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Profile of rectus abdominis muscle of the prospective students of athletic special sports class of SMA Negeri 1 Sewon Bantul

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Abstract
This research aims to determine (1) the profile of rectus abdominis muscle of the prospective male students of the athletics special sports class at SMA Negeri 1 Sewon (Sewon 1 High School), Bantul in 2020-2022; (2) profile of the rectus abdominis muscles of the prospective female students of the athletics special sports class at SMA Negeri 1 Sewon Bantul in 2020-2022. This research was a descriptive quantitative study. The research population was the prospective students of the athletics special sports class at SMA Negeri 1 Sewon Bantul from 2020-2022 totaling 22 students, with the details consisted of 17 male students and 5 female students. The sampling technique used the total sampling technique. The research was sit-ups for 1 minute. The data analysis used the descriptive analysis with percentages. The results of the study show that (1) the rectus abdominis muscles of the male students of athletics special sports class at SMA Negeri 1 Sewon Bantul in 2020-2022. (2) The rectus abdominis muscles of the female prospective students of athletics special sports class at SMA Negeri 1 Sewon Bantul in 2020-2022.

Keywords: Rectus abdominis, athletics, prospective special sports class students

1. Introduction
One of the sports coaching at the education is the Special Sports Class (KKO). Special Sports Class (KKO) is a class that is devoted to developing sports achievements. Specialized to develop sports achievements. Sports achievement coaching for KKO students which is carried out in a well-organized manner in each KKO organizing school is expected to be able to provide sports achievement coaching services (Fitriana, 2022: 34) [1]. Athletes/students should be increasingly encouraged to participate in one sport throughout the year to improve their sports skills. Organizing schools KKO organizing schools should ideally determine the branches of sports that will be fostered and developed achievements, one of which is athletics. Athletics, which includes walking, running, throwing, and jumping, is the oldest sport in the world. This is because the age of this athletic sport is as old as the beginning of the first humans in the world. The activities of walking, running, throwing and jumping are forms of basic skills most original and most natural from humans, as well as are movements that are very important and invaluable to human life. Athletics is said to be the oldest sport age and is also referred to as the "mother or parent" of all sports and is often referred to as the "mother" of all sports. The reason is because the movement of athletics have been reflected in the lives of early humans, remembering that walking, running, jumping and throwing unconsciously they have done in an effort to maintain and develop their lives, they even use it to save themselves from the disturbance of the surrounding nature (Purnomo & Dapan, 2017: 3) [2].
Athletics consists of walking, running, jumping, and throwing based on the distance traveled when running can be divided into: a) short distance sprints ranging from 60 to 400 meters, b) middle distance running (middle distance) ranging from 800 to 1500 meters, and c) long distance running (long distance) ranging from 3000 meters to 42.195 km (marathon). Throwing numbers consist of javelin throwing, discus throwing, hammer throwing, and shot put bullet. Road numbers consist of 3000 m (for juveniles), 5000 m (for juniors) and 10,000 m,

20,000 m (For Seniors). Jumping consists of high jump, long jump, jump and pole vault (Purnomo & Dapan, 2017) [3]. One of the important elements or factors to achieve an achievement in sports, in addition to mastery of techniques, tactics, and mental abilities is physical condition. How important and influence on the achievement of a sporting a sporting achievement is very dependent on the needs or demands of each sport. As for some physical conditions that affect the development of athlete achievement among others, namely, strength, speed, flexibility, endurance, balance, muscular endurance (power) (Fikar & Wulandari, 2022: 47) [4]. In this study will focused on the physical condition component of strength, namely core muscle.

Core Muscle is a collection of muscles in the abdomen that looks like a cube with abdominal muscles as the front, paraspinal muscles and gluteus at the back, diaphragm at the top and at the bottom are pelvic floor muscles and hip support muscles. Core Muscle itself is composed of 29 muscles that help humans to stabilize the spine, pelvis, as well as the kinetic chain in helping movement. As a kinetic chain in assisting movement (Pratiwi, 2022: 15) [6]. If the core system works properly efficient, it will result in proper power distribution, optimal power distribution, optimal control and efficiency in movement.

Core muscle stability is very important in supporting daily body movement activities, when stability is achieved, strength can be generated through the legs to run, jump, and perform other activities. A good core muscle stability score can reduce the risk of injury in movement and is good at transferring movement to the superior and inferior extremities. Both superior and inferior extremities. Core muscles that are not will have an impact on posture which will interfere with movement in the superior and inferior extremities both superior and inferior extremities, so that movement is no longer coordinated (Elphinston, 2020: 24) [7].

The rectus abdominis of an athletic athlete can affect the athlete's performance during the match. It can be said that rectus abdominis can affect athletic performance. Athletes to get optimal performance requires a strong core muscle is needed. In fast walking numbers, technical skills are one of the things that are considered because at the time of assessment the number of violations committed by athletes, for example knees bent, floating legs, and running can be detrimental to the athlete during the race. Athletes during the race technical skills in fast walking one of which is influenced by the factor of stability (Prasetyo, 2021: 7) [8].

In sprint, there are many factors that affect running speed, including core muscles, especially at the front, which are often called abdominal muscles or *rectus abdominis*. Maulana's research (2016: 28) [9] shows that there is a significant contribution between abdominal muscle strength and running speed. The results of research by Argantos & Hidayat (2017) [10]; Saputra & Primayanti (2019) [11]; Gunadi (2021) [12]; Anwar, *et al*., (2018) [13] also prove that there is a significant relationship between abdominal muscle strength and long jump ability. Setiawan & Mintarto (2017: 2) [14] state that having good abdominal muscle strength will provide maximum results. Strong abdominal muscles can help the rhythm of steps and arms while running. This is because when running the abdominal muscles will keep the body posture upright while running.

The importance of the athlete's physical condition should be based on by the coaches even athletes must also be very realize how important physical condition is, so can find out early. Athletes who experience disturbances in physical condition, will later result in on the acquisition of achievements and athlete performance in a match. Physical condition test results in the form of data will be used by the coach to inform the state of physical condition to athletes. Physical condition is also used as a tool to help design the next training program so that it can improve athlete's physical condition.

Some coaches still consider technical skills are not something that is important in achievement. Technical skills in athletic sports are influenced by core muscles or Core Muscle. But there are still coaches who don't know that core muscle is important in athletic sports. With this test, SMA Negeri 1 Sewon Bantul wants prospective KKO students later can have a very good performance in championships representing the school. The task of the coach will optimize training patterns and athletes' achievements if they already know the athlete's physical condition in all aspects from the beginning. From the description of the background description of the problem above, the researcher wishes to conduct a study entitled "Profile of *rectus abdominis* Muscle of the Prospective Students of Athletic Special Sports Class of SMA Negeri 1 Sewon, Bantul".

2. Materials and Methods

This research is quantitative descriptive research. According to Sugiyono (2017: 207) [15], quantitative descriptive analysis technique is data analysis by describing or describing the data that has been collected as it is. The research place is SMA Negeri 1 Sewon Bantul which is located at Jl. Parangtritis No.KM. 5, Tarudan, Bangunharjo, Sewon Sub-district, Bantul Regency, Special Region of Yogyakarta. Bantul, Special Region of Yogyakarta. The research time will be conducted from July to November 2022. The population in the study were prospective students of the special sports class of athletics at SMA Negeri 1 Sewon, Bantul from 2020-2022, totaling 22 students. Bantul from 2020-2022 totaling 22 students, with details of 17 boys and 5 girls. The sampling technique used is total sampling. The instrument measures the strength of the front core muscle or *rectus abdominis* muscle. Then the research instrument used is the lying test sitting knee bend (sit-ups) for 1 minute. The instrument this instrument has a validity of 0.670 and a reliability of of 0.885 (Sari & Subagio, 2021: 398) [16]. Test norms sit-ups for both men and women are presented in Table 1 as follows:

Table 1: Sit up test norms

Interval	Kategori
Mi + 1,8 Sbi < X	Sangat Tinggi
Mi + 0,6 Sbi < X ≤ Mi + 1,8 Sbi	Tinggi
Mi - 0,6 Sbi < X ≤ Mi + 0,6 Sbi	Cukup
Mi - 1,8 Sbi < X ≤ Mi – 0,6 Sbi	Rendah
X ≤ Mi - 1,8 Sbi	Sangat Rendah

Description

X = average
Mi = ½ (ideal max score + ideal min score)
Sbi = 1/6 (ideal max score - ideal min score)
Ideal max score = highest score
Ideal min score = lowest score

Data analysis techniques in this study using percentage descriptive data analysis techniques (Sugiyono, 2017: 112). Percentage descriptive formula as follows:

$$P = \frac{F}{N} X\ 100\%$$

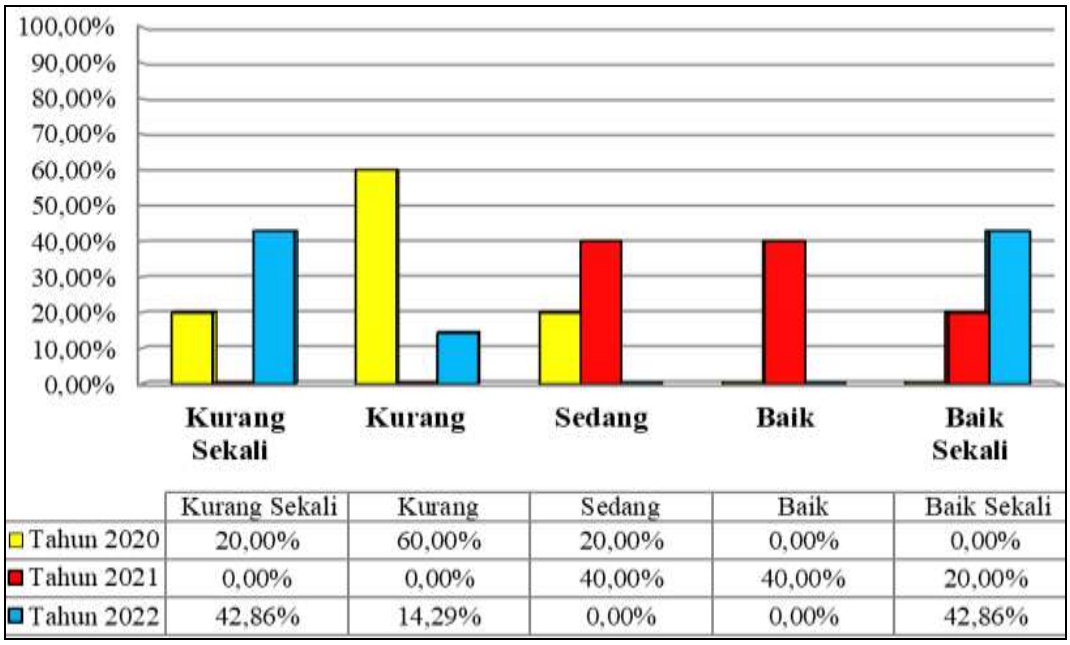
Description
P = Percentage sought (Relative Frequency)
F = Frequency
N = Number of Respondents

3. Results and Discussion

3.1 Results

a) Rectus abdominis Muscle of Male Student Candidates

Rectus abdominis of male candidates for special sports classes at SMA Negeri 1 Sewon Bantul in Figure 1 as follows

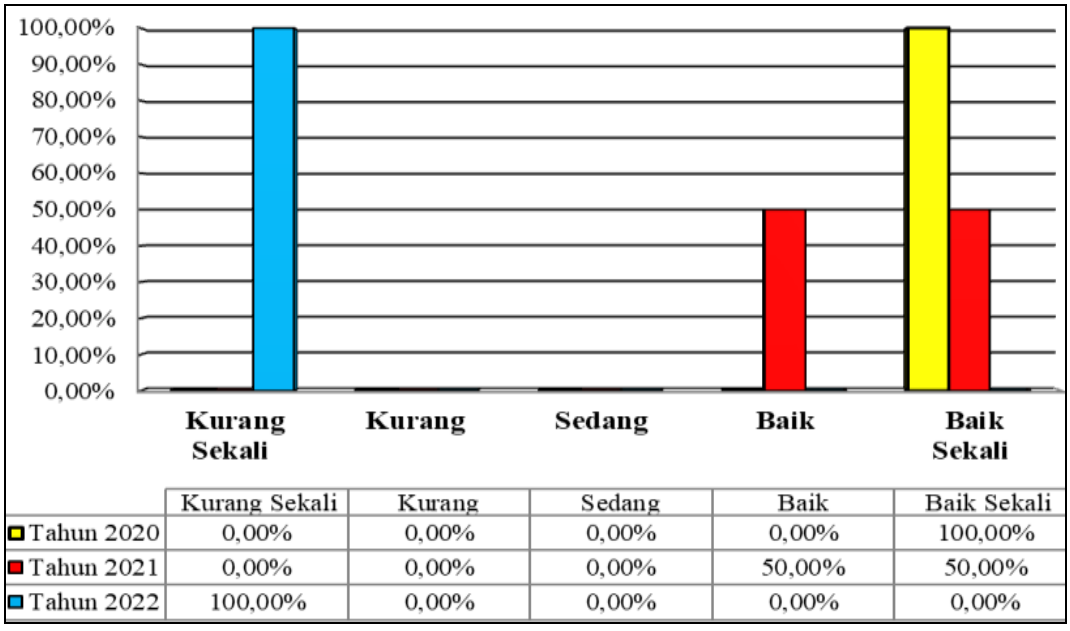


	Kurang Sekali	Kurang	Sedang	Baik	Baik Sekali
Tahun 2020	20,00%	60,00%	20,00%	0,00%	0,00%
Tahun 2021	0,00%	0,00%	40,00%	40,00%	20,00%
Tahun 2022	42,86%	14,29%	0,00%	0,00%	42,86%

Fig 1: Rectus abdominis bar chart male prospective students of special sports class of SMA Negeri 1 Sewon

Based on Figure 1, it shows that *rectus abdominis* male KKO student candidates at SMA Negeri 1 Sewon Bantul in 2020 are in the "Very Poor" category 20.00% (1 student), "Poor" 60.00% (3 students), "Moderate" 20.00% (1 student), "Good" 0.00% (0 students), and "Excellent" 0.00% (0 students), in 2021 the categories "Very Poor" 0.00% (0 students), "Poor" 0.00% (0 students), "Moderate" 40,00% (2 students), "Good" 40.00% (2 students), and "Excellent" 20.00% (1 student), and in 2022 the category of "Less than Very Poor" category amounted to 42.86% (3 students), 'Poor' 14.29% (1 student), "Moderate" 0.00% (0 students), "Good" 0.00% (0 students), and "Excellent" 42.86% (3 students).

b) Rectus abdominis Muscle of female student candidates



	Kurang Sekali	Kurang	Sedang	Baik	Baik Sekali
Tahun 2020	0,00%	0,00%	0,00%	0,00%	100,00%
Tahun 2021	0,00%	0,00%	0,00%	50,00%	50,00%
Tahun 2022	100,00%	0,00%	0,00%	0,00%	0,00%

Fig 2: Rectus abdominis bar chart female prospective students of special sports class of SMA negeri 1 sewon

Based on Figure 2 above, it shows that the *rectus abdominis* of female KKO student candidates at SMA Negeri 1 Sewon Bantul in 2020 is in the "Very Poor" category of 0.00% (0 students), "Poor" 0.00% (0 students), "Moderate" 0.00% (0 students),"Good" 0.00% (0 students), and "Excellent" 100.00% (2 students), in 2021 the category "Very Poor" of

0.00% (0 students), "Poor" 0.00% (0 students), and "Excellent" 100.00% (2 students). Very Poor" category of 0.00% (0 students), 'Poor' 0.00% (0 students), 'Moderate' 0.00% (0 students), 'Good' 50.00% (1 student), and 'Excellent' 50.00% (1 student), and in 2022 the "Very Poor" category was 100.00% (1 student), "Poor" 0.00% (0 students), "Moderate" 0.00% (0 students), "Good" 0.00% (0 students), and "Excellent" 0.00% (0 students).

3.2 Discussion

Based on the results of the study, it shows that the *rectus abdominis* of male candidates for special sports classes at SMA Negeri 1 Sewon Bantul is mostly in the excellent category. Based on the research results, it shows that the average *rectus abdominis* of male candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2020 is 29.00, in 2021 *rectus abdominis* is 37.40, and in 2022 *rectus abdominis* is 33.86. Based on this data, it shows that the *rectus abdominis* of male candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2021 is better than in 2020 with a difference of 8.4 and in 2022 with a difference of 3.54. *rectus abdominis* male candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2021 are better than in 2020 and 2022 because male candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2021 in terms of achievement are also better than others. In terms of achievement, male candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2021 are better, so students are also more physically trained.

Based on the results of the study, it shows that the *rectus abdominis* of prospective female students for special sports classes at SMA Negeri 1 Sewon Bantul is mostly in the excellent category. Based on the research results, it shows that the average *rectus abdominis* of female candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2020 is 36.00, in 2021 *rectus abdominis* is 35.00, and in 2022 *rectus abdominis* is 11.00. Based on this data, it shows that the *rectus abdominis* of female candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2020 is better than in 2021 with a difference of 1.00 and in 2022 with a difference of 25.00. *Rectus abdominis* female candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2020 are better than in 2021 and 2022 because female candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2020 in terms of achievement are also better than others. In terms of achievement, female candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2020 are better, so students are also more physically trained.

Core muscles, in general, can be defined as the muscles where the center of gravity of the body is located. Core muscles support the entire movement and balance of the human body. Specifically, core muscles are muscle structures that support the entire structure of the spine, abdomen, pelvis and pelvis, or what is called the Lumbo-Pelvic Hip-Complex (LPHC) (Septianingtyas, *et al*., 2018: 14) [18]. Strong core muscles are useful for maintaining the balance of the proportion of body muscles in performing the entire kinetic chain of body movements. Core muscles control the efficiency of acceleration or deceleration movements, and stabilization of the body, so as to prevent injury (Utama, *et al*., 2020: 164) [17]. Core muscles are essential for providing localized strength, balance, and lowering the risk of injury. In other words, core muscles are central to the control of core muscle strength, balance, and movement that will be maximized by the kinethic chains of both the upper and lower extremities.

Core Muscle is a collection of muscles in the abdomen that looks like a cube with abdominal muscles as the front, paraspinal muscles and gluteus at the back, diaphragm at the top and at the bottom are pelvic floor muscles and hip support muscles. Core Muscle itself is composed of 29 muscles that help humans to stabilize the spine, pelvis, as well as a kinetic chain in assisting movement (Pratiwi, 2022: 15) [19]. If the core system works efficiently, it will result in proper power distribution, optimal control and efficiency in movement. Core Muscle is located in the lumbo-pelvic-hip complex. The Core Muscle area is the location or place of the center of gravity and the place of the beginning of all movements. The efficiency of the core is intended to maintain the normal lengthening relationship of the agonist and antagonist functions, which will increase the relationship of the two forces in the lumbo-pelvic-hip complex area.

The movements in athletics are based on the biomotor abilities needed in athletics. One of the biomotor components of athletics is abdominal muscle strength. Abdominal muscle strength is one of the important factors in athletics such as long jump, high jump, shot put, and running numbers. This is proven by the results of research by Argantos & Hidayat (2017) [20]; Saputra & Primayanti (2019) [21]; Gunadi (2021) [22]; Anwar, *et al*., (2018) [23] also prove that there is a significant relationship between abdominal muscle strength and long jump ability. This means that the better the strength of the athlete's abdominal muscles, the better the long jump ability. Abdominal muscle strength has an important role in the success of jumping in the squatting style long jump. Abdominal muscle strength has an important role because the legs provide support to the legs so that they can be stretched forward as far as possible, the point is to help the point of weight forward the implementation of the jump in the squatting style long jump. The results of Ardanari & Mintarto's research (2018) [24] show that the contribution of abdominal muscle strength to discuss throwing achievement is 53.3%. The results of Safrizal's research (2022) [25] show that there is a positive and significant relationship between abdominal muscle endurance and the ability to run a 100 meter sprint of (r = 0.81). Basically, muscle strength is a stretch between endurance and muscle strength. Abdominal muscle endurance is needed to maintain activities that are dominated by muscle use.

Furthermore, Kusuma (2020) [26]; Gunadi (2021) [27]; Abidin (2021) [28] in his research shows that there is a significant relationship between abdominal muscle strength and O'Brien style bullets. Factors that influence the O'Brien style bullet reject require elements of physical condition such as: strength, speed, flexibility, balance, accuracy, endurance, agility, and coordination. Yeti (2021) [29] revealed that the contribution of strength in the abdominal muscles to the achievement of the shot put number using the O'Brien style was 20.16%. Abdominal muscle strength affects running ability, as the results of Maulana's research (2016) [30] prove that there is a significant relationship between abdominal muscle strength and 100 meter running speed. Running 100 meters with a very short time requires strength not only from leg muscle strength but almost all limbs including abdominal muscles. The abdomen as a power center, this part of the body is the origin of all movements or a link that stabilizes all movements through it. Setiawan & Mintarto (2017: 2) [31] state that having good abdominal muscle strength will provide maximum results. Strong abdominal muscles can help the rhythm of steps and arms while running. This is because when running the abdominal muscles will keep the body posture upright

while running.

The *rectus abdominis* is the outermost abdominal muscle connected by a band of ligaments called the linea alba. The *rectus abdominis* is the muscle that forms the sixpack. Rectus means straight and abdominis is the abdomen. The *rectus abdominis* muscle is perpendicular to the abdomen. This muscle serves to maintain the spine when doing forward back bend movements and keep the pelvis stable. Origo: costae to V, VI, VII and on processus xyphoideus sterni, Insersio: the top of os. Pubis. The abdominal wall is formed by the abdominal muscles which are bounded on the top by the angulus infrasternalis and on the bottom by the iliac crest, pubic sulcus and inguinal sulcus. The abdominal wall muscles consist of the front, lateral and back (ventrolateral) abdominal wall muscles (Kalaba *et al*., 2016: 3) [32].

Abdominal muscle strength needs attention, especially in implementing athletic training programs. Strength training gets a larger portion in a workout compared to the portion of other exercises. Strength is also the most important basis in training movement skills. The component of a person's physical condition in relation to his ability to use muscles to receive loads while working. Training can be done using weight training, where with this exercise there can be an increase in the number of sarcomeres and muscle fibers (actin and myosin filaments needed in muscle contraction), so that with the formation of new muscle fibers, muscle strength can increase (Gunadi, 2021: 30) [33]. One of the exercises used to increase abdominal muscle strength is the sit-up exercise. Nasrulloh, *et al*., (2018: 43) [34] say that the sit-up movement is a strength abdominal exercise commonly done to strengthen the abdominal muscles, this exercise is aerobic, sit-ups are not only for abdominal muscle strength training but can also reduce body fat and increase lean muscle mass. Usually do this sit-up exercise with a count of 15 times, the back of the head tends to lift involuntarily and what needs to be considered during sit-ups is to inhale when moving up then exhale when going back down.

Another method that can also strengthen and tone the abdominal muscles is the plank exercise. This plank movement aims to build isometrics and endurance. Plank exercise needs to be developed because it has so many benefits, namely strengthening the upper and lower core muscles of the body, improving movement function, and improving balance and stability. This plank movement is one type of exercise that is isometric, namely a type of static contraction exercise with muscular contraction against resistance without any change in muscle length or not followed by joint movement (Lisnaini, *et al*., 2021: 2) [35].

4. Conclusions

Based on the results of data analysis, description, testing of research results, and discussion, it can be concluded that:

1. Rectus abdominis male candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2020 were in the "Very Poor" category of 20.00% (1 student), "Poor" 60.00% (3 students), "Medium" 20.00% (1 student), "Good" 0.00% (0 students), and "Excellent" 0.00% (0 students), in 2021 the "Very Poor" category was 0.00% (0 students), "Less" 0.00% (0 students), "Moderate" 40.00% (2 students), "Good" 40.00% (2 students), and "Excellent" 20.00% (1 student), and Year 2022 the "Less than Excellent" category was 42.86% (3 students), "Less than" 14.29% (1 student), "Medium" 0.00% (0 students), "Good" 0.00% (0 students), and "Excellent" 42.86% (3 students).
2. Rectus abdominis female candidates for special sports classes at SMA Negeri 1 Sewon Bantul in 2020 were in the "Very Poor" category of 0.00% (0 students), "Less" 0.00% (0 students), "Moderate" 0.00% (0 students), "Good" 0.00% (0 students), and "Excellent" 100.00% (2 students), in 2021 the "Very Poor" category was 0, 00% (0 students), "Less" 0.00% (0 students), "Medium" 0.00% (0 students), "Good" 50.00% (1 student), and "Excellent" 50.00% (1 student), and Year 2022 the "Less" category is 100.00% (1 student), "Less" 0.00% (0 students), "Medium" 0.00
3. % (0 students), "Good" 0.00% (0 students), and "Excellent" 0.00% (0 students).

Acknowledgements

Based on the research conclusions above, there are several suggestions that can be conveyed, For trainers, they should pay attention to the core muscle of prospective students of special sports classes at SMA Negeri 1 Sewon Bantul by providing the right training method. For prospective students of special sports classes at SMA Negeri 1 Sewon Bantul to add other exercises that support in increasing core muscle, because it affects athletic achievement. In this research there are still many shortcomings, for that future researchers should develop and refine this research with a broader scope.

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Appendix

Table 2: Norms

Statistics			
		Rectus abdominis Calon Siswa Putra	**Rectus abdominis Calon Siswa Putri**
N	**Valid**	17	5
	Missing	0	12
Mean		33,47	30,60
Median		32,00	35,00
Mode		30,00	11,00[a]
Std, Deviation		7,53	11,55
Minimum		21,00	11,00
Maximum		46,00	40,00
Sum		569,00	153,00
a, Multiple modes exist, the smallest value is shown			

Table 3: Descriptive statistics rectus abdominis male student candidate

Statistics				
		Tahun 2020	**Tahun 2021**	**Tahun 2022**
N	Valid	5	5	7
	Missing	2	2	0
Mean		29,00	37,40	33,86
Median		30,00	38,00	30,00
Mode		30,00	32,00[a]	24,00[a]
Std, Deviation		4,64	4,34	9,74
Minimum		21,00	32,00	24,00
Maximum		33,00	42,00	46,00
Sum		145,00	187,00	237,00
a, Multiple modes exist, The smallest value is shown				

Table 4: Descriptive statistics rectus abdominis female student candidate

Statistics				
		Tahun 2020	**Tahun 2021**	**Tahun 2022**
N	Valid	2	2	1
	Missing	0	0	1
Mean		36,00	35,00	11,00
Median		36,00	35,00	11,00
Mode		35,00[a]	30,00[a]	11,00
Std, Deviation		1,41	7,07	11,00
Minimum		35,00	30,00	11,00
Maximum		37,00	40,00	11,00
Sum		72,00	70,00	11,00
a, Multiple modes exist, the smallest value is shown				