36.0 ± 3.0 ml/kg/min). Preliminary findings suggest that performing concurrent sprint interval and strength improves aerobic performance measures, such as VO_2max at the same time.

Whilst the above mentioned training principles are employed for both endurance and strength training regimes, the physiological adaptations for both are notably different due

To differences in the application of programm design variables (Dudley and Fleck, 1987). Endurance training programmes such as those used for running or cycling typically involve the performance of high-repetition, low-resistance exercise continuously over long periods of time (e.g. 1-2 hours) (Dudley and Fleck, 1987). The intention of this type of training is to increase aerobic capacity (maximal oxygen uptake (VO_2 max), efficiency and economy) through physiological changes including increased muscle capillary and mitochondrial density and enzyme activity in the respiratory pathway. This would suggest that long-term concurrent training may interfere with hypertrophic adaptations through a decreased ribosomal biogenesis and thus, decreased translational capacity (Kraemer, *et al.,* 2000).

Wilson and colleagues, 2012 was reported that the total training volume (i.e. duration and frequency) of endurance training in a concurrent training protocol negatively correlates with hypertrophic and strength adaptations. Research suggests that, in order to maximize adaptations to resistance exercise training, no more than two aerobic exercise sessions should be conducted each week (Jones *et al.*, 2013).

Figure 2. Showing the mean comparison of Vo_2 max results of the Study subjects pre and posttests.

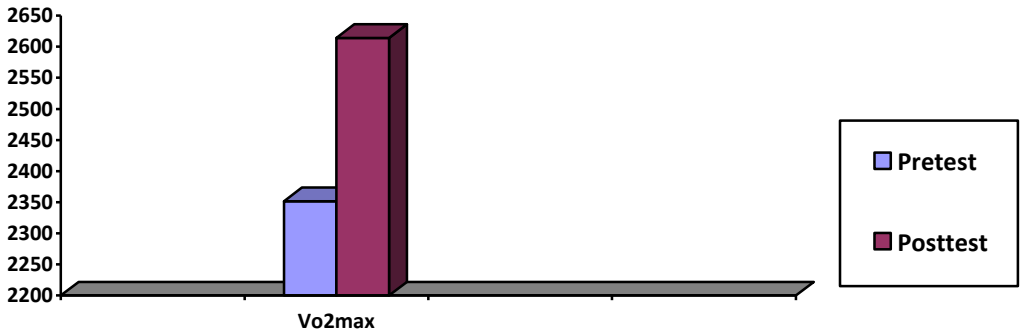


Figure 2. Showed that as there was a significant difference observed between pretest and post test results on Vo_2 max of the study subjects. The subjects were showed statically significant difference from pre to post test result.

4.5. BMI

TABLE 4.5: Descriptive Mean and Standard Deviation Values on BMI Results of the Subjects.

Variables	N	Test	Mean	Std. Deviation
Body Mass Index	28	Pre-test	20.72	0.750
		Post- test	23.20	0.813

Table 4.5 shows that the pre-test means value and standard deviations of the subjects on BMI were 20.72±0.750 were as, post-test mean and standard deviations were 23.20±.813 respectively with the mean value difference were considered statically significant at $p \leq 0.05$. To find out the means difference, the paired t-test was applied and the results are presented in table 4.6.

TABLE 4.6: The Mean Difference Values and Significance Levels of Pre and Post Test Result of Subject on BMI Variable.

BMI	Paired Differences				t	df	Sig. (2-tailed)
	MD	Std. Deviation	95% Confidence Interval of the Difference				
			Lower	Upper			
Pretest – Posttest	2.478	0.417	-2.64	-2.315	31.43	27	.000

*df- degree of freedom, * Significant at 0.05 level of significance, t-value needed for significance at 0.05 level of significance = df (1, 27) = 1.314*

From the table 4.6 it is clear that the t-value applied to the pre-test means was 31.43 which were greater than the required table value of 1.314 for significant at 0.05 level of confidence with the degrees of freedom 1 and 27. As the above table shows the pre-test and post-test mean difference of the subjects on BMI were 2.478 respectively which were greater than the

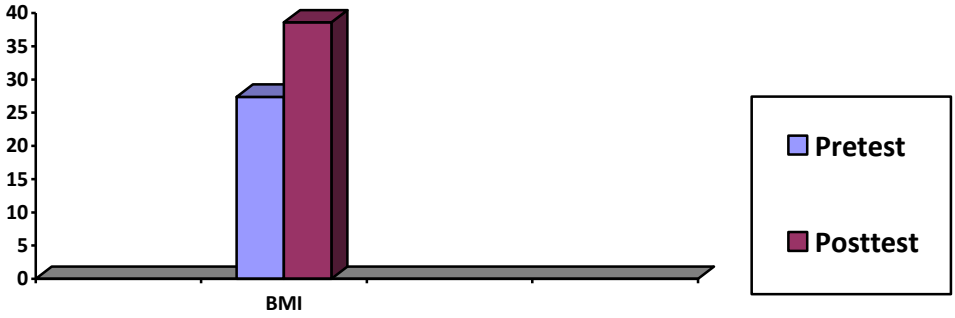
confidence interval level of 0.00 at 0.05 level of confidence. It indicates that, significant differences were existed among the pretest and posttest on BMI. The findings of the current study shows that there was statically significant improvement on BMI of Nekemte kenema B group Football Club from pretest to postets (MD=2.478) due to 12 weeks concurrent training combined with nutritional design.

The findings of the current study agree with the findings of (Hamid *et al.,* 2011) who evaluated the effect of concurrent resistance and endurance training on body composition, aerobic power and muscular endurance in college students. Concurrent Distinct Endurance-Resistance (CDER), Concurrent Parallel Endurance-Resistance (CPER) and No Training controls (C). After a 12-week training period, fat-free mass, aerobic power, flexibility and Sargent jump height increased similarly in both experimental groups (CDER and CPER). Also, decreases in body fat percentage, mean time in 60 m running and agility occurred in CDER and CPER.

A significant difference in body fat percentage was seen in CPER when compared to CDER and C. Although body mass increased only after the CPER protocol application, it can be concluded that both CDER and CPER protocols were similarly effective in positive transformation of body composition, aerobic power and muscular endurance. This finding was supported by the finding of (García *et al.*, 2017) who analyzed the effect of 12-week low-volume high intensity interval training (HIIT)-based concurrent training program on body composition, upper- and lower-body muscle strength, mobility, and balance in older adults, as well as to compare it with a low-moderate–intensity continuous training. Body composition and physical functioning were assessed before (pretest) and after (posttest) a 12-week intervention.

This finding also supported by the finding of (Jorge *et al.,* 2017) wich show improvements of body composition in overweight and obese women. In this context, although the results were not highly marked, CT seems to be a better approach for the prevention and management of the women overweight and obesity than HIIT.

Figure 3. Showing the mean comparison of BMI results of the Study subjects pre and posttests



The above figure showed that there was significance difference on BMI test before and after subjects underwent in 12 weeks concurrent training combined with nutritional design.

5. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The primary purpose of this study was to find out the effects of Concurrent Training combined with Nutritional Design on Selected Physical Fitness componenets of Male Football Players of Nekemte Kenema B Group. To this end, this chapter deals with summary of the major finding of the study, the conclusion drawn from the finding and recommendation forwarded.

5.1. Summary

The purpose of the present study was to find out the effect of ‘’Concurrent Training combined with Selected Nutritional Design on Selected Physical Fitness componenets of Male Football Players of Nekemte Kenema B Group’’. To achieve the purpose of this study, 28 male football players of Nekemte kenema were selected by using census sampling technique and their age ranged from 20 to 24. The subjects were underwent twelve weeks of concurrent training combined with selected nutritional design for three days per week with duration of 70 minutes.

Subjects were tested on selected criterion measures namely, selected componenets of physical fitness tests like explosive strength (vertical jump test), endurance (12 min cooper test) and body composition (BMI) variables prior to and after the 12 weeks consumption of nutritional design combined with training period. The data collected from the participants pre and post-test were statistically examined to find out the significant improvement by using SPSS version 20, descriptive and paired t-test. In all cases, the criteria for statistical significance were set at ($P \leq 0.05$).

The results showed that there was significant improvement on the selected physical fitness componenets; explosive strength (power), endurance and body composition variables of male subjects. The differences recorded for the performance characteristics of selected componenets of physical fitness showed better improvements on vertical jump, Vo_2max and BMI. It was concluded that concurrent training combined with nutritional design of 12 weeks for male football players of Nekemte kenema achieved better fitness performance on selected componenets of physical fitness.

5.2. Conclusions

Based on the major findings of the study, the following points were stated as conclusions.

1. The findigs of the study showed that significant improvements were found on explosive strength after 12 weeks of nutritional design combined with concurrent training.

2. It was concluded that significant improvement was seen on Vo2max due to the treatment when compared to pretest result.
3. The results of the present study shown that 12 weeks of nutritional design combined with concurrent training was significantly improved BMI of the subjects.

5.3. Recommendations

Based on the results and findings of the study, the following recommendations were made.

1. It is recommended that concurrent training in combined with nutritional design shall be adopted to football players at different age groups.

2. It is recommended to the coaches, trainers and physical educators to adopt this training to improve physical, physiological health of the different subjects.
3. Similar study may be conducted on special patients population.
4. Similar research work may be replicated by using other skill related physical fitness, physiological and anthropometric variables for different age.

6. REFERANCES

Ackland T R, Lohman T G, Sundgot-Borgen J, Maughan R J, Meyer N L, Stewart A D and Muller W .2012. Current status of body composition assessment in sport: review and position statement on behalf of the ad hoc research working group on body composition health and performance, under the auspices of the I.O.C. medical commission. *Sports Medicine* 42: 227-49.

Alves, A.R., Marta, C., Neiva, H.P., Izquierdo, M. and Marques, M.C. 2018. *Concurrent training in prepubertal children:*

Alves, A.R., Marta, C.C., Neiva, H.P., Izquierdo, M. and Marques, M.C. 2016. Intrasession Concurrent Strength and Aerobic Training Order Influence Training Induced Explosive Strength and VO2max in Prepubescent Children? *Journal of Strength & Conditioning Research*, 30(12): 3267-3277.

American College of Sports Medicine and Academy of Nutrition and Dietics, Dietitians of Canada. Thomas T., Erdman K., Burke L. 2016. Nutrition and athletic performance. Joint position statement, special communications. *Official Journal of the American College of Sports Medicine*,48(3):543–568.

American Council on Exercise. 2015. Healthy Living: Percent Body Fat Norms for Men and Women.

Balabinis, C.P., Psarakis, C.H., Moukas, M., Vassiliou, M.P. and Behrakis, P.K. 2003. Early phase changes by concurrent endurance and strength training. *Journal of Strength and Conditioning Research*, 17(2): 393-401.

Bangsbo, J., Mohr, M., and Krustrup, P. 2000. Physical and metabolic demands of training and match-play in the elite football player. *Journal of Sports Sciences, 24*(7): 665-674.

Bell, G.J., Syrotuik, D., Martin, T.P., Burnham, R., and Quinney, H.A. 2000. Effect of concurrent strength and endurance training on skeletal muscle properties and hormone concentrations in humans. *European Journal of Applied Physiology*, 81: 418–427.

Björn Hansson. 2018. Functional and molecular responses to concurrent exercise of the arm extensors, *swedish school of sport and health sciences*.

Bompa, T. and Haff, G.G.2009. Periodization: theory and methodology of training: *Human Kinetics. ISBN-13*, pp.978-0736074834.

Cantrell, G.S., Schilling, B.K., Paquette, M.R. and Murlasits, Z. 2014. Maximal strength, power, and aerobic endurance adaptations to concurrent strength and sprint interval training. *European journal of applied physiology*, 114(4): 763-771.

Chtara, M., Chaouachi, A., Levin, G.T., Chaouachi, M., Chamari, K., Amri, and Laursen, P.B. 2008. Effect of concurrent endurance and circuit resistance training sequence on muscular strength and power development. *Journal of Strength and Conditioning Research*, 22(4): 1037–1045.

Coffey, V.G., Hawley, J.A. 2007. The molecular bases of training adaptation. *Sports Med*. 37: 737–763.

Daniel Bubnis, MS, NASM-CPT, NASE Level II-CSS on .July 24, 2017. what is muscular endurance? The Top 5 Muscular Endurance Exercises Endurance Exercise (Aerobic) *American Heart Association.*

Dudley, G. A., and Fleck, S. J. 1987. Strength and endurance training. Are they mutually Exclusive *Sports Medicine*, 4(2): 79-85.

Eskola, J., Lamberg, K., Pakkanen, M., Partanen, M., Tamminen, J., Kuningas Jalkapallo. 2003. *Intereuropean Publications.*

García-Pinillos, F., Laredo-Aguilera, J.A., MUN, M., NEZ, J. and Latorre-Roma, P.A. 2017. Effects Of 12-Week Concurrent High-Intensity Interval Strength And Enduranc Training Program On Physical Performance In Healthy Older People.

Geoff C. 2017. concurrent training; science and practical application performance training programming, strength training, endurance Training performance training.com/gc blog/concurrent-training.

Glowacki, S.P., Martin, S.E., Maurer, A., Baek, W., Green, J.S.,and Crouse, S.F. 2004. Effects of resistance, endurance, and concurrent exercise on training outcomes in men. *Medicine and Science in Sports and Exercise*, 36: 2119– 2127.

Goto, K., Ishii, N., Sugihara, S., Yoshioka, T. and Takamatsu, K. 2007. Effects of Resistance Exercise on Lipolysis During Subsequent Submaximal Exercise. *Medicine and Science in Sports and Exercise*, 39: 308-315.

Haff, G. G., Lehmkuhl, M. J., Mccoy, L. B. and Stone, M. H. 2003. Carbohydrate Supplementation and Resistance-Training. *Journal of Strength and Conditioning Research*, 17: 187-96.

Hamid Arazi, Hassan Faraji, Mahdi Ghahremani Moghadam and Ali Samadi. 2011. Effects Of Concurrent Exercise Protocols On Strength, Aerobic Power, Flexibility And Body Composition. *Kinesiology* 432:107-114.

Hawley, J. A., Tipton, K. D. and Millard-Stafford, M. L. 2006. Promoting Training Adaptations Through Nutritional Interventions. *Journal of Sports Science* 24: 709-21.

Hawley, J.A. and L. M. Burke. 2010. Carbohydrate availability and training adaptation: effects on cell metabolism. *Exercise. Sport Science.* Rev., Vol. 38, No. 4, pp. 152Y160.

Izquierdo, M., Häkkinen, K., Ibanez, J., Kraemer, W.J., and Gorostiaga, E.M. 2005. Effects of combined resistance and cardiovascular training on strength, power, muscle cross sectional area, and endurance markers in middle aged men. *European Journal of Applied Physiology*, 94: 70–75.

Izquierdo, M., Ibanez, J., Häkkinen, K., Kraemer, W.J., Larrion, J.L., and Gorostiaga, E.M. 2004. Once weekly combined resistance and cardiovascular training in healthy older men. *Medicine and Science in Sports and Exercise*, 36: 435–443.

Jeukendrup, A. E. 2004. Carbohydrate Intake during Exercise and Performance. *Nutrition,* 20: 669-77.

Jones, T.W., Howatson, G., Russell, M., and French, D.N. 2013. *Performance and neuromuscular adaptations following differing ratios of concurrent strength and endurance training. J. Strength Cond*. Res. 27, 3342–3351.

Jordan Syatt. 2012. *Developing Explosive Strength and Power for Athletic Performance, 23: 324-332.*

Jorge Cervantes-Sanabria and Jessenia Hernández-Elizondo Arch Sports Med . 2017. Effect of High-Intensity and Concurrent Training in Body Composition in Costa Rican Overweight and Obese Women, School of Physical Education and Sports, University of Costa Rica, Costa Rica 1(2):65-74.

Karlsson, J. and Saltin, B. 1971. Diet, muscle glycogen, and endurance performance. *Journal of applied physiology*, *31*(2): 203-206.

Kraemer, W. J. 2000. Physiological adaptations to anaerobic and aerobic endurance training programs. In T. R. Baechle and R. W. Earle (Eds.), *Essentials of strength training and conditioning* (Second ed., pp. 137-168). Champaign, IL: Human Kinetics.

Kravitz L. The Effect of Concurrent Training. 2013. IDEA Health & Fitness Association. Louie .2017. *how improve explosive strength.23(30):653-642.*

Marta, C., Marinho, D.A., Barbosa, T.M., Izquierdo, M. and Marques, M.C. 2013. Effects of concurrent training on explosive strength and VO2max in prepubescent children. *International journal of sports medicine*, *34*(10): 888-896.

Maughan,R. and Shirrefs,S. 2007. nutrition and hydration concerns of female football players. *Biritish journal of sport medicne*,41:60-63.

Morgans, R., Orme, P., Anderson, L., & Drust, B. 2014. *European journal of Principles and practices of training for soccer.*

Nader GA. 2006. Concurrent strength and endurance training: from molecules to man. *Med Sci Sports Exercise*; 38:1965–1970.

National Association for Sport and Physical Education. 2009. Appropriate uses of fitness measurement. *American alliance for health, physical education, recreation and dance*, 53: 693-703.

Ode, Joshua J., Pivarnik, James M., Reeves, Mathew J., & Knous, Jeremy L. 2007. Body Mass Index as a Predictor of Percent Fat in College Athletes and No athletes. *Medicine &Science in Sports & Exercise*, 39(3): 403-409.

Osgnach, C.; Poser, S.; Bernardini, R.; Rinaldo, R.; di Prampero, P.E. 2010. Energy cost and metabolic power in elite soccer: A new match analysis approach. *Med. Sci. Sports Exerc*, 42, 170–178.

Petré, H., Löfving, P. and Psilander, N. 2018. The Effect of Two Different Concurrent Training Programs on Strength and Power Gains in Highly-Trained Individuals. *Journal of sports science and medicine, 17*(2): 167.

Riebe, D. 2014. Exercise Prescription. In: Pescatello, L. ASCM's *Guidelines for Exercises Testing and Prescription*. 9th ed. Baltimore, MD: Lippincott Williams and Wilkins. 162-193.

Robert Wood. 2008."Body Mass Index (BMI)." *Topend Sports Website*

Rodriguez, N. R., Di Marco, N. M., and Langley, S. 2009. American College of SportsMedicine, American Dietetic Association Dietitians of Canada Position Statement. *Nutrition and athletic performance.* Med Sci Sports Exerc, 41(3):709-731.

Slater G, and Phillips S. 2011. Nutrition guidelines for strength sports: Sprinting, weightlifting, throwing events, and bodybuilding. *Journal of Sports Sciences* 47(9):542.

Spiering, B. A., Kraemer, W. J., anderson, J. M., Armstrong, L. E., Nindl, B. C., Volek, J. S. and Maresh, C. M. 2008. Resistance Exercise Biology. *Sports Medicine*, 38,527540**.**

Steve shaw. 2016. Concurrent periodization-the development of strength and muscle mass. Soccer Science. *Human Kinetics* 2011;29(1):67–77.

Tabata,I.,Nishimura, k., kouzaki, M.,Hirai Y,Ogita. F. and Miyachi, M. 1996. Effect of moderate intensity-endurance and hign intensity-intermittent traininig on anerobic

capacity and Vo_2 max.in,marconnect,p *annual congress, frontiers in sport science,the European perspective* (28-31).

Tipton, K. D., and Witard, O. C. 2007. Protein requirements and recommendations for athletes: *Relevance of ivory tower arguments for practical recommendations. Clinics in Sports Medicine,*26:17- 36.

Tremblay MS, Colley RC, Saunders TJ, Healy GN, Owen N . "Physiological and health implications of a sedentary lifestyle". *Applied Physiology, Nutrition, and Metabolism Physiologie Appliquee, Nutrition Metabolisme*. 35 (6): 725–40.

Wilson, J.M., Marin, P.J., Rhea, M.R., Wilson, S.M.C., Loenneke, J.P., Anderson, J.C .2012. *Concurrent Training:* A Meta-Analysis Examining Interference of Aerobic and Resistance Exercises. J. Strength Cond. Res. 26, 2293–2307.

7. APPENDICES

APPENDIX-I

Description of the Training Schedule for Three Months

In physical training it needs well designed and prepared plan. The main goal of this training plan is to develop some components of physical fitness variables of male football players through 12 weeks concurrent training intervention. In physical training plan and goals objectives should be specified, participants fitness level should be test before and after training, exercise should be selected it should follow the training principles, it should be well adjusted to the participant's fitness level. The schedule is prepared with time frame, intensity and frequency of exercises.

The following table includes different types of physical exercise which will be performed by the subjects within 12 weeks in order to improve some components of physical fitness variables. The exercises involve in this study are warming up exercise main work (strength endurance) and finally cooling down exercise which help to develop athletes fitness level. Also FITT (frequency, Intensity, time and type of exercise) principle of training is applied in the schedule;

1. Frequency of Training: the repetition of exercise in one set. The training schedule will be performed 3 days per week on Tuesday, Wednesday and Friday.

2. Intensity of Training: is how hard the body exercising or how much energy is expended when exercising. In this study the researcher will use moderate to adapt the exercise to high intensity for increasing load in the consecutive three months. There are ways to measure intensity of training;

- Heart rate-heart rate can be an indicator of the challenge to the cardiovascular system that the exercise represents.
- Vo2max- the amount of oxygen consumed by the body during exercise.

Exercise is categorized into three different intensity levels. These levels include **Moderate** (60-65% MHR), and **Vigorous** (65-85% MHR) for aerobic exercise and are measured by the metabolic equivalent of task. The effects of exercise are different at each intensity level (i.e. training effect). Recommendations to lead a healthy lifestyle vary for individuals based on age, weight, and existing activity levels "Published guidelines for healthy adults' state is

that 20-60 minutes of medium intensity continuous or intermittent aerobic activity 3-5 times per week is needed for developing and maintaining fitness" (ACSM, 1990).

3. Duration of Training: the subjects perform the exercise for 70'per day in this study. Duration is dependent on the intensity of activity (Tabata, 1996).

4.Type of Activity: any activity that uses large muscle groups, which can be maintained continuously, E.g, push up, squat jump, suicide 50, dumbell shoulder press and box steps various concurrent game activities (Steve shaw,2016) .

Planning the Session and the Training Weeks

Based on the above mentioned reasons and others the researchers will use the training principles, this training session is designed for three months, and based on the principles of frequency, intensity, type and principle of rest and recover it will be a three days per week.

Table 1: **Training Schedule for First Month (December, 2018)**

Month-1	Types of exercise	Time	Repetition/rest	Intensity	Total duration
Tuesday 9:00-10:10am	**Warming up** : Jogging ,Walking leg swing, Dynamic stretching	15min		Moderate 60-65%	70min
	Main part:				
	Squat jump	10min	3x10rep/1min rest		
	Push up	10min	3x10rep/2min rest		
	Suicide 50	5min	2x1rep/1min rest		
	Dumbbell shoulder press	10min	4x10rep/2min rest		
	Box steps	10min	3x10rep/1min rest		
	Cool down: Static stretching Walking	10min			
Wednesday 9:00-10:10am	**Warming up :** Jogging ,Walking leg swing, Dynamic stretching	15min		Moderate 60-65%	70min
	Main part:				
	Squat jump	10min	3x10rep/1min rest		
	Push up	10min	3x10rep/2min rest		
	Suicide 50	5min	2x1rep/1min rest		
	Dumbbell shoulder press	10min	4x10rep/2min rest		
	Box steps	10min	4x5rep/1min rest		
	Cool down: Static stretching Walking	10min			

Month-1	Types of exercise	Time	Repetition/rest	Intensity	Total duration
Friday 9:00-10:10am	**Warming up** : Jogging ,Walking leg swing, Dynamic stretching	15min		60-65%	70min
	Main part: Squat jump Push up Suicide 50 Dumbbell shoulder press Box steps	 10min 10min 5min 10min 10min	 3x10rep/1min rest 3x10rep/2min rest 2x1rep/1min rest 4x10rep/2min rest 4x5rep/1min rest		
	Cool down: Static stretching Walking	 10min			

Table 2: Training Schedule for Second Month (January, 2019)

Month-2	Types of exercise	Time	Repetition/rest	Intensity	Total duration
Tuesday 9:00-10:10am	**Warming up** : Jogging ,Walking leg swing, Dynamic stretching	15min		vigorous 65-70%	70min
	Main part:				
	Squat jump	10min	3x15rep/1min rest		
	Push up	10min	3x15rep/2min rest		
	Suicide 50	5min	2x2rep/1min rest		
	Dumbbell shoulder press	10min	4x15rep/2min rest		
	Box steps	10min	4x10rep/1min rest		
	Cool down: Static stretching Walking	10min			
Wednesday 9:00-10:10am	**Warming up :** Jogging ,Walking leg swing, Dynamic stretching	15min		65-70%	70min
	Main part:				
	Squat jump	10min	3x15rep/1min rest		
	Push up	10min	3x15rep/2min rest		
	Suicide 50	5min	2x2rep/1min rest		
	Dumbbell shoulder press	10min	4x15rep/2min rest		
	Box steps	10min	4x10rep/1min rest		
	Cool down: Static stretching Walking	10min			

Month-2	Types of exercise	Time	Repetition/rest	Intensity	Total duration
Thursday 9:00-10:10am	**Warming up** : Jogging ,Walking leg swing, Dynamic stretching	15min		vigorous 65-70%	70min
	Main part: Squat jump Push up Suicide 50 Dumbbell shoulder press Box steps	 10min 10min 5min 10min 10min	 3x15rep/1min rest 3x15rep/2min rest 2x2rep/1min rest 4x15rep/2min rest 4x10rep/1min rest		
	Cool down: Static stretching Walking	 10min			

Table 3: Training Schedule for Third Month (February, 2019)

Month-3	Types of exercise	Time	Repetition/rest	Intensity	Total duration
Tuesday 9:00-10:10am	**Warming up** : Jogging ,Walking leg swing, Dynamic stretching	15min		vigorous 70-85	70min
	Main part:				
	Squat jump	10min	3x20rep/1min rest		
	Push up	10min	3x20rep/2min rest		
	Suicide 50	5min	2x3rep/1min rest		
	Dumbbell shoulder press	10min	4x20rep/2min rest		
	Box steps	10min	4x15rep/1min rest		
	Cool down: Static stretching Walking	10min			
Wednesday 9:00-10:10am	**Warming up :** Jogging ,Walking leg swing, Dynamic stretching	15min		vigorous 70-85%	70min
	Main part:				
	Squat jump	10min	3x10rep/1min rest		
	Push up	10min	3x10rep/2min rest		
	Suicide 50	5min	2x1rep/1min rest		
	Dumbbell shoulder press	10min	4x10rep/2min rest		
	Box steps	10min	4x15rep/1min rest		
	Cool down: Static stretching Walking	10min			

Month-3	Types of exercise	Time	Repetition/rest	Intensity	Total duration
Friday 9:00-10:10am	**Warming up** : Jogging ,Walking leg swing, Dynamic stretching	15min		vigorous 70-85%	70min
	Main part: Squat jump Push up Suicide 50 Dumbbell shoulder press Box steps	 10min 10min 5min 10min 10min	 3x20rep/1min rest 3x20rep/2min rest 2x3rep/1min rest 4x20rep/2min rest 4x15rep/1min rest		
	Cool down: Static stretching Walking	 10min			

APPENDIX-II

Table 4: Current Menu plan of Nekemt Kenema B group football players.

	Meal	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1	breakfast	Dulet Milk Bread	Egg Bread Milk	Dulet Bread Tea	Dulet Milk Bread	Juice bread	Chechebsa Milk	Dulet Milk Bread
2	Lunch	Pasta Bread Salad water	Kikil water	Pasta Bread Banana Water	Rice Meat Salad Water	Pasta Salad Water	Kikil Water	Pasta Banana Water
3	Dinner	Tibs Bread	Pasta Bread Water	Salad Bread Banana Water	Tibs Water	Tibs Banana Water	Tibs Water	Tibs Water

Table 5: Designed menu plan

	Breakfast	Lunch	Dinner	Total calorie	Nutrient type
Monday 12:30-1:00am	sphagheti(392kcal)	Goat tibs(1250kc)	Beef and Rice (293kcal)	3,325 kcal	Carbs Protein Fat Vitamin
	Bread(480 kcal)	Bread(480kcal)	Milk (103kcal)		
		Juice(112) Yogurt(149)	Water 1000ml		
	milk (103kal)	Water 1000ml	Juice (112kc)		
Tuesday 12:30-1:00am	rice (204kcal)	Goattibs (1250kcal) Yoguhrt (149) 1000ml	Spaghetti and chicken (392kcal) 1000ml	3,117 kcal	Carbs Protein Fat Mineral Vitamin
	Oatmeal(166kcal) milk(103 kcal)	Juice(112kcal)	Juice (112kcal) Yoghurt (149)		
	Bread (480kac)	Water 1000ml	Water 500ml		
Wednesday 12:30-1:30am	Spaghetti(392kcal)	Kitfo(1250kcal)	Egg sandwich (570kcal)	3431 kcal	Fat Carbs Protein Vit and min
	Milk (103kcal)	Cheese (457kcal)	Milk(103kcal) Oat meal(166)		
	Bread(480kc)	Water 1000ml	Water 1000ml		

Thursday 12:00-1:00am	Bread(480kcal) Milk(103kcal)	Bread(480kcal) Milk(103kcal)	Dulet (1062kcal) Juice(112kcal)	3369kcal	Carbs Protein Fat Vit& min
	Rice(204kcal)	Rice(204kcal)	Water 500ml		
Friday 12:00-1:00am	Spaghetti(392kcal)	Chicken rice(681kcal)	Green salad (100kcal)	3431 kcal	Carbs Protein Fat Vit& min
	Bread (480kcal)	Bread(480kcal)	Beef (1250kcal)		
	milk(103kcal)	Water	Water		
Saturday 12:00-1:00am	rice (204kcal) oatmeal(166 kcal)	Beef and rice(1454kcal)	Green salad(100kcal)	3405 kcal	Protein Carbs Fat Vitamin
	Milk (103kcal)	Yogurt(149)	Bread(480kcal) Oatmeal(166)		
	Bread (480kcal)	Water	Milk(103kc)		
Sunday 12:30-1:00am	Spaghetti(392kcal)	Kitfo(1250kcal)	Rice and beef(1454kcal)	3679kcal	Vit&min protein Fat Carbs
	Milk(103kcal)	Bread(480kcal)	Water 100ml		
		Water 1000ml			

APPENDIX-III

Consent to participate voluntarily in this research study

Researcher Name:-Medanit Belay

Supervisor Name: - K.V. Balamurugan (PhD) and Negussie Bussa (BPharm, PhD)

Proposal Title: -Effect of Concurrent Training and Selected Nutritional Design on Selected Physical Fitness Components : The Case of Male Football Players of Nekemete Kenema B Group, Ethiopia.

You are being asked to participate in this study as described below. All this like research study carried out governed by the regulation for research on human beings. These regulations require that the researcher should obtain a signed agreement from you to participate in this research project. The researcher will explain to you in detail the purpose of the project, the procedure to be used, the potential benefits and the possible risk of participation in this study. You can ask the researcher any question that you may have about the study. The basic explanation of the project is summarized below. After discussion, if you agree to participate in the study, please sign this form in the presence of the researcher. You may discontinue at any time from the study if choose to do so.

1. Purpose and Procedure

The purpose of this research project is to investigate the effect of concurrent training and selected nutritional design on selected physical fitness components of male football players with the age of 20-24.The subjects to be involved in this study will be 28 in number and participation on this study will require you to perform a certain test to measure the physical fitness variables.

2. Risks and Safeguards

The risks of this research study are small, while administering the tests and during test you may experience localized muscle fatigue in your thigh, you might feel some muscle soreness and fatigue during the tests. But we do not expect any unusual risks as a direct result of the study, if any unexpected physical injury occurs, appropriate first aid will be provided, but no financial compensations will be given.

3. Confidentiality

The information obtained about you will be kept in confidence, although you are free to release it to your own trainer. The information will be used only for scientific purpose without identifying you as an individual.

4. **Contact Address**

1.Medanit Belay----------0967461196

2. K.V. Balamurugan (PhD) ----------0904543332

3.Negussie Bussa (BPharm, PhD) ----------0910275526

I certify I have read and fully understand the above project. I willingly consent to participate

Name of subject: _____

Signature of subject: _____

Address: _____

Date: _____

I certify that I have explained fully to the above subject the nature, the purpose, the potential benefits and the possible risks involved in this research study.

Date: _____

Signature of the investigator: _____

APPENDIX-IV

Table 6. Pre and Post test result of the subjects on selected variables

No.	Subject code		Parameter to be measured					
		Age	Explosive Strength		12 min run		BMI	
			Pretest	Posttet	Pretest	Posttet	Pretest	Posttet
1.	S1	21	36.00	45.00	44.87	42.55	21.00	23.70
2.	S2	24	35.00	40.00	43.35	43.55	19.50	22.50
3.	S3	24	35.00	43.00	43.35	45.74	20.50	23.00
4.	S4	20	36.00	44.00	42.59	45.83	21.00	23.60
5.	S5	22	41.00	41.00	40.13	54.21	21.50	23.90
6.	S6	21	38.00	42.00	42.59	46.83	22.50	24.01
7.	S7	23	38.00	44.00	33.42	42.36	20.80	22.90
8.	S8	22	39.00	46.00	38.11	45.83	20.70	22.80
9.	S9	24	39.00	42.00	44.91	51.09	20.78	23.02
10.	S10	20	42.00	49.00	44.82	53.32	19.30	21.80
11.	S11	24	33.00	40.00	37.89	45.83	20.40	22.30
12.	S12	23	40.00	42.00	40.35	47.50	21.30	24.10
13.	S13	22	38.00	44.00	38.34	46.83	20.80	23.60
14.	S14	24	32.00	40.00	40.64	43.48	21.10	23.90
15.	S15	21	36.00	40.00	40.13	51.08	19.90	21.90
16.	S16	23	32.00	40.00	40.15	48.11	20.20	23.21

17.	S17	20	37.00	40.00	44.87	47.06	21.00	24.05
18.	S18	22	38.00	45.00	40.13	51.08	21.00	23.80
19.	S19	23	37.00	42.00	40.86	45.16	22.00	24.04
20.	S20	24	38.00	42.00	40.13	47.17	21.40	23.70
21.	S21	22	40.00	45.00	43.59	48.98	20.70	22.80
22.	S22	23	39.00	42.00	44.40	46.70	21.50	24.32
23.	S23	23	38.00	43.00	40.35	46.05	20.21	23.15
24.	S24	20	40.00	46.00	41.47	46.83	19.64	22.00
25.	S25	24	35.00	39.00	45.83	48.09	19.39	21.21
26.	S26	20	37.00	43.00	35.90	43.48	20.60	23.40
27.	S27	22	36.00	40.00	40.13	45.49	21.04	24.00
28.	S28	23	39.00	40.00	42.59	48.31	20.60	23.01

APPENDIX - V

Paired Sample T- Tests of Parameters

TABLE 7: The Mean Difference Values and Significance Levels of Pre and Post Test Result of Subject on Explosive Strength Variable.

Explosive strength	Paired Differences				t	Df	Sig. (2-tailed)
	MD	Std. Deviation	95% Confidence Interval of the Difference				
			Lower	Upper			
Pretest – Posttest	5.21	2.33	-6.118	-4.31	11.83	27	.000

TABLE 8: The Mean Difference Values and Significance Levels of Pre and Post Test Result of Subject on Vo_2 max Variable.

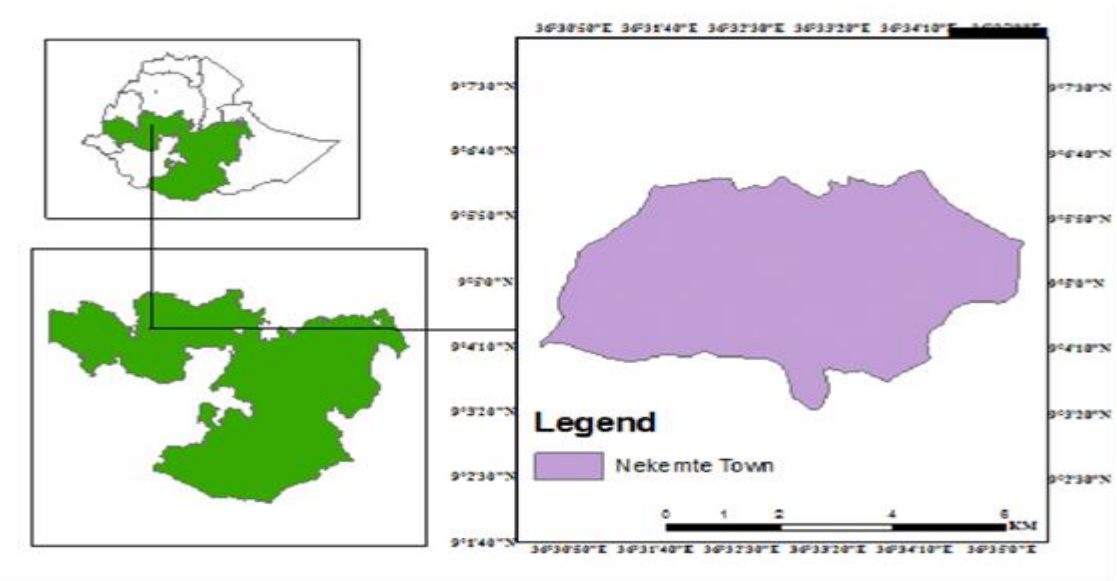
Vo2max	Paired Differences				t	Df	Sig. (2-tailed)
	MD	Std. Deviation	95% Confidence Interval of the Difference				
			Lower	Upper			
Pretest – Posttest	4.81	5.54	-7.77	-4.44	8.754	27	.000

TABLE 9: The Mean Difference Values and Significance Levels of Pre and Post Test Result of Subject on BMI Variable

BMI	Paired Differences				t	Df	Sig. (2-tailed)
	MD	Std. Deviation	95% Confidence Interval of the Difference				
			Lower	Upper			
Pretest – Posttest	2.478	0.417	-2.64	-2.315	31.43	27	.000

APPENDIX VI

Figure 1: Map of the Study Site



Source: Nekemte city administration (2007).