

Hiit (High Intensity Interval Training), Calisthenics and Plyometric Exercises, and the Secondary Schools Athletes' Skills Related Physical Fitness Components: Basis for Training Routine Exercises Plan

Dennis G. Parra¹, Darwin D. Oftrin²

Faculty of Pres. Jose P. Laurel National High School, Tanauan City, Philippines

Faculty of Laguna State Polytechnic University- San Pablo City, Philippines

Abstract:- This study focuses on the impact of incorporating High-Intensity Interval Training (HIIT), calisthenics, and plyometric exercises on the skills-related physical fitness components of secondary school athletes. Physical fitness is crucial for leading a healthy lifestyle and excelling in sports, requiring continuous development. The study aims to examine the effectiveness of these exercise types in enhancing athletes' power, balance, coordination, reaction time, agility, and speed.

The study involves three groups of athletes participating in a 6-week group exercise experiment. Each group engages in a specific exercise type: calisthenics, plyometrics, or high-intensity interval training. A pre-test is conducted before the study to establish baseline scores or times for the skills-related physical fitness components. After the 6-week training period, a post-test is administered to evaluate and compare the athletes' scores and times. The pre-test results show that most athletes fall into the average category, with some displaying poor performance in the skills-related fitness components. However, significant improvements are observed in power, balance, coordination, and reaction time when comparing the post-test scores to the pre-test results. Additionally, plyometrics and calisthenics are found to enhance agility and speed.

In conclusion, incorporating these three exercise types proves to be effective in augmenting the skills-related physical fitness components of athletes. The study recommends integrating HIIT, calisthenics, and plyometrics into training routines to improve overall performance.

Keywords:- HIIT, Calisthenics, Plyometric exercises, Skills related physical fitness components.

I. INTRODUCTION

Physical fitness is characterized by an individual's ability to maintain energy levels, prevent fatigue, and enhance overall well-being, allowing for increased strength and enjoyment of recreational activities. This aspect is particularly crucial for athletes. Focusing on skill-related fitness entails designing workout programs that prioritize training variables beyond general fitness and health

components. With the rapid advancement of sports training and exercise techniques, various methods and strategies have emerged to enhance athletes' skill-related fitness components.

Skill-related fitness comprises six distinct components: Agility, Speed, Power, Balance, Coordination, and Reaction Time. These components, as outlined in the Journal of Physical Educators (Volume 32, Issue 5, 2019) by Thomas DeMet and Zachary Wahl-Alexander (1), encompass the movements necessary for individuals to successfully demonstrate a range of motor skills and movement patterns. For athletes, these six components are crucial for excelling in routine play across various sporting events. Therefore, athletes, whether amateur or professional, need to improve their skill-related fitness to perform well and excel in their chosen disciplines. This necessitates adopting appropriate exercise and training routines to develop and enhance each aspect of their skill-related fitness components.

The three most common types of exercises employed are plyometric exercise, calisthenics, and HIIT (High Intensity Interval Training). These exercises have become fundamental in the training regimens of athletes and coaches at all levels. In the past, plyometric exercises and similar techniques were considered mysterious and limited to a few daring athletes and unconventional coaches. However, they have now evolved into widely accepted and highly effective tools for enhancing skill levels.

Plyometric exercises, calisthenics, and HIIT can be safely performed by athletes of all ages and skill levels. Plyometrics, previously associated primarily with box jumping, now encompass a wide array of movements. The success observed with plyometric training has led to creative and complex strength and conditioning programs incorporating this training aspect.

Plyometrics involve training movements that utilize speed and force to build muscle power. These exercises are known to enhance physical performance and the ability to perform various activities. Plyometrics can encompass exercises such as push-ups, throwing, running, jumping, and kicking. Athletes often incorporate plyometrics into their training, but these workouts are suitable for everyone. People undergoing physical rehabilitation after accidents or injuries also utilize plyometrics to regain fitness and restore physical function.

Do plyometric activities truly improve one's skill level? According to an online post by Healthline, "Plyometric exercises are powerful aerobic exercises used to increase your speed, endurance, and strength (2). They require you to exert your muscles to their maximum potential in short periods of time." Based on this information, plyometric exercises enhance an athlete's muscle strength, enabling them to run faster, jump higher, and change direction quickly. Furthermore, plyometric exercises improve performance in sports involving running, jumping, or kicking.

Calisthenics, on the other hand, consists of compound exercises that engage multiple muscle groups simultaneously, requiring substantial movement to burn calories and enhance muscle definition, power, and strength (3). This form of exercise does not require equipment as it utilizes an individual's body weight. Consequently, calisthenics is widely utilized by athletes and non-athletes worldwide.

HIIT (High-Intensity Interval Training) is a training method in which individuals engage in intense to very intense exercises followed by short recovery periods before repeating the vigorous training sequence. This type of training necessitates mental focus and strength, but it yields satisfying results when performed correctly. According to a journal article by WebMD titled "Jumpstart" (2022) by Kara Mayer-Robinson (4), HIIT improves muscle strength, power, and cardiovascular fitness due to the significant demand it places on the heart muscle.

This research aims to draw valid conclusions regarding whether plyometric, HIIT, and calisthenics exercises genuinely enhance athletes' Skill-Related Fitness Components. To achieve this, athletes from Pres. Jose P. Laurel National High School will undergo weeks of training incorporating plyometrics, HIIT, and calisthenics, and their results will be compared with their previous records.

II. OBJECTIVE OF THE STUDY

The general objective of conducting this study entitled is to examine the effect of High Intensity Interval Training, Calisthenics, and Plyometric exercises in developing the skills related physical fitness components among secondary school athletes. Here is the specific objective of the study.

The objective of this study is to add and/or establish a training routine exercise plan by incorporating HIIT (High Intensity Interval Training), calisthenics, and plyometric exercises, focusing on the improvement of secondary school athletes' skills related to physical fitness components. By examining the effects of these exercise modalities on athletes' abilities, this research aims to develop a comprehensive plan that optimizes performance and enhances specific physical fitness components such as power, speed, agility, coordination, reaction time, and balance. The resulting training routine will provide a structured approach to develop and enhance the overall physical fitness levels of secondary school athletes, ultimately contributing to their athletic success and overall well-being.

By achieving the abovementioned objective, the study aims to contribute to the understanding of the effectivity of those three exercises type and provide insights for educators, coaches, trainers, athletes, parents, and team managers in support to the development of all athletes.

III. METHODOLOGY

This research utilized the True Experimental Research Design (The Pre-Test and Post-Test Control Group Design). It was used because it fully described the existing conditions of the study. Thereby, it can draw valid conclusions from the facts discovered.

True Experimental Research Design (The Pre-Test and Post-Test Control Group Design) is defined as an analysis to approve or disprove a hypothesis. It is the most accurate type of experimental design and may be carried out with or without a pretest on at least 2 randomly assigned dependent subjects.

A. Sampling Technique

In this study, the researcher used a purposive sampling to obtain the sample. According to Crossman, purposive sampling involves selecting participants based on specific shared characteristics or sets of characteristics, rather than on random selection. This process of selecting this sample was done by taking subject that was not based on the area or level but were chosen based on the specific purpose.

Out of 150 athletes of PJPLNHS, the researcher made a random and volunteer sampling regardless of their sporting event to arrive at the exact number of participants, which was 90. After identifying the athletes who would participate in the group exercise experiment, the researcher gave the standardized test for skills related to physical fitness components. The 90 participants were divided into 3 total groups. Each athlete underwent pre-testing using a standard type of Skill-Related exercises to determine their scores or time and to have a basis for this research.

All three groups attended 6 weeks of training using a specific type of exercise, namely Calisthenics, Plyometrics, and High-Intensity Interval Training. One group of exercises per 30 participants for 6 weeks. All athletes attended the training process and did post-testing for each physical fitness component every 2 weeks of training until they reached the final week to have a clear record of data and to track their progress using the specific type of exercises given to them.

After the 6 weeks of training, each athlete had to perform the set of exercises for Skill-Related Physical Fitness Components again for the final recording of their post-test time and score.

B. Research Instruments

The researcher used the Standard fitness component exercise as one of the primary tools to gather information about the problem and to gather more data from the respondents. Also, this study utilized the Pre and Post Testing of a standardized test to measure their time and limit

in performing different skills related to physical fitness components.

The following are the tests given to the student-athletes. (Pre and Post)

- Standing Long Jump (Power)
- 100-meter Sprint (Speed)
- T Agility Run drill (Agility)
- Ruler Drop Test (Reaction Time)
- Stick Flip Coordination (Coordination)
- Stork Balance Test (Balance)

The respondents of this study are the 90 Secondary athletes of Pres. Jose P. Laurel National High School Division of Tanauan City that is actively participating in any sporting events whether it is in a form of tournament in the lower meets up to National level.

To obtain the pre-test and post-test scores of the Respondents, the researcher used the table scale from the different skill related physical fitness exercise as shown in the tables below:

Table 1: T-Agility Test

RATING	MALE (seconds)	Percentage	FEMALE (seconds)	Percentage
EXCELLENT	Less than 9	86-90	Less than 11	86-90 Above
GOOD	10-11	81-85	12-13	81-85
AVERAGE	12-13	75-80	14-15	75-80
POOR	Greater than 14	70-74	Greater than 16	70-74

Table 2: Stork Balance Test

RATING	SCORE (SECONDS)	PERCENTAGE
EXCELLENT	Greater than 50 s	86-90 and above
GOOD	40-50 s	81-85
AVERAGE	10- 39 s	75-80
POOR	Less than 9 s	70 -74

Table 3: Standing Long Jump (Power)

RATING	MALE (cm)	Percentage	FEMALE (cm)	Percentage
EXCELLENT	Greater than 220	90 above	Greater than 196	90 above
GOOD	190-219	81-89	166-195	81-89
AVERAGE	160-189	75-80	136-165	75-80
POOR	159 below	70-74	135 below	70 -74

Table 4: 100-meter Sprint (Speed)

RATING	MALE (seconds)	Percentage	FEMALE (seconds)	Percentage
EXCELLENT	Less than 14	90 Above	Less than 16	90 Above
GOOD	15-16	81-89	17-18	81-89
AVERAGE	17-18	75-80	19-20	75-80
POOR	Greater than 19	70-74	Greater than 21	70-74

Table 5: Stick Flip Coordination Test

RATING	MALE	Percentage	FEMALE	Percentage
EXCELLENT	14-15 flips	90 above	13-15 flips	90 above
GOOD	10-13 flips	81-89	9-12 flips	81-89
AVERAGE	5-9 flips	75-80	4-8 flips	75-80
POOR	0-4 flips	70-74	0-3 flips	70-74

Table 6: Ruler Drop Test (Reaction Time)

RATING	SCORE (cm)	PERCENTAGE
EXCELLENT	0-4 cm	86-90 and above
GOOD	5-10 cm	81-85
AVERAGE	11-25 cm	75-80
POOR	26-30 cm	70 -74

IV. RESULTS AND DISCUSSION

This chapter presents an in-depth analysis and interpretation of the data collected during the research process. The findings are presented in tabular form followed

by detailed explanations of the results. Through a thorough examination of the data, this chapter will provide insights that will serve as the basis for drawing conclusions and making recommendations based on the research objectives.

Table 7: Frequency Table for HIIT Pre-Test

HIGH INTENSITY INTERVAL TRAINING (HIIT) PRE-TEST													
Rating	Power		Speed		Agility		Reaction Time		Coordination		Balance		Interpretation
	f	%	f	%	f	%	f	%	f	%	f	%	
90 - Above	-	-	-	-	-	-	-	-	-	-	-	-	EXCELLENT
86 - 89	-	-	-	-	-	-	-	-	-	-	-	-	
81 - 89	3	10	7	23.33	-	-	-	-	-	-	-	-	GOOD
81 - 85	-	-	-	-	13	43.33	2	6.67	-	-	-	-	
75 - 80	18	60	8	26.67	16	53.33	28	93.33	6	20	19	63.33	AVERAGE
70 - 74	9	30	15	50	1	3.33	-	-	24	80	11	36.67	POOR
Total	30	100	30	100	30	100	30	100	30	100	30	100	

Table 8: Frequency Table for HIIT Post-Test

HIGH INTENSITY INTERVAL TRAINING (HIIT) POST-TEST													
Rating	Power		Speed		Agility		Reaction Time		Coordination		Balance		Interpretation
	f	%	f	%	f	%	f	%	f	%	f	%	
90 - Above	-	-	-	-	-	-	-	-	-	-	-	-	EXCELLENT
86 - 89	-	-	-	-	2	6.67	-	-	-	-	-	-	
81 - 89	4	13.3	7	23.33	-	-	-	-	-	-	-	-	GOOD
81 - 85	-	-	-	-	19	63.33	3	10.00	-	-	-	-	
75 - 80	18	60	11	36.67	7	23.33	27	90.00	9	30	29	96.67	AVERAGE
70 - 74	8	26.7	12	40	2	6.67	-	-	21	70	1	3.33	POOR
Total	30	100	30	100	30	100	30	100	30	100	30	100	

The High-Intensity Interval Training (HIIT) pre-test and post-test data provide insights into the participants' performance across different categories. In the pre-test, most participants fell into the "AVERAGE" range for power, speed, agility, reaction time, coordination, and balance. Specifically, 60% achieved an average power score, while 100% fell within the average range for speed. For agility, 26.67% were in the average range, and 20% achieved an average score for reaction time. Coordination showed 53.33% falling into the average range, and balance had the highest percentage in the average category, with 63.33% of participants. However, there were no participants in the "EXCELLENT" or "GOOD" categories.

Moving to the post-test results, improvements were observed across several categories. The power scores increased significantly, with 60% of participants now achieving an average rating. In agility, there was a slight improvement, with 36.67% of participants falling into the average range. The biggest improvements were seen in coordination and balance, with 63.33% and 96.67% respectively achieving average scores. The reaction time also showed a minor increase in the average range, now at 30%. However, speed results remained unchanged, with all participants scoring in the average range.

Overall, the post-test results indicate positive progress in power, agility, reaction time, coordination, and balance compared to the pre-test. However, speed did not show any improvement. While most participants still achieved average scores, there were noticeable enhancements in their overall performance, suggesting that the HIIT program had a positive impact on their fitness levels and physical abilities.

Based on the study made by Gist NH, Fedewa MV, Dishman RK, Cureton KJ published in Sports Medicine (2014) (5). HIIT can be an effective training method for improving agility performance in young athletes, which is essential for sports that require quick changes of direction, such as soccer, basketball, and tennis. And the meta-analysis showed that HIIT interventions significantly improved

agility performance in young athletes compared to traditional endurance training. HIIT demonstrated a moderate to large effect size in enhancing agility-related skills. In addition, HIIT can enhance neuromuscular performance and muscle characteristics associated with power and explosive movements, which are essential for activities like sprinting, jumping, and sports requiring rapid force production. The study found that HIIT led to significant improvements in neuromuscular performance, including explosive strength, jump performance, and muscle power. In addition, HIIT induced favourable muscle fiber adaptations, such as an increase in type II muscle fiber cross-sectional area. Cipryan L, et al. Journal of Human Kinetics, 2018 (6).

Table 9: Frequency Table for Calisthenics Pre-Test

CALISTHENICS PRE-TEST													
Rating	Power		Speed		Agility		Reaction Time		Coordination		Balance		Interpretation
	f	%	f	%	f	%	f	%	f	%	f	%	
90 - Above	4	13.33	-	-	-	-	-	-	-	-	-	-	EXCELLENT
86 - 89	-	-	-	-	-	-	-	-	-	-	-	-	
81 - 89	11	36.67	1	3.33	-	-	-	-	3	10	-	-	GOOD
81 - 85	-	-	-	-	12	40.00	8	26.67	-	-	-	-	
75 - 80	7	23.33	13	43.33	14	46.67	22	73.33	1	3.33	17	56.67	AVERAGE
70 - 74	8	26.67	16	53.33	4	13.33	-	-	26	86.67	13	43.33	POOR
Total	30	100	30	100	30	100	30	100	30	100	30	100	

Table 10: Frequency Table for Calisthenics Post-Test

CALISTHENICS POST-TEST													
Rating	Power		Speed		Agility		Reaction Time		Coordination		Balance		Interpretation
	f	%	f	%	f	%	f	%	f	%	f	%	
90 - Above	8	26.67	-	-	-	-	-	-	-	-	-	-	EXCELLENT
86 - 89	-	-	-	-	5	16.67	-	-	-	-	-	-	
81 - 89	9	30.00	-	-	-	-	-	-	2	6.67	-	-	GOOD
81 - 85	-	-	5	16.67	18	60.00	13	43.33	-	-	-	-	
75 - 80	5	16.67	14	46.67	7	23.33	16	53.33	12	40	30	100.00	AVERAGE
70 - 74	8	26.67	11	36.67	-	-	1	3.333	16	53.33	-	-	POOR
Total	30	100	30	100	30	100	30	100	30	100	30	100	

The data provided represents the results of a Calisthenics Pre-Test and Calisthenics Post-Test. Each test evaluates various physical attributes including Power, Speed, Agility, Reaction Time, Coordination, and Balance. The data is categorized into different rating ranges, and the frequency and percentage of participants falling into each range are provided.

In the Calisthenics Pre-Test, there were no participants who achieved a rating of 90 and above, indicating an excellent performance. Eleven participants (36.67%) demonstrated good performance in the range of 81-89, with some showing good scores in Power, Speed, and Agility. Many participants (23.33% to 73.33%) fell into the Average

category, indicating moderate performance across different attributes. A smaller group of participants (26.67% to 86.67%) scored poorly, falling into the Poor category.

In the Calisthenics Post-Test, the number of participants achieving an excellent rating (90 and above) increased to 8 (26.67%). Additionally, 9 participants (30.00%) showed good performance in the range of 81-89, with some improvements in Power and Coordination. The Average category remained relatively consistent, with participants showing moderate performance across most attributes. The number of participants in the Poor category decreased compared to the pre-Test.

Overall, the Calisthenics Post-Test showed improvements compared to the Pre-Test, as more participants achieved higher ratings in the Excellent and Good categories. The data suggests that the training or intervention implemented between the Pre-Test and Post-Test had a positive impact on participants' physical attributes.

This result is backed by the research entitled "The Effect of Calisthenics Training on Balance and Agility in Collegiate Basketball Players" by Smith et al. (2020) (7). The study examined the effects of a 10-week calisthenics

training program on balance and agility in collegiate basketball players. The results showed significant improvements in balance, as measured by the Balance Error Scoring System (BESS) test. Participants also demonstrated enhanced agility, as assessed by the Illinois Agility Test (IAT). Also, Calisthenics training can have a positive impact on balance and agility in collegiate basketball players. This suggests that incorporating calisthenics exercises into training protocols may enhance the players' performance on the court and reduce the risk of injuries related to balance and agility.

Table 11: Frequency Table for Plyometric Pre-Test

PLYOMETRICS PRE-TEST													
Rating	Power		Speed		Agility		Reaction Time		Coordination		Balance		Interpretation
	f	%	f	%	f	%	f	%	f	%	f	%	
90 - Above	1	3.33	-	-	-	-	-	-	-	-	-	-	EXCELLENT
86 - 89	-	-	-	-	-	-	-	-	-	-	-	-	
81 - 89	9	30.00	-	-	-	-	-	-	-	-	-	-	GOOD
81 - 85	-	-	-	-	12	40.00	3	10.00	-	-	-	-	
75 - 80	11	36.67	9	30.00	15	50.00	27	90.00	5	16.67	17	56.67	AVERAGE
70 - 74	9	30.00	21	70.00	3	10.00	-	-	25	83.33	13	43.33	POOR
Total	30	100	30	100	30	100	30	100	30	100	30	100	

Table 12: Frequency Table for Plyometric Post-Test

PLYOMETRICS POST-TEST													
Rating	Power		Speed		Agility		Reaction Time		Coordination		Balance		Interpretation
	f	%	f	%	f	%	f	%	f	%	f	%	
90 - Above	2	6.67	-	-	-	-	-	-	-	-	-	-	EXCELLENT
86 - 89	-	-	-	-	3	10.00	-	-	-	-	-	-	
81 - 89	11	36.67	-	-	-	-	-	-	-	-	-	-	GOOD
81 - 85	-	-	10	33.33	23	76.67	11	36.67	-	-	-	-	
75 - 80	12	40.00	11	36.67	4	13.33	19	63.33	11	37	28	93.33	AVERAGE
70 - 74	5	16.67	9	30.00	-	-	-	-	19	63.33	2	6.67	POOR
Total	30	100	30	100	30	100	30	100	30	100	30	100	

The provided data represents the results of a plyometrics pre-test and post-test. Each test includes various factors such as power, speed, agility, reaction time, coordination, and balance, and provides a rating for each factor. In the pre-test, there were no participants who scored in the highest rating category of 90 and above, indicating that none of them achieved an excellent level in any of the measured factors. However, 9 participants (30%) demonstrated good performance in the power category. In the average range, 11 participants (36.67%) scored in the power category, 9 participants (30%) in speed, 15 participants (50%) in agility, 27 participants (90%) in reaction time, 5 participants (16.67%) in coordination, and 17 participants (56.67%) in balance. In the post-test, 2 participants (6.67%) achieved an excellent rating in power, while 3 participants (10%) achieved it in coordination. The average range saw improvements, with 12 participants (40%) in power, 11 participants (36.67%) in speed, 4

participants (13.33%) in agility, 19 participants (63.33%) in reaction time, 11 participants (37%) in coordination, and 28 participants (93.33%) in balance.

Overall, the post-test results showed an increase in performance across most categories compared to the pre-test, indicating progress using plyometric exercise.

Based on the study conducted by Markovic, G., & Mikulic, P. (2010) entitled "Neuro-musculoskeletal and performance adaptations to lower-extremity plyometric training" they found out that Plyometric training leads to improvements in lower-extremity strength, power, and neuromuscular coordination. It also enhances jump performance and sprinting speed. Thus, Plyometric exercises can be effective for enhancing athletic performance, especially in activities that require explosive lower-body movements like jumping and sprinting.

Table 13: Mean Pre-Assessment Skills Related Physical Fitness Components

Skills Related Fitness Components	Types of Exercise	Mean	SD	Interpretation
Agility	HIIT	79.67	2.75	Average
	Calisthenics	79.03	3.97	Average
	Plyometric	79.23	3.08	Average
Power	HIIT	76.07	3.67	Average
	Calisthenics	80.50	7.32	Good
	Plyometric	78.23	5.73	Average
Speed	HIIT	77.57	6.13	Average
	Calisthenics	74.97	3.44	Average
	Plyometric	74.13	2.97	Poor
Balance	HIIT	74.63	1.25	Average
	Calisthenics	74.47	2.64	Poor
	Plyometric	74.13	1.17	Poor
Coordination	HIIT	73.57	1.92	Poor
	Calisthenics	72.77	3.82	Poor
	Plyometric	72.50	2.29	Poor
Reaction Time	HIIT	77.90	1.47	Average
	Calisthenics	78.93	3.02	Average
	Plyometric	77.43	1.72	Average
Overall Components	HIIT	76.57	1.74	Average
	Calisthenics	76.78	2.22	Average
	Plyometric	75.94	1.88	Average

70-74 = Poor, 75-80 = Average, 81-85-81-89 = Good, 86-90-90 above = Excellent

The table presents an analysis of various skills related to fitness components and their corresponding mean scores, standard deviations (SD), and interpretations.

Agility scores across all types of exercises (HIIT, Calisthenics, and Plyometric) hover around the average range, with mean scores ranging from 79.03 to 79.67. The standard deviations range from 2.75 to 3.97, indicating moderate variability in performance for agility.

Power scores show slightly more variation. While the mean scores for HIIT and Plyometric exercises fall within the average range (76.07 and 78.23, respectively), Calisthenics exercise stands out with a higher mean score of 80.50, classified as "Good." The standard deviations range from 3.67 to 7.32, indicating some variability in power performance across the different exercise types.

Speed scores exhibit a similar pattern to agility and power, with mean scores falling within the average range (74.13 to 77.57) across HIIT, Calisthenics, and Plyometric exercises. However, the standard deviations are relatively high, ranging from 2.97 to 6.13, suggesting a wider range of performance levels for speed.

Balance, coordination, and reaction time scores consistently fall within the average range across all exercise types. The mean scores range from 72.50 to 74.63, and the standard deviations range from 1.17 to 3.82. These components appear to be areas where improvement is needed, as they are consistently classified as "Average" or "Poor."

Overall, the mean scores for the three overall components (agility, power, and speed) range from 75.94 to 76.78, falling within the average range. The standard deviations are relatively low for these components, ranging from 1.74 to 2.22, indicating less variability in performance.

In summary, the table suggests that the individuals assessed have average performance levels in agility, power, speed, and the overall fitness components. There is room for improvement in balance, coordination, and reaction time, as these components consistently exhibit lower mean scores and higher standard deviations.

Table 14: Mean Post-Assessment Skills Related Physical Fitness Components

Skills Related Fitness Components	Types of Exercise	Mean	SD	Interpretation
Agility	HIIT	81.10	3.58	Good
	Calisthenics	82.47	3.75	Good
	Plyometric	82.60	3.30	Good
Power	HIIT	76.87	3.99	Average
	Calisthenics	82.63	8.19	Good
	Plyometric	80.00	5.87	Average
Speed	HIIT	77.43	5.51	Average
	Calisthenics	77.03	4.35	Average
	Plyometric	79.03	5.95	Average
Balance	HIIT	75.43	0.94	Average
	Calisthenics	76.77	1.38	Average
	Plyometric	76.33	1.30	Average
Coordination	HIIT	73.80	1.54	Poor
	Calisthenics	75.23	2.76	Average
	Plyometric	74.70	1.91	Average
Reaction Time	HIIT	78.30	2.02	Average
	Calisthenics	79.80	2.27	Average
	Plyometric	79.67	2.62	Average
Overall Components	HIIT	77.16	1.75	Average
	Calisthenics	78.99	2.36	Average
	Plyometric	78.72	2.07	Average

70-74 = Poor, 75-80 = Average, 81-85-81-89 = Good, 86-90-90 above = Excellent

The data provided represents the mean (average) and standard deviation (SD) for various skills related to fitness components, as well as the types of exercises associated with each component.

In terms of Agility, the mean scores for HIIT, Calisthenics, and Plyometric exercises were 81.10, 82.47, and 82.60, respectively. With standard deviations of 3.58, 3.75, and 3.30, these scores indicate a good level of agility for individuals engaging in these exercises.

Power, on the other hand, showed slightly lower mean scores. The mean scores for HIIT, Calisthenics, and Plyometric exercises were 76.87, 82.63, and 80.00, respectively, indicating an average level of power. The standard deviations were 3.99, 8.19, and 5.87 for each exercise type, showing some variability in power scores among individuals.

Speed demonstrated similar results, with mean scores of 77.43, 77.03, and 79.03 for HIIT, Calisthenics, and Plyometric exercises, respectively. These scores, along with the standard deviations of 5.51, 4.35, and 5.95, indicate an average level of speed across the exercises.

Balance also showed an average level of performance, with mean scores of 75.43, 76.77, and 76.33 for HIIT, Calisthenics, and Plyometric exercises, respectively. The standard deviations were relatively low, suggesting consistency in balance scores among individuals.

Coordination had lower mean scores compared to other components, with values of 73.80, 75.23, and 74.70 for HIIT, Calisthenics, and Plyometric exercises, respectively. These scores indicate a relatively poor level of coordination. The standard deviations were 1.54, 2.76, and 1.91, showing some variability in coordination abilities.

Reaction Time exhibited average performance, as indicated by mean scores of 78.30, 79.80, and 79.67 for HIIT, Calisthenics, and Plyometric exercises, respectively. The standard deviations were relatively low, suggesting consistency in reaction time scores among individuals.

Overall, the mean scores for the fitness components across all exercise types were within the average range. The mean scores for HIIT, Calisthenics, and Plyometric exercises were 77.16, 78.99, and 78.72, respectively, indicating an average level of fitness. The standard deviations were relatively low, suggesting consistency in overall fitness scores among individuals.

In general, the post-test scores generally show improvement compared to the pre-test scores. Agility, power, and some speed-related skills demonstrate good scores in the post-test. However, coordination skills remain in the poor to average range. The interpretation suggests that the exercise types had varying effects on different fitness components, with some exercises yielding better results than others.

Table 15: Pre-Assessment Scores on Skills Related Physical Fitness Components when Exposed to 3 Types of Exercises

Skills Related Fitness Components		Sum of Squares	df	Mean Square	F	Sig.
Agility	Between Groups	6.289	2	3.144	0.288	0.751
	Within Groups	951.000	87	10.931		
	Total	957.289	89			
Power	Between Groups	294.867	2	147.433	4.431*	0.015
	Within Groups	2894.733	87	33.273		
	Total	3189.600	89			
Speed	Between Groups	192.422	2	96.211	4.959**	0.009
	Within Groups	1687.800	87	19.400		
	Total	1880.222	89			
Balance	Between Groups	3.889	2	1.944	0.592	0.556
	Within Groups	285.900	87	3.286		
	Total	289.789	89			
Coordination	Between Groups	18.489	2	9.244	1.179	0.312
	Within Groups	682.233	87	7.842		
	Total	700.722	89			
Reaction Time	Between Groups	35.356	2	17.678	3.734*	0.028
	Within Groups	411.933	87	4.735		
	Total	447.289	89			
Overall Components	Between Groups	11.262	2	5.631	1.473	0.235
	Within Groups	332.515	87	3.822		
	Total	343.777	89			

This table is the result of a statistical analysis to determine if there is a significant difference in pre-assessment scores on skills related physical fitness components when exposed to different types of exercises (HIIT, Plyometrics, and Calisthenics).

It shows the sum of squares (SS), degrees of freedom (df), mean square (MS), F-statistic (F), and significance level (Sig.) for each of the fitness components (agility, power, speed, balance, coordination, reaction time, and overall components).

The SS represents the variation in scores due to the different types of exercises, the df represents the number of participants in the study minus the number of groups, and the MS represents the variation in scores due to the different types of exercises divided by the degrees of freedom.

The F-statistic is a ratio of the MS between groups to the MS within groups, which determines whether the variation between groups is significantly larger than the variation within groups. The significance level (Sig.) indicates whether the result is statistically significant (i.e., whether the variation between groups is not likely due to chance).

The results show that there are significant differences in power, speed, and reaction time between the three types of exercises. Specifically, the F-statistics for power (4.431*),

speed (4.959**), and reaction time (3.734*) are greater than the critical value, and the significance levels for these components are less than 0.05 (the conventional level of statistical significance).

However, there are no significant differences in agility, balance, coordination, and overall components between the three types of exercises, as their F-statistics are not significant, and their significance levels are greater than 0.05.

In conclusion, the study found that different types of exercises (HIIT, Plyometrics, and Calisthenics) have a significant effect on power, speed, and reaction time but not on agility, balance, coordination, and overall components.

In summary, the low scores in the pre-assessment could be attributed to various factors such as individual differences, varying levels of skill, physical fitness level or other factors unrelated to group differences. The significance levels and F-values provide insights into the statistical significance of the differences observed in some components.

This information can be used to inform exercise programs designed to improve specific physical fitness components, but further research is needed to confirm these findings and determine the optimal exercise program for improving physical fitness.

Table 16: Post-Assessment Scores on Skills Related Physical Fitness Components when Exposed to 3 Types of Exercises

Skills Related Fitness Components		Sum of Squares	df	Mean Square	F	Sig.
Agility	Between Groups	41.356	2	20.678	1.642	0.199
	Within Groups	1095.367	87	12.590		
	Total	1136.722	89			
Power	Between Groups	500.067	2	250.033	6.386**	0.003
	Within Groups	3406.433	87	39.154		
	Total	3906.500	89			
Speed	Between Groups	67.200	2	33.600	1.191	0.309
	Within Groups	2455.300	87	28.222		
	Total	2522.500	89			
Balance	Between Groups	27.756	2	13.878	9.330**	0.000
	Within Groups	129.400	87	1.487		
	Total	157.156	89			
Coordination	Between Groups	31.489	2	15.744	3.455**	0.036
	Within Groups	396.467	87	4.557		
	Total	427.956	89			
Reaction Time	Between Groups	41.356	2	20.678	3.862*	0.025
	Within Groups	465.767	87	5.354		
	Total	507.122	89			
Overall Components	Between Groups	58.867	2	29.433	6.842**	0.002
	Within Groups	374.289	87	4.302		
	Total	433.156	89			

The data presented in the table 16 shows the results of this study determining whether there is a significant difference in the post-assessment scores on the skills related physical fitness components when exposed to different types of exercises. The study investigated three types of exercises: High Intensity Interval Training (HIIT), Plyometrics, and Calisthenics, and six skills related fitness components: Agility, Power, Speed, Balance, Coordination, and Reaction Time, as well as the Overall Components.

To analyze the data, a one-way analysis of variance (ANOVA) was conducted, which allowed for testing the null hypothesis that there are no significant differences between the means of the groups. The ANOVA output includes the sum of squares (SS), degrees of freedom (df), mean square (MS), F-value, and significance level (Sig.) for each of the six skills related fitness components and the Overall Components.

The results of the ANOVA showed that there was a significant difference in the post-assessment scores for Power, Balance, Coordination, Reaction Time, and the Overall Components between the three types of exercises, with p-values of 0.003, 0.000, 0.036, 0.025, and 0.002, respectively. The F-values for these skills related fitness components ranged from 3.455 to 9.330, indicating a significant difference between the means of the groups.

On the other hand, there was no significant difference in the post-assessment scores for Agility and Speed between the three types of exercises, with p-values of 0.199 and 0.309, respectively. The F-values for these skills related fitness components were 1.642 and 1.191, respectively, which indicates that there was no significant difference between the means of the groups.

Overall, the study suggests that the type of exercise has a significant impact on the improvement of certain skills related fitness components, such as Power, Balance, Coordination, Reaction Time, and the Overall Components, but not on Agility and Speed. HIIT, Plyometrics, and Calisthenics may be useful exercises for improving certain skills related fitness components, but further research is needed to confirm these findings and determine the optimal exercise program for improving physical fitness.

V. CONCLUSION AND RECOMMENDATION

Based on the data gathered and analysed, the following conclusions can be drawn from the conducted research:

- High Intensity Interval Training, Calisthenics and Plyometric exercises are effective parts of the training program regardless of sporting event whether it's a team sport or individual or dual sports. These exercises showed significant improvement to Power, Speed, and Reaction Time during their pre-testing when the athletes are exposed to those exercises. Therefore, the hypothesis of this study was partially rejected by this result.
- Significant impact on the improvement of certain skills related physical fitness components during their pre-test period and based on the result of the post-test, Power, Balance, Coordination, and Reaction Time, came up with a strong result showing that these skills related fitness components have a significant impact on for the 3 different types of exercises. Based on this, the hypothesis of the study is partially rejected.
- Comparing the pre-test to the post-test results of Calisthenics and Plyometrics, it is observed that both exercises have led to an overall improvement in most categories, with an increase in the number of participants falling in higher rating categories for parameters such as power and agility. The results suggest that both

Calisthenics and Plyometrics are effective in improving physical fitness, but further improvement is required in certain areas.

Based on the results and conclusions of the study, the following recommendations are hereby suggested:

- Since the study revealed that the use of 3 different types of exercises is an effective addition in enhancing and improving the skills related physical fitness components of athletes, coaches and sports enthusiasts are then encouraged to use or to add HIIT, Calisthenics, or Plyometrics to their training routine for them to further develop most of their skills related physical fitness components.
 - P.E teachers may also use the result of this study to adjust their usual physical activity exercises for their students to generate improvement/s on the result of their PPFT Test required for all public schools. Using the different type of exercises, P.E teachers can now target specific development for each skills related fitness components.
 - The school Principals, Department Heads and School Administrators may give support on the use of 3 different types of exercises to improve their learners holistically and to promote an active citizenry.
 - Also, individuals who just want to enhance their fitness level can use this research to have a more target-based approach type of training on top of their routinary exercise to further improve their skills related fitness components.
5. Future researchers may use this as a reference for their study. They may conduct further research to investigate why some of the skills related components remain average even after using one or more specific exercise. With the help of future researchers, there will be more specific data to help improve athletes and non-athletes in terms of their fitness level.

REFERENCES

- [1.] Erin K., (2019) Things You Need to Know about Anaerobic Exercise *Health Line* <https://www.healthline.com/health/fitness-exercise/anaerobic-exercise>
- [2.] Daniel Bubnis, Emily Cronkleton (2019) What are Plyometric Exercises <https://www.healthline.com/health/exercise-fitness/plyometric-exercises>
- [3.] Sherri Gordon, Kristin Mcgee (2023) What are Calisthenics Calisthenics: Benefits, Types, and Getting Started (verywellfit.com)
- [4.] Kara Mayer-Robinson (2022). Jumpstart WebMD
- [5.] Gist NH, Fedewa MV, Dishman RK (2019). "Effects of high-intensity interval training on agility performance in young athletes: a systematic review and meta-analysis." *Sports Medicine*
- [6.] Cipryan L. et. al. (2018). "Effects of high-intensity interval training on agility performance in young athletes: a systematic review and meta-analysis." *Journal of Human Kinetics*
- [7.] Smith et. al., (2020). The Effect of Calisthenics Training on Balance and Agility in Collegiate Basketball Players *Pedagogy Department of Special Education. Researchgate.net*
- [8.] Markovic, G., & Mikulic, P. (2010). Neuromusculoskeletal and performance adaptations to lower-extremity plyometric training. *Sports Medicine*, 40(10), 859-895.
- [9.] Markovic, G., & Mikulic, P. (2010). Neuromusculoskeletal and performance adaptations to lower-extremity plyometric training. *Sports Medicine*, 40(10), 859-895.
- [10.] Maamer, S., & Karim C. (2016) Effects of Plyometric Training on Physical Fitness in Team Sports Athletes: A Systematic Review. *National Center for Biotechnology Information, v. 53, (231-247)* doi: 10.1515/hukin-2016-0026
- [11.] Little, J. P., Safdar, A., Wilkin, G. P., Tarnopolsky, M. A., & Gibala, M. J. (2010). A practical model of low-volume high-intensity interval training induces mitochondrial biogenesis in human skeletal muscle: potential mechanisms. *The Journal of Physiology*, 588(6), 1011- 1022.
- [12.] Ramirez-Campillo, R., Alvarez, C., Henriquez-Olguín, C., Báez-Sanmartín, E., Martínez, C., Andrade, D. C.,... & Izquierdo, M. (2014).
- [13.] Effects of plyometric training on endurance and explosive strength performance in competitive middle and long-distance runners. *Journal of Strength and Conditioning Research*, 28(1), 97-104. DOI: 10.1519/JSC.0b013e3182a1f44c
- [14.] Markovic, G., & Mikulic, P. (2010). Neuromusculoskeletal and performance adaptations to lower-extremity plyometric training. *Sports Medicine*, 40(10), 859-895.
- [15.] Kelly B., (2021) How to do Calisthenics, A Convenient and Effective Bodyweight Workout *Insider Reviews* <https://www.insider.com/what-is-calisthenics>
- [16.] Kobal, R., Stančin, S. S., & Filipčič, A. (2017). The effects of plyometric training on sprint performance: A meta-analysis. *Journal of Strength and Conditioning Research*, 31(9), 2443-2452.
- [17.] Ramirez-Campillo, R., Meylan, C., Alvarez, C., Henriquez-Olguín, C., Martínez, C., Cañas-Jamett, R., Andrade, D. C., & Izquierdo, M. (2014). Effects of plyometric training on endurance and explosive strength performance in competitive middle and long-distance runners. *Journal of Strength and Conditioning Research*, 28(1), 97-104.